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Ritual Practice, Ceremonial Organization, and the Value and Use of Birds in Prehispanic Chaco Canyon, New Mexico, 800-1150 CE

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and the Value and Use of Birds in Prehispanic Chaco Canyon,

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in Anthropology

by

Katelyn Jo Bishop

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ABSTRACT OF THE DISSERTATION

Ritual Practice, Ceremonial Organization,

and the Value and Use of Birds in Prehispanic Chaco Canyon,

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by

Katelyn Jo Bishop

Doctor of Philosophy in Anthropology

University of California, Los Angeles, 2019

Professor Gregson T. Schachner, Co-Chair

Professor Richard Gardner Lesure, Co-Chair

In the North American Southwest, the long-term centrality of birds to Pueblo ceremonial life has been demonstrated both ethnographically and archaeologically. Whole birds, their parts, and their feathers have been frequent participants in or components of ritual practice. Despite the wide acceptance that Chaco Canyon was a central location for ceremony and ritual in the northern Southwest during the Pueblo II period, few details of the nature of ritual practice have been reconstructed. This dissertation explores the use and significance of birds in Chaco in order to reconstruct details of ceremonial life during the canyon's major occupation (800-1150 CE). Six museum collections were examined to produce a dataset that presents avifaunal remains from Chaco Canyon excavated over the last 130 years. This research demonstrates that, while birds may have been occasional contributions to diet, and while their bones were used to manufacture certain bone ornaments and implements, their primary importance in Chaco Canyon was in ceremonial life. Birds were active and frequent participants in ritual practice, used widely across the canyon. Many local and several exotic types of birds were important to the inhabitants of Chaco Canyon; foremost among these were eagles, hawks, macaws, and turkeys. The distribution of these birds between different sites, however, hints at the presence of social hierarchy in the canyon, and that differentiation may have been based in ritual authority and differential access to certain ceremonial resources. Results not only shed light on the value of birds to the prehispanic occupants of Chaco Canyon and on the nature of Chacoan ritual, but also demonstrate the importance of (re)examining collections from historic excavations, and the value of using legacy and archival data to enhance provenience and contextual information in studies of Chaco’s material culture.

The dissertation of Katelyn Jo Bishop is approved.

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University of California, Los Angeles

2019

Dedicated to the memory of my beloved father,

James Bishop.

TABLE OF CONTENTS

Chapter 1: Introduction..........1
I. Project Focus..........2
II. Chaco Canyon..........3
III. Primary Debates..........8
a. Chronology and Timing of Social Changes in the Canyon..........8
b. The Chaco "System"..........10
c. Population..........11
d. Social Organization..........12
e. Inequality..........15
f. Ritual and Ceremony in Chaco..........16
IV. Research Objectives..........17
a. (1) Bird Use and Human-bird Relationships..........17
b. (2) Nature of Ritual Practice..........17
c. (3) Ceremonial Organization in Chaco Canyon..........18
V. Outline of the Dissertation..........19

Chapter 2: The Importance of Birds in both Past and Present Pueblo Life..........23
I. Involvement of Birds in Pueblo Life..........25
a. Methods of Procurement..........25
b. Captive Wild Birds..........29
c. Primary and Secondary Products..........34
i. Feathers..........34
ii. Stuffed Birds..........43
iii. Whole Skins and Complete Portions..........43
iv. Taboo and Avoidance..........44
v. Bone..........45
d. Birds as Food..........46
i. Turkey..........47
ii. Other Types of Birds Eaten..........56
iii. Symbolic Consumption..........57
e. Birds in the Naming of Clans..........58
II. Ornithological Nomenclature..........61
III. Symbolic Associations..........68
IV. Conclusions..........77

Chapter 3: Social Zooarchaeology and a Practice Theory Approach to Ritual..........80
I. Social Zooarchaeology and Avian Zooarchaeology..........80
a. Avian Zooarchaeology, Avian Agency, Ontological Taxonomies..........83
b. Birds in the Southwest U.S..........85
II. Ritual and Religion in Archaeology..........87
III. A Practice Theory Approach to Ritual..........89
a. Ritual Practice and Ritualization..........91
b. Mechanisms of Ritualization..........93
IV. In Defense of Many Contexts..........97

V. Ceremonial Organization....102
a. Horizontal Ceremonial Organization....103
a. Vertical Ceremonial Organization....111

Chapter 4: Outline of Collections Examined, History of Excavation, and Methods....116
I. History of Archaeological Exploration in Chaco Canyon....116
II. Scope of the Research Project and Collections Examined....118
III. Prior Research on Birds in Chaco Canyon....122
IV. Methods....128
a. Taxonomic Identifications....132
b. Methods for Determining Age, Sex, and Pathology....135
i. Age....135
ii. Sex....139
iii. Pathology....141
c. Quantitative Analytical Measures and Measurements....143
i. Measurements....146
d. Context....147

Chapter 5: Avifaunal Use, Diet, and Bone Object Manufacture....151
I. The Avifaunal Assemblage....151
a. Taxonomic Composition of the Assemblage....153
i. Turkeys and other Galliforms....156
ii. Raptors....156
iii. Water Birds....158
iv. Doves and Pigeons....158
v. Woodpeckers and Allies....159
vi. Perching Birds....159
vii. Macaws and Parrots....160
b. Preservation and Taphonomy....164
c. Site-level Variation....165
II. Birds as a Dietary Resource....169
a. Consideration of the Species Present....170
b. Heat Treatment....173
c. Butchery and Disarticulation....176
d. Summary of Evidence....182
e. A Closer Look at Turkeys....186
III. Worked Bird Bone Objects....190
a. Tube Beads....191
b. Awls....197
c. Whistles....198
d. Needles....198
e. Worked Talons....198
f. Patterns....199
g. Scrape marks....200
IV. Conclusion....202

Chapter 6: Ritual Avifaunal Use, Ritual Practice, and Ceremonial Organization............204
I. The Ritual Avifaunal Dataset..205
II. Bird Burials, Intentional Placements, Articulated Birds, and
Articulated Bird Parts...209
a. Articulated Depositions at Great House Sites..212
b. Articulated Depositions at Small Houses...220
III. Unique Contexts...228
a. Pueblo Alto Bird Pit...228
b. Pueblo Bonito Room 334..231
c. Floor Contexts...236
IV. Ritual Practice and the Mechanisms of Ritualization..238
a. Articulated Dedicatory Bird Depositions..239
b. Traditionalism at Pueblo Bonito...250
c. Stored Ritual Items..255
d. Summary of the Nature of Ritual Practice..257
e. Some Thoughts on Actual Ritual Practices...259
V. Ceremonial Organization...264
a. Inter-site Ceremonial Organization...267
b. Pre-850 CE Sites...274
c. Summary of Ceremonial Organization Evident at the Inter-Site Level..........275
d. The Effects of Excavation Bias on Evident Patterns in Inter-Site Ceremonial
Organization..277
e. Intra-site Ceremonial Organization...280
f. Duality and Plurality as Organizing Principles..283
i. Duality..283
ii. Plurality..285
iii. Unstructured Organization...286
g. Vertical Ceremonial Organization...286

Chapter 7: Discussion and Conclusions...290
I. Bird Use and Human-Bird Relationships in Chaco Canyon.....................................291
II. The Nature of Ritual Practice in Chaco Canyon..294
III. Ceremonial Organization in Chaco Canyon..301
a. Great and Small House Ritual...302
b. Restricted and Controlled Use of Macaws and Eagles..................................303
c. Location, Restricted Visibility, and Exclusivity of Ritual.............................305
d. Ritual Leadership in Chaco Canyon..306
e. Duality and Plurality as Organizing Principles..307
f. A Hypothetical Narrative...311
IV. Concluding Thoughts..313

LIST OF FIGURES

Figure 1.1. Chaco Canyon situated within the San Juan Basin and the Four Corners region. Redrawn from Windes 1987:Figure 1.3.....5

Figure 2.1. Two axes of turkey use, domestic versus wild birds (x-axis) and ceremonial versus dietary use (y-axis), showing pueblos documented as having used turkeys in these ways.....52

Figure 2.2. Two axes of turkey use, domestic versus wild birds and ceremonial versus dietary use, including pueblos for which one of the axes was unknown.....54

Figure 2.3. Links between domestic and wild turkeys and their uses.....55

Figure 5.1. Chaco Canyon, showing some of the sites from which material was analyzed.....152

Figure 5.2. Examples of bone tube beads or bead blanks.....193

Figure 5.3. CHCU 50705, tube bead of turkey tibiotarsus (showing front and back), highly polished with both ends smoothed; Gallo Cliff Dwelling.....195

Figure 5.4. Three tube beads manufactured from the same golden eagle ulna (CHCU 1205, 1162, 1156); Bc 51.....196

Figure 5.5. Bone awl manufactured from turkey tibiotarsus (CHCU 607); Kin Kletso.....197

Figure 5.6. Worked talons.....199

Figure 6.1. Pueblo Bonito showing formally deposited articulated birds or parts, as well as construction stages proposed by Windes and Ford (1996) and Windes (2003).....251

Figure 6.2. Presence/absence distribution of all avifaunal remains identified to species within the ritual avifaunal dataset at Pueblo Bonito.....281

Figure 7.1. Showing the northern and western burial crypts at Pueblo Bonito, and the rooms containing articulated deposits of macaws and eagles.....310

LIST OF TABLES

Table 2.1. Uses of turkeys mentioned in ethnographic literature..53

Table 2.2. Frequencies of clans named after birds at 20 pueblos..60

Table 2.3. Several reported bird-directional associations at several pueblos...............................76

Table 3.1. Mechanisms of ritualization, archaeological manifestations, and examples................96

Table 3.2. Expected patterns in avifaunal remains relative to principles of horizontal organization...108

Table 3.3. Haviland's (1975) correlates and Brandt's ethnographically-derived descriptions....112

Table 3.4. Expected patterns in bird use relative to ceremonially-based hierarchy....................114

Table 4.1. Breakdown of Number of Fragments and NISP bird bone from each collection examined; parentheses are the shorthand versions used in the text to refer to each collection...119

Table 4.2. All sites represented in the avifaunal dataset, locations of avifaunal collections, and associated projects..120

Table 4.3. Categories of information and variables recorded in analysis..................................131

Table 4.4. Number of fragments identified taxonomically by each analyst...............................133

Table 5.1. Taxonomic composition of the Chaco avifaunal assemblage analyzed for this research..154

Table 5.2. All macaw and parrot remains recovered from Chaco Canyon, including both those remains analyzed in this dissertation research and those described in literature and archival documents...162

Table 5.3. NISP, MNI, and number of taxa by site, and extent of excavation, number rooms excavated, and avifaunal density by site..166

Table 5.4. Body weight and gregariousness of species identified in the assemblage.................172

Table 5.5. NISP and percent heat-treatment by taxa...175

Table 5.6. NISP and percent cutting/chopping by taxa...177

Table 5.7. Proportion of cut marks on wing and non-wing elements for golden eagle and turkey...179

Table 5.8. Proportion of cut marks suggestive of filleting and disarticulation for golden eagle and turkey....180

Table 5.9. NISP and percent crushing and peeling by species....182

Table 5.10. Distribution of all disarticulated and heat-treated remains between taxa....184

Table 5.11. Percent NISP of several taxa exhibiting evidence of disarticulation or heat-treatment....185

Table 5.12. Percentages of male versus female turkeys....189

Table 5.13. Percentage male versus female turkeys using different methods of sexing....190

Table 5.14. Worked bird bone from Chaco Canyon....191

Table 6.1. The "ritual avifaunal dataset": subset of the overall avifaunal dataset having removed remains resulting from dietary or manufacturing activities....206

Table 6.2. NISP, MNI, number of taxa, and avifaunal specimen density by site for the ritual avifaunal dataset....208

Table 6.3. Intentionally deposited articulated individuals or parts at great house sites (excluding parts from the Pueblo Alto Bird Pit and Pueblo Bonito Room 334, discussed in the text)....217

Table 6.4. Intentionally deposited articulated individuals or parts at small house sites....225

Table 6.5. NISP and MNI of taxa found in the Pueblo Alto Bird Pit....229

Table 6.6. Minimum number of wings and legs in the Pueblo Alto Bird Pit....230

Table 6.7. NISP and MNI of taxa found in Pueblo Bonito Room 334....232

Table 6.8. Minimum number of body parts in Pueblo Bonito Room 334....233

Table 6.9. Percentages of body part elements compared to expected percentages in a complete bird skeleton....233

Table 6.10. Effects of removing partial individuals on the distribution of articulated bird deposits in rectangular rooms, kivas, and pithouses at small houses and great houses....257

Table 6.11. Sites in the pre-850 and post-850 CE samples, avifaunal NISP, and temporal assignments....266

Table 6.12. Avifaunal NISP, density, and taxa count for post-850 CE great and small houses....268

Table 6.13. Proportion of NISP of several types of birds between post-850 great houses and small houses....270

Table 6.14. Taxa involved in formal articulated deposits at post-850 CE great houses and small houses....272

Table 6.15. Turkey (NISP), eagle (NISP), and macaw (MNI) representation at three great houses....273

Table 6.16. Number of formally deposited articulated birds and bird parts at three great houses....273

Table 6.17. Proportion of NISP of several types of birds within pre-850 and post-850 site assemblages....275

Table 6.18. Proportion of NISP of several types of birds between great houses and small houses, using only remains excavated after 1970....280

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VITA/BIOGRAPHICAL SKETCH

Katelyn Bishop received a BA in Anthropology and French Language and Literature from the University of Virginia, and an MA in Anthropology from the University of California, Los Angeles. She has previously published on the importance and use of birds in Early Formative Period Chiapas, Mexico in the journal *Latin American Antiquity*, and on the deposition of ritually significant types of faunal remains in Chaco Canyon in the journal *Kiva*. She has been involved in larger-scale collaborative projects and publications concerning water management and soil productivity in Chaco Canyon (*Journal of Archaeological Science, Antiquity, PLOS One*), demographic transitions in the Americas (Current Anthropology), and work that has made theoretical contributions to the study of complex hunter gatherers (*Journal of Archaeological Method and Theory*) and methodological contributions to Zooarchaeology (*Journal of Archaeological Science*). Aside from working in the United States Southwest, she maintains active zooarchaeological research in Guatemala. Emphases of her work include the social value of animals in prehistoric societies, iconography, art, and animal symbolism, and collections-based and archival research. Her research has been funded by the National Science Foundation, the National Geographic Society, the PaleoWest Foundation, and the Fred Plog Memorial Fellowship.

Chapter 1: Introduction

Chaco Canyon was the center of a large regional system in the northern Southwest during the Pueblo II period (900-1150 CE). Though the canyon has a long and complex history of occupation beginning as early as 3000 years ago, the 9th through 12th centuries saw an unparalleled upswing in construction and the establishment of a far-ranging economic, social, and religious network that spread across the northern Southwest. These several centuries produced the still-standing great houses and small houses that now dot the landscape of the Chaco Culture National Historical Park, leaving an incredibly rich material record that is still being explored.

Chaco Canyon has received an enormous amount of scholarly attention. Its monumentality and seemingly novel development have intrigued scholars who work all over the world, in addition to many specialists who work in the U.S. Southwest. Yet major, critical debates still surround some of our most basic understandings of the canyon. These concern the feasibility of daily life and population size, the role that the Chaco cultural system played in the greater San Juan Basin, the degree, nature, and basis of inequality, and the forms of organization that characterized social life. For all the research conducted in or on the canyon, many of these fundamental issues remain debated.

This is especially true of our understanding of Chacoan ritual. While nearly all accept the integral role that ritual played in life in Chaco Canyon and Chaco's ceremonial role in the region at large, the nature of ritual practice is still relatively poorly understood (Plog 2011:52). And yet, Chaco Canyon has seen nearly 130 years of extensive excavation and survey at its many great houses and small houses. Artifact collections totaling more than a million objects, likely several million, exist in museums across the country, available for study. Several major sites have been extensively excavated, and many more have been partially excavated or tested. The appropriate data are often available, waiting to be gathered and marshaled, in order to address many of the major debates still concerning the canyon. In fact, recent Chaco research has renewed efforts to study the artifact collections from historic and recent excavations, systematically focusing on different material classes (Bishop and Fladd 2018; Crown and Hurst 2009; Crown and Wills 2003; Ditto 2017; George et al 2018; Heitman 2011, 2015; Jolie 2018; Mathien 2001, 2003; Mattson 2015, 2016; Mills 2008; Mills and Ferguson 2008; Plog and Heitman 2010; Vivian et al 1978; Watson et al 2015). The importance of studying patterning in the spatial distribution of different artifact types was illustrated by Neitzel (2003), who examined artifact frequency, distribution, and concentration within Pueblo Bonito. These studies have helped to improve our understanding of ancient Chaco Canyon in many ways.

Part of the difficulty of conducting such artifact-based studies is the great amount of time and effort that is required to visit the many institutions that hold objects, and to piece together often missing contextual details from archival records. These tasks are getting easier with the development of such resources as the Chaco Research Archive (http://chacoarchive.org/cra). The research presented in this dissertation adds one more to the list of artifacts/material classes systematically studied from Chaco: the bird remains.

Project Focus

In this dissertation, I seek to accomplish two major goals: first, to understand the nature of human-bird relationships in Chaco Canyon from 800 to 1150 CE, the ways that birds and their primary and secondary products were used and valued, the many ways they were incorporated into everyday life, and the ways that birds affected the lives of the people of Chaco. The second goal is to attempt to develop a picture of ritual practice and ceremonial organization using avifaunal remains. Through this dissertation, I hope to provide information that clarifies and supplements our understanding of Chacoan ritual, and weigh in on several of the broader debates concerning the details of Chacoan life.

To this end, nearly 12,000 fragments of bird bone from six different collections across the country were analyzed (see Table 4.1). The significant part that birds have played in Pueblo ritual for centuries has been made abundantly clear in both ethnographic and archaeological records from the region (see Hill 2000; Tyler 1979). Just as studies of other ritually significant materials, such as ornaments, shell, and turquoise can shed light on Chacoan ritual, so too can avifaunal remains be used as a proxy to understand the same.

Chaco Canyon

Chaco Canyon is located in the San Juan Basin in northwestern New Mexico (Figure 1.1). The area designated as the Chaco Culture National Historical Park contains approximately 4,000 known archaeological sites (prehistoric, historic, habitation, ceremonial, et cetera) (National Park Service 2015), situated within the canyon walls and on top of the surrounding mesas, dating from at least 900 BCE to the historic period. While Chaco Canyon has a long and complex occupation history, its Pueblo II (900-1150 CE) period occupation has received the most scholarly attention, and references to Chaco usually imply the Chaco "florescence" or the Chaco "phenomenon" of the 11th and 12th centuries. During this period, the influence of Chaco culture on the surrounding region is thought to have been at its greatest, with extensive construction of Chaco-style pueblos both inside and outside of the canyon. One defining characteristic of Pueblo II period Chaco is the dense concentration of monumental architecture in the form of great houses—multistory, masonry pueblos with massive ground plans—along the central stretch of the canyon. In just 11 km, extending from the easternmost Wijiji to the westernmost Peñasco Blanco, there are at least 13 known great houses, most of which are clustered even more tightly together, along with numerous “small house” sites, along a short stretch referred to as “downtown Chaco.” The definition of the Chaco “phenomenon” also rests on a series of seemingly unique traits that characterized Chaco Canyon and the surrounding region from 800-1150 CE. These include a system of outlier communities whose architecture mirrored to varying degrees that of intra-canyon sites, an extensive road network whose purpose is debated but probably included both practical and ceremonial/symbolic aspects, and the importation into the canyon of a variety of nonlocal goods from California, Mexico, and other parts of the Southwest, including cacao, turquoise, parrots, shell, copper bells, timber, pottery, and agricultural products (e.g. Crown and Hurst 2009; Ditto 2017; Lekson 2006; Mathien 2001; Nelson 2006; Toll 2006; Watson et al 2015). Together, these special characteristics have been marshalled to interpret the Chaco regional system in a variety of ways.

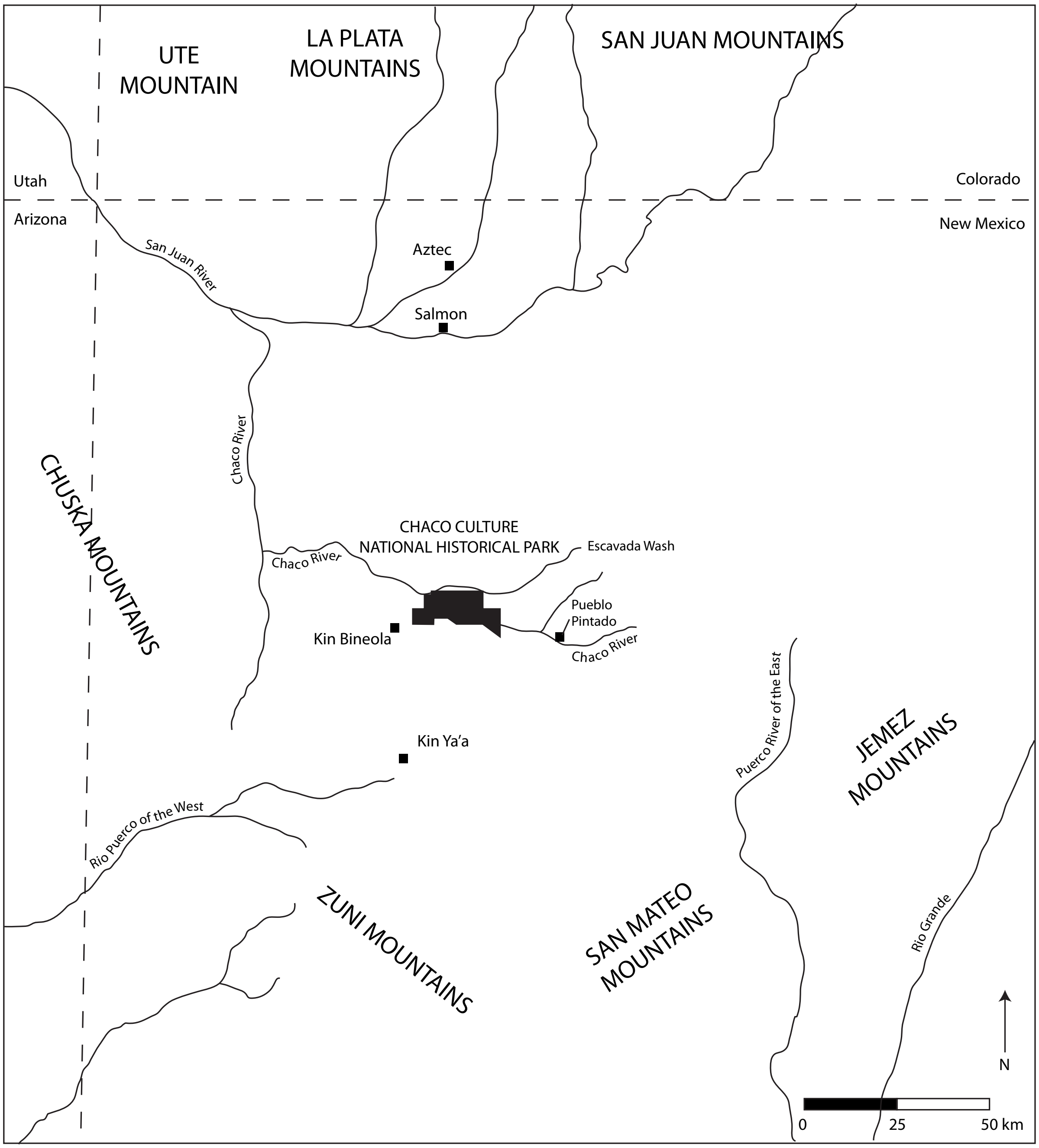

Figure 1.1. Chaco Canyon situated within the San Juan Basin and the Four Corners region. Redrawn from Windes 1987:Figure 1.3.

Within the canyon proper, Archaic hunter-gatherer populations were present as early as 3000 years ago (at, for example, Atlatl Cave) (Vivian and Hilpert 2002:11). By the beginning of the Basketmaker III period (500-750 CE), pithouse villages were being constructed on mesa tops (such as Shabik'eshchee), and farming was a major economic activity. It was around this time that the basic "building block" of Chacoan architecture appeared, the three-room suite, comprised of a living room with two small storage rooms (Vivian and Hilpert 2002:11). By 800 CE, crescent-shaped room blocks with 4-5 room suites and a kiva appeared, and only fifty years later, multistory masonry pueblos were constructed. Monumental, impressive versions of this format were built, expanded, and remodeled during the course of the 9th through 12th centuries, a period characterized by the development of the canyon as the center of a large regional network that shared ideas, architectural styles, practices, beliefs, and material culture. It is the famous, monumental Chaco great houses such as Pueblo Bonito, Pueblo del Arroyo, Pueblo Alto, and Peñasco Blanco, that have drawn the attention of archaeologists and many other interested groups.

Chacoan historical chronology based on architectural development and dendrochronological dating is as follows: in the mid-to-late 9th century, construction began on the foundational components of the Pueblo Bonito, Peñasco Blanco, and Una Vida great houses. When first built, these resembled small house sites, with later additions and remodeling enlarging them significantly over time (Lekson et al 2006:76-77). A general decrease/hiatus in great house construction and expansion occurred between about 940 CE and 1020 CE (Lekson 1984). After this, around 1030 CE, great house construction increased once again in the canyon, correlated with increasing population (Wills 2000:38), and construction was renewed at Pueblo Bonito and other existing great houses, and begun at several new great houses between 1020 and 1075 CE. After 1075 CE, there was an "explosion" in building activity at great houses across the canyon, and construction efforts were significantly intensified (Lekson et al 2006; Toll 2006). In the early 12th century, new, somewhat smaller and more compact great houses were constructed in the McElmo style (Lipe 2006; Vivian and Hilpert 2002; Wills 2009). Not long after these new constructions, by 1150 CE, construction ceased for good at Chaco Canyon great houses and the canyon was eventually depopulated. Twenty years later, the same was true of many of the outlier sites (Vivian and Hilpert 2002). This depopulation is thought to have been initially inspired by deteriorating climatic conditions at the end of the 11th century, and exacerbated by a prolonged drought between 1130 and 1180 CE (Vivian et al 2006). Recent efforts in direct dating, discussed below, are refining interpretations of the timing of the material markers of the Chaco phenomenon (e.g. Plog and Heitman 2010; Watson et al 2015).

The professional excavation history of Chaco Canyon is long and complex, spanning nearly the last 130 years. The major excavation and survey programs conducted are described in greater detail in Chapter 4, but the four major programs have been: (1) the Hyde Exploring Expedition, from 1896-1901, sponsored by the American Museum of Natural History and led by George Pepper and Frederic W. Putnam; (2) the National Geographic Society/Smithsonian Institution expedition, from 1920-1927, led by Neil Judd; (3) excavations of the University of New Mexico and the School of American Research in the 1930s and 1940s; and (4) the Chaco Project, from 1971-1986, initiated by the National Park Service. Several other note-worthy projects took place on a smaller scale and are also discussed in Chapter 4. Suffice it to note here that, given the variety of projects, directors, and sponsoring institutions, this 130-year excavation history has resulted in an immense amount of material from many different sites, material that is now dispersed widely in multiple institutions across the country.

Primary Debates and Discussions

Given the breadth of research conducted in the canyon and the range of involved parties, it is not surprising that there are several major debates and discussions that continue to surround our understanding of Chaco Canyon. These include the following: (1) the timing of certain aspects of the growth and development of the Chaco phenomenon; (2) the nature of the Chaco "system" (what was the primary role of canyon sites in the larger Chacoan sphere or network); (3) the size of the resident population in Chaco Canyon, and, by extension, the scale of agricultural endeavors and the suitability of canyon-lands for agriculture; (4) social organization at the many different sites in the canyon, both at the intra- and inter-site level; and (5) the presence (or absence) of social inequality and the nature of leadership. The discussion presented below serves only as an introduction to the complex literature on each of these debates. Some of these will be discussed in greater detail in Chapter 7 in light of the results of this dissertation research.

Chronology and Timing of Social Changes in the Canyon

One of the ongoing discussions surrounding Chaco Canyon concerns the cultural-historical chronology of the occupation of Chaco Canyon and the timing of important social changes. Efforts in dendrochronological dating over the last thirty years have realized the importance of local occupation and construction in the 800s CE in Chaco Canyon, especially at Pueblo Bonito (e.g. Windes and Ford 1996; Windes 2003). However, the interpretation that the Chaco "florescence" took place from 1030 to 1130 CE, during which the influence of the Chaco regional system and its "power" (however defined) was supposedly at its greatest, has recently been challenged. Efforts in direct dating have demonstrated that many of the material markers of the Chaco "florescence" were already important components of Chaco life in the 9th century (Plog 2018; Plog and Heitman 2010; Watson et al 2015). In Room 33, part of the northern burial crypt at Pueblo Bonito, the earliest and stratigraphically lowest burials in this room have been AMS dated to the late 8th and early 9th century (Plog and Heitman 2011; Kennett et al 2017:2). All 11 dated burials from the room range from then to the early 1100s, revealing that the establishment and use of this material-rich crypt (in which the individuals placed bore matrilineal relationships to one another) began much earlier than the supposed beginning of the Chaco fluorescence in 1030 CE (Kennett et al 2017; Plog 2018:242; Plog and Heitman 2010). Similarly, AMS dating of macaw remains from Bonito, non-local birds previously assumed to have been brought into the canyon during the supposed florescence, revealed that 12 of the 14 dated individuals were acquired before 1030 CE, and some of these much earlier (between 890 and 970 CE) (Plog 2018:242; Watson et al 2015). Turquoise and shell, also assumed to have been imported primarily after 1030 CE, appear to have been important since the founding of Bonito. Based on association with the earliest AMS-dated burials in the northern crypt, which contained around 20,000 pieces of turquoise (Plog and Heitman 2010), this and shell were already being brought into the canyon in significant quantities in the 9th century (Plog 2018:243).

These direct dating efforts have helped to refine our understanding of the beginnings of Pueblo Bonito and the timing of the Chaco florescence. Based on the above, the "hallmarks" of the Chaco "florescence" assumed to have appeared circa 1030 CE actually began to arrive well before this time in the early 9th century. The ramifications of this conclusion are easy to digest: that the impressive traits of the Chaco florescence had an earlier origin than previously assumed, and that even at the founding of Pueblo Bonito, the materials and activities that are assumed to mark the prominence of the Chaco cultural system (macaws, turquoise, shell, impressive construction, rich interments) were already beginning or in full swing (Plog 2018:237-246).

Considering dendrochronological, architectural, and direct dating evidence, the Chacoan historical chronology, specifically focused on Pueblo Bonito, thus appears as the following: Construction began on Pueblo Bonito in the early 9th century CE. The irregularly-shaped rooms in the northern arc of Pueblo Bonito were the first to be constructed (Windes and Ford 1996; Windes 2003), and the eastern and western wings built off of this northern nucleus were constructed no later than 852 CE (Windes and Ford 1996). Already in the early 800s, large amounts of turquoise and shell were being brought into the canyon, much of which was interred with the earliest burials in the northern burial crypt, which was used and maintained for over 300 years (Plog 2018; Plog and Heitman 2010). Scarlet macaw acquisition appears to have begun in the early 900s, and continued into at least the 12th century (Plog 2018; Watson et al 2015). These markers of the Chaco phenomenon thus appear earlier than previously recognized. After this point, the chronology described earlier for Chaco Canyon may reasonably be picked up again.

The Chaco "System"

Many models have been proposed to define the Chaco cultural system, attempting to explain both the internal workings of the canyon, and the relationship between canyon sites and the rest of the San Juan Basin and beyond. Some models are more grounded in data than others, and some have been evaluated through regional or global comparison. Some scholars have interpreted the monumentality of Chaco and its far-reaching influence as evidence of a state-level redistribution center, of which Chaco was the administrative and potentially militaristic center, exacting tribute from other areas (LeBlanc 1999; Lekson 2009, 2018; Wilcox 1993, 1999, 2004). More modest explanations focus on the internal workings of the canyon, and see Levi-Straussian hierarchical house-based societies (Heitman 2011, 2015). Still others, by comparison to other sites and regions, have called Chaco a "rituality" (Yoffee 2001) or a "location of high devotional expression" (Renfrew 2001), both of which emphasize the ritual and ceremonial importance of sites within the canyon to the surrounding region. Perhaps the most widely popular model is the pilgrimage model, which envisions the canyon and its buildings as a ceremonial mecca to which pilgrims from the San Juan Basin made periodic journeys for the purpose of ritual but which otherwise stood largely empty during the remainder of the year (e.g. Judge 1989; Kantner and Vaughn 2012; Lekson et al 1988; Malville and Malville 2001; Toll 1985; Van Dyke 2007; Windes 1987). These models cite evidence of feasting (Toll 1985; Windes 1987), the importation of large quantities of externally produced goods into the canyon, and the simultaneous dearth of evidence of the exportation of material to areas outside of the canyon. Opponents of this model have relied on artifactual and excavation data to make the case for domestic consumption in the canyon, by examining the trash mounds at Pueblo Alto (Plog and Watson 2012; Wills 2001) and Pueblo Bonito (Crown 2016a; Wills et al 2015).

Population

A necessary component of any of the above models is an estimate of resident population size in the canyon, which in turn relies in part on an evaluation of the agricultural potential of Chaco Canyon lands to feed residents. Since it is the only nearly completely excavated great house, most reconstructions of population in Chaco have relied on Pueblo Bonito. Bernardini (1999:449) and Windes (1984:83) proposed maximum populations of 70 and 100 people respectively. These estimates have been questioned by Plog (2018:247-248) for several reasons;

first, Windes' estimates are based on the number of households proxied by the number of hearths, and Bernardini's estimates are based on room connections (doorways and hatches) as proxies for room suites. The post-abandonment collapse of upper-story rooms, however, where hearths and room connections were likely to have been found (Bustard 2003:92; Mills 2002:76), hinders the reconstruction of number of households (Plog 2018:247). This, plus the sheer volume of artifacts recovered from Bonito (Neitzel 2003), lead Plog (2018:248) to estimate a slightly higher residential population, between 200 to 400 people.

This history of research on the subject of agricultural feasibility and scale in Chaco Canyon is long and complicated. Many who are skeptical of a sizeable resident population in Chaco claim the canyon's "inhospitable" nature as incapable of supporting any number of people. The marginality of this environment, it is said, would have prohibited intensive maize agriculture, an assumption that is then used to argue for low population levels. This assumption ignores the diverse agricultural strategies that can be employed in semi-arid environments (e.g. Hack 1942; Whiting 1966). Where this assumption has actually been tested, the debate over agricultural feasibility has been fueled in part by varying interpretations of soil salinity to argue for (e.g. McCool 2018; Tankersley 2017; Tankersley et al 2016) or against (e.g. Benson 2011, 2016; Benson et al 2006) the capability of canyon soils to support maize agriculture. An extensive review of the debate over the quality of canyon soils has been given by McCool et al (2018), which, having reviewed all of the available data on soil salinity measured by electrical conductivity, including original research by the authors, demonstrates that salinity levels in Chaco soils were not at all prohibitive to maize agriculture.

Social Organization

Scholars have struggled to understand the social organization of Chaco sites in terms of *either* a Western Pueblo or Eastern Pueblo model, archetypes derived from ethnographic research. In the Western (predominantly Hopi) model, pluralism is the dominating theme and clans and lineages are the primary building blocks of Pueblo organization. The Eastern (predominantly Rio Grande) model is one of dualism, where two opposing and complementary moieties form the overarching organizational units of society. Some scholars (e.g. Wills 2000; Lekson 2006) have questioned the relevance of ethnographically-documented organizational systems as models to conceptualize social organization in the Ancestral Pueblo world, because doing so assumes a great deal of continuity between the past and the present (Plog 2018:248). Others (e.g. Ware 2014, 2018; Whiteley 2015) conclude, however, that the prehispanic Pueblo Southwest should be viewed from historical perspective, since ancestral ties have been demonstrated and because ethnographic knowledge can provide an invaluable framework for understanding the past. Ware (2014) has argued that both the ethnographic and archaeological record are essential for understanding one another, since they are linked by long-term social trajectories and processes. The relationship is therefore one of homology rather than analogy (see also Whiteley 2018). In attempting to relate the ethnographic present to the archaeological past, especially in debates concerning social organization, the effort instead should be to test any ethnographically-inspired model with archaeological data, rather than to assign any one organizational strategy uncritically from a historic community to an ancestral one (Plog 2018:248). Therefore, all models may be relevant regardless of the degree of continuity between the past and present, but must be tested rather than simply extended from the present to the past without evaluation.

Previous research in Chaco Canyon has overwhelmingly assumed the presence of a Western style of organization in the past (Heitman and Plog 2005:70; Plog 2018:249). Compelling arguments, however, have been made for duality as an organizational principle in Chaco Canyon. Specifically, at Pueblo Bonito, this argument is based on the great house's overall symmetrical layout, the presence of a bisecting wall running through the middle of the site, and the presence of two burial clusters (e.g. Ditto 2017; Fritz 1978, 1987; Heitman and Plog 2005; Mills 2015; Plog and Heitman 2010; Vivian 1970, 1990:298-299, 446-448). Features of the layouts of Wijiji and Hungo Pavi have also been cited as evidence of dualism (Whiteley 2015). More recently, material artifacts and their distributions have been used to test models of dualism or pluralism in Chaco Canyon. Analysis of the contents and diversity of primary context assemblages at Pueblo Bonito indicates a pattern of plurality (Ditto 2017). The distribution of ritual faunal remains has indicated duality at the same site (Bishop and Fladd 2018; Bishop et al forthcoming). The coexistence of both dual and plural organizing principles within Chaco has been suggested (Ware 2014, 2018; Whiteley 2015). To Whiteley (2015), these principles pattern at the level of the site, with some sites predominantly exhibiting dual organization and others plural, though this system was fluid and pueblos could operationalize either form. To Ware (2014:70), plural organization predominated early in Chaco but gave way to dual organization in the twelfth century. Such a situation, where moieties or dual division co-exist at the same time with plural sodalities, characterizes most of the Keres Pueblos and the Pueblo of Jemez. The way forward in continuing to assess models of dualism and pluralism for Chaco Canyon is in the development of archaeological models and expectations for the distribution of different classes of material remains.

Inequality

Many scholars acknowledge that some degree of social differentiation or inequality characterized Chacoan society (though see, for example, Renfrew 2001 for an egalitarian model). There is still disagreement, however, on the foundation, extent, and overall nature of differential power (Schachner 2015:57). Many aspects of the canyon's archaeological record support the interpretation that some form of institutionalized leadership was present, including the construction of monumental architecture, the acquisition of non-local goods, rich burials, intensive acquisition of wood, pottery, and turquoise, and size differences between great and small house sites (Plog 2018:256; Schachner 2015:57). Some have interpreted control over wood resources and labor as evidence of noncoercive corporate group power (Wills 2000), and others have argued that control over regional networks of exchange created a ruling elite that maintained a state-like redistribution system (LeBlanc 1999; Lekson 2006, 2009, 2018; Wilcox 2004). Still others have argued that control of agricultural surplus was used to host lavish feasts in the canyon (Toll 1985; Windes 1987).

Many models see ritual leaders in Chaco Canyon, who controlled ritual knowledge and ritual practice. Especially at Pueblo Bonito, Heitman and Plog (2005; Plog and Heitman 2010) interpret the nature of the northern burial crypt at Bonito as demonstrating that ritual leaders controlled ritual knowledge and paraphernalia (Plog 2018:258-259). But scholars disagree on how this power was obtained, whether these leaders were competitive with other ritual leaders (Kantner 1996, 2010; Kantner and Vaughn 2012; Van Dyke 1998, 1999), or whether cooperative ritual leaders managed labor (Nelson 1995; Saitta 1997, 1999; Vivian 1990).

Ritual and Ceremony in Chaco

Regardless of the model subscribed to, the forms of social organization believed to have been present, or the degree of social differentiation thought to have existed, most scholars recognize that Chaco must have held ceremonial importance in the region, and that ritual was important in the canyon. Few reconstructions, however, have supplied details of the nature of ritual or offered descriptions of possible ritual practices (Plog 2011:52). While the specifics of Chacoan ritual—the way it may have looked, the way it may have been organized, what was involved—are relatively poorly understood, recently a handful of scholars have begun to focus on specific material classes in artifact-based analyses or analyses of architectural features, returning to existing collections and archival data to answer questions about the nature of ritual practice. Such research has focused on cylinder vessels (Crown and Hurst 2009; Crown and Wills 2003), kivas (Crown and Wills 2003), ornaments (Mattson 2015, 2016), contents of the Bonito northern burial crypt (Plog and Heitman 2010), caches (Mills 2008), ceremonial objects and architectural elaboration (Heitman 2011, 2015), turquoise (Mathien 2001, 2003), shell trumpets (Mills and Ferguson 2008), faunal remains (Bishop and Fladd 2018), perishables (Jolie 2018), macaws (Watson et al 2015; George et al 2018), primary context artifact assemblages (Ditto 2017), and wooden objects (Vivian et al 1978). Alone, each of these studies speaks to a specific aspect of ritual life, but together, they contribute to the developing picture of Chacoan ritual that I hope to clarify further in this dissertation. Despite the distribution of archaeological materials from Chaco Canyon across the country, such artifact-based studies may be the key to resolving many of the ongoing debates for Chaco Canyon.

Research Objectives

In this dissertation, I seek to address three primary research objectives through the analysis of avifaunal remains recovered from Chaco Canyon. The first and most basic objective seeks to develop the picture of human-bird relationships in ancient Chaco Canyon. Second, using birds as a proxy, ritual practice can be investigated. And third, I seek to understand how ritual and ceremonial life were organized in Chaco Canyon. In addressing these objectives, I develop not only a holistic understanding of the use of birds by people in Chaco Canyon, the nature of human-bird relationships, and the role of birds in ritual practice, but also provide a greater understanding of the details of ritual and ceremonial life. Each of the research objectives briefly introduced here will be outlined in greater theoretical detail in Chapter 3.

(1) Bird Use and Human-Bird Relationships

This objective is addressed through a traditional zooarchaeological analysis that reveals the many ways that birds and their parts were used and valued. The term "bird use" is used here to trigger the right understanding in the mind of the reader, but the human-bird relationship encompasses more than economical interactions, including their symbolic value, their place in ontology, and other types of meanings and relationships.

(2) Nature of Ritual Practice

Addressing this objective draws heavily on the work of Catherine Bell concerning ritual *practice*, a theoretical perspective with two major tenets of relevance here. First, as a type of practice, ritual is a dynamic activity that both structures and is structured by belief and the social order (Bell 2009a,b; Fogelin 2007a, 2008a,b). It can be used to create change in existing social and belief structures, and to respond to change by creating stability in existing structures. Second, through the lens of practice theory, ritual becomes *ritualization*, which transforms the concept of ritual into a strategic way of acting through which particular social actions are differentiated in relation to others (Bell 2009a,b). This differentiation of ritual practice from other types of practice, in other words the ritualization of practice that transforms practice into ritual, is achieved through the use of one or several "mechanisms" of ritualization (Bell 2009b). To archaeologists, while ritual practice itself cannot be observed, some of the mechanisms of ritualization leave material traces in the archaeological record, which can be used to identify and understand the nature of ritual practice. These mechanisms and their implications will be further explored in Chapter 3. The degree to which these mechanisms are evident in the archaeological record, and the ways that they were employed, can inform our understanding of the nature of Chacoan ritual.

(3) Ceremonial Organization in Chaco Canyon

The third research objective concerns the organization of ceremonial life in Chaco Canyon. For this objective, expectations are informed by the ethnographically-documented forms of dualism and pluralism of social-ceremonial organization in the Pueblo Southwest described above. The presence or absence of these principles can be inferred from the spatial distribution of different types of ritual objects. Recent artifact-based studies that have examined patterns in spatial distribution have demonstrated the promise of this approach and revealed evidence for both duality and plurality in Chaco (e.g. Bishop and Fladd 2018; Bishop et al forthcoming; Ditto 2017).

In addition to horizontal forms of ceremonial organization such as duality and plurality, evidence for the presence of hierarchical organization and authority based in ritual knowledge and leadership are examined. As a ritual resource, birds and their parts can be controlled, either through prohibitions of use or social rules dictating their use. Individuals considered to be ritual leaders, or groups considered to have authority, can exercise their control over these resources.

The final placement of certain materials of ritual significance, in primary context or even in secondary or discard contexts, can reveal intentional decisions that reflect conventions about the materials discarded and overarching social principles that structured life (e.g. Adams 2016; Adams and Fladd 2017; Jones 2001; McAnany and Hodder 2009; Pollard 2008; Walker 2002). The distribution of different materials involved in ritual practice then, can strongly indicate the distribution of different types of practices, the organizational principles that structured when and where different practices took place, and ideas about how and when ritual objects were "discarded". Therefore, the study of the spatial distribution of bird remains and of practices involving birds can speak to principles of ceremonial organization in Chaco.

Outline of the Dissertation

The case for birds as a ritual proxy is made in Chapter 2, which outlines the many ways that birds are used in the modern and historic Pueblo world, providing ethnographically documented examples of their importance.

Chapter 3 will outline a practice theory approach to ritual offered by the work of Catherine Bell, develop an original framework for the application of her *mechanisms of ritualization* to the archaeological record, and outline the expectations that this framework provides for the analysis of Chacoan ritual. In this chapter, I will also discuss ethnographically derived models of socio-ceremonial organization and their implications for interpreting the spatial distribution of material remains in Chaco Canyon.

In Chapter 4, I introduce the reader to the history of excavation in Chaco Canyon, and describe the origins and nature of the collections that were analyzed for this dissertation. I also outline the methods established and employed to collect the data presented here.

In Chapter 5, I introduce the entire assemblage and discuss the variety of birds that the inhabitants of Chaco procured. This chapter also examines evidence for the dietary consumption of birds, and the nature of bird bone object, tool, and ornament manufacture.

Chapter 6 turns towards understanding the role that birds played in ritual practice and ceremonial life in the canyon. This chapter explores the involvement of birds in ritual practice and the nature of ritual practice itself. Moving further, I test implications from ethnographically-derived models of socio-ceremonial organization. It is important to note that, while these expectations may be derived from ethnographic models, the focus in this dissertation is not on explaining why certain forms of social organization arose in Chaco, but in identifying prominent, structural organizing themes of Chacoan ritual. Additionally, evidence for inequality based in ritual authority is examined. Together, Chapters 5 and 6 address fully the first research objective, developing an understanding of the multi-faceted nature of human-bird relationships in Chaco Canyon.

The results of this research reveal that birds were an important part of daily life in Chaco Canyon, and a rich variety of local and nonlocal types of birds were valued by its inhabitants (Chapter 5). Occasionally, birds were minor contributions to the Chacoan diet. Bird bone was sometimes used to manufacture worked objects, primarily of ornamental or ceremonial value.

But engagement with and acquisition of birds was driven, more than anything, by their symbolic value and the roles that they played in ceremonial and ritual life.

The involvement of birds in ceremonial life in Chaco Canyon took many forms. Birds were active and frequent participants in ritual practice, especially in acts of ritual offering, foundation, and closure (Chapter 6). Parts of birds, such as wings, were probably used as objects of ritual paraphernalia, and in some cases also received special burial or discard. Their feathers were likely important in the manufacture of ceremonial items and clothing. Details of these practices were not static across the canyon. While the inhabitants of great house sites and small house sites both involved birds in their daily and ceremonial lives, in some ways these practices were fundamentally different. Ritual at great houses focused on the use of exotic or high-value types of birds, especially macaws, eagles, and other raptors, while that at small houses involved more locally and abundantly available types of birds.

Differences in the way ritual practices involving birds were carried out by people at great houses and small houses hints at the presence of vertical organization in the canyon and the roles of ritual leaders who may have organized, directed, and carried out important ceremonial responsibilities (Chapter 6). Access to certain types of birds appears to have been restricted, either to people at great houses only, or even to specific great houses. This reflects either social roles dictating who could use what birds, or strict control over the acquisition and distribution of these birds. Pueblo Bonito and its ritual leaders may have been the linchpin of this complicated ceremonial system involving birds.

Details of the human-bird relationship in Chaco Canyon, of the nature of ritual practice, and of ceremonial organization within the canyon are the subjects to which this dissertation is dedicated. Overall, the picture developed here is one of high-level investment in birds in general, with the inhabitants of Chaco Canyon going to great lengths to procure the birds that were of symbolic or other value to them.

This dissertation research is contextualized by the efforts of a suite of scholars in the past twenty years to return to collections of artifacts from Chaco Canyon and produce new data and analyses (e.g. Bishop and Fladd 2018; Bishop et al forthcoming; Crown and Hurst 2009; Crown and Wills 2003; Ditto 2017; Heitman 2015; Jolie 2018; Mathien 2001; Mattson 2015, 2016; Mills 2008; Neitzel 2003; Plog and Heitman 2010). By turning attention to the large assemblage of avifaunal remains excavated from Chaco Canyon, the analysis of this unique material class can greatly inform our understanding of the nature and organization of Chacoan ritual.

Chapter 2: The Importance of Birds in Past and Present Pueblo Life

The importance of birds in the Pueblo world is abundantly clear to any reader of Pueblo ethnography. Their involvement in almost every facet of Pueblo life is evident in the thousands of pages that have been written on the modern and historical pueblos in the last five centuries. Early Spanish chroniclers made note of the presence and use of different types of birds, while later ethnographers described in detail the methods used to capture them, the use of the feathers of different species, and in some cases the symbolic significance of different birds in Pueblo thought. Birds have served as clan totems, characters in narratives and stories, symbolic members of clans, indices of the cardinal directions, important components of ritual, suppliers of feathers for the manufacture of ceremonial items, pets, and in some cases as sustenance (e.g. Fewkes 1900a; Gnabasik 1981; Ladd 1963; McKusick 2001; Schroeder 1968; Tyler 1979; Voth 1912).

The details of this 500-year-long ethnographic and historical record support the conclusion that the most prolific type of involvement of birds in the Pueblo world was and is in ceremonial and ritual life. Birds feature more prominently than any other class or type of animal in Pueblo ceremony, seconded perhaps by carnivores. The behaviors and qualities of different types of birds are of paramount importance in directing how each is used. Specific types of birds are chosen because of their behaviors or qualities, or for the colors of their feathers, both of which can bestow upon the user or the situation the qualities that the bird possesses or the symbolic concepts with which the bird is associated. Moreover, the world of bird-use is highly prescribed. Rules abound about how each type of bird and its feathers are to be used, dictating which contexts are appropriate and by which clans or societies. In some cases, even the minute details of how birds are procured, from where, and by whom, are dictated by migration narratives, tribal history, and lineal descent. Some birds are taboo for consumption, while the feathers of others are only to be used by specific social or ceremonial groups, and still others receive the types of burials otherwise only afforded humans.

While they are recognized as a scientific class of animal in Linnaean taxonomy (class Aves), ethno-ornithological studies of bird-related nomenclature in Pueblo societies provide ample documentation that, at contact and subsequently (and almost certainly in the ancient past) "birds" are also defined in Pueblo thought as a distinct group of animals, separated from others by their ability to fly, and comprising a class that is internally diverse with many different types and categories[1]. This chapter outlines and describes the multitude of ways that this class of animal is involved in Pueblo daily—and especially ceremonial—life. Below I will detail the use of feathers, stuffed birds, whole skins, and bone, as well as birds as a source of food, taboos and avoidances, and their role in the naming of clans. I will also discuss the importance of considering Pueblo ornithological nomenclature and "native taxonomies," and will outline some of the major themes evident in the symbolic associations and meanings that different birds hold in Pueblo thought.

The following discussion is not intended to provide guidelines or expectations for a direct historical approach to interpreting the specifics of Chacoan ritual and relationships with birds. John Ware (2014) has argued for the interdependence of the archaeological past and the ethnographic record in understanding long-term social trajectories in Pueblo history. The Pueblo ethnographies are "historical destinations rather than…sources for comparative analogies" (Ware 2014:xxiii). Going "back and forth" between the two sheds light on both, especially elucidating long-term historical processes that, though far from static, remain persistent in their importance. Components and phenomena of a Pueblo social history cannot be viewed in isolation, since this

[1] Bats are also often considered birds (Bailey 1940:17; Henderson and Harrington 1914:9)

denies their historical contingency and relatedness to that which came before and after. I would argue that the ceremonial, symbolic, and ritual significance of birds in the Pueblo world is one such long-term overarching tradition that forms a prominent and persistent theme throughout Pueblo history and prehistory. This is not to say that many changes cannot have taken place in how birds were involved in life, and undoubtedly they have. But the information in the following pages provides a backdrop, a baseline, a starting point, for the variety of practices that birds may be involved in, and for their overwhelming ceremonial importance in the Pueblo region.

Involvement of Birds in Pueblo Life

Methods of Procurement

While the uses of various birds and their feathers are well described in the ethnographic record, the methods used to procure birds have not been as frequently reported. Regardless, several scholars have discussed means of procurement used in the present or historically, and speculated on methods which may have been used in the ancient past. In the past, the majority of birds may have been acquired using snares fashioned from sticks, rocks, and thread, by traps that used bait, taken directly from their nests as young birds, by the use of spears or arrows, or even through the throwing or slinging of rocks. Different methods would have to be employed for different birds, depending on factors such as body size, behavioral specifics, nesting and feeding habits, et cetera (Bishop forthcoming), and whether or not a live bird needed to be procured.

Writing in 1962, Zuni anthropologist Edmund Ladd noted that at Zuni birds were taken at any opportunity, with no restrictions as to how a bird's feathers may be used relative to how it was procured (Ladd 1963:11). Birds were acquired as roadkill, and feathers as gifts from outsiders. Before the introduction of firearms to the reservation, young boys did much of the hunting of birds for their feathers (Ladd 1963:10). Ladd reconstructs several types of snares that were used before the gun, and provides examples of possible methods employed in the prehispanic past. “The methods of snaring…all involve intimate knowledge of the habitat and feeding habits of each bird, for which there was a specific snare designed and used” (Ladd 1963:11). Four general types of snare were used, each consisting primarily of single or multiple horse-hair nooses attached to a weight, such as a rock or stick: a snare for field and perching birds, a snare for “brush feeding birds,” a snare for “water feeding birds,” and one for “ground feeding birds” (Ladd 1963:67). Human hair would likely have been used prehispanically (Ladd 2001:11). Large birds such as hawks and eagles on the other hand, were taken as nestlings and raised at the village for their feathers (Ladd 2001:11).

Outside of Zuni, such detailed descriptions of hunting methods before the introduction of firearms are lacking. For Jemez Parsons (1925:15) does mention that traps of sticks and horsehair were used to capture bluebirds and other small-sized birds. There is one reference to the method of pluck-and-release, supposedly employed for bluebirds at Isleta (Parsons 1932:211). Surely this practice happened and happens at other pueblos more widely than has been noted in the ethnographic literature.

Procurement methods for eagles and some other birds of prey differ markedly from those used for most other birds. For practical reasons, while it is conceivable that most small and medium-sized birds can be taken with some kind of trap or snare, the same method used to capture a small bird might not be effective for procuring an eagle because of its large body size. Second, the desired use for these birds by many pueblos, as captive sources of feathers and/or honored members, or “children,” of the clan (Beaglehole 1936:20), demands that a non-fatal method be employed to capture them. The use of the term “eagle” here includes both the golden and bald eagle. Tthe use of this term to include other types of birds (namely hawks) is discussed below as an issue of ornithological nomenclature.

Ethnographic literature documents that live eagles, whether adult or nestling, were captured by Hopi, Taos, Pecos, Jemez, Cochiti, Zuni, Zia, and the Keresan Pueblos generally (Beaglehole and Beaglehole 1935:19-20; Ellis 1959b:91; Gnabasik 1981: 141-142; Parsons 1925:68, 1936:20; White 1947: 226, 1962:28, 47). Several methods of procuring live eagles have been documented. Young eagles can be taken from their nests in spring, a practice documented at least at Zuni and some of the Keresan Pueblos (Gnabasik 1981:141-142; Ladd 1963; Parsons 1925:68, 1936:20), and at Hopi (Fewkes 1900a; Voth 1912).

Another method documented for procuring live eagles is the pit-snare method, employed at least at Taos, Hopi, Pecos, Jemez, and sometimes Cochiti (Beaglehole and Beaglehole 1935:19-20; Ellis 1959b:91; Gnabasik 1981:141-142; Parsons 1925:68, 1936:20; Tyler 1979:47). Such traps consisted of a pit covered by matting, beneath which a hunter would hide and above which live or recently killed bait would be used to lure an eagle. If an eagle landed on the prey, the hunter would grab its feet, pulling it into the pit to contain it (Gnabasik 1981:141; Tyler 1979:47-48). At Hopi, Fewkes (1900a:700) describes an above-ground version of the hunting pit. These “eagle-hunt-houses,” small, circular stone enclosures with walls about four-feet high were built on mesa tops and used to conceal the hunter. A dead rabbit was tied to the beams of the structure while the hunter crouched inside, and an attracted eagle would be similarly snared. Fewkes (1900a:702) suggests that by 1900, the eagle hunt house and the pit-snare methods were no longer employed at Hopi, and that eagles were taken exclusively as nestlings. Parsons (1939:29) states that the pits were formerly used at Hopi and Taos, and at the time of writing, still in use at Jemez. These three methods of eagle procurement—pit-snare, eagle hunt house, and nestling-take—are designed to bring live birds back to the pueblo, after which point they receive a range of special treatments, discussed further below.

To provide a counter-example to the taking of live eagles, at Zuni, Jemez, and Cochiti, eagles may have been killed in the field. Both at Cochiti and Zuni, adult eagles were killed while out hunting, especially on extended hunting trips. The bird was skinned on the spot, with just the skin retained. In each case, however, the skin seems to be a stand-in for the live eagle, and it was treated in similar ways to a live eagle arriving at Zuni, or was met with its own type of ceremonial welcome (Ladd 1963:12; Lange 1959:134-136; Gnabasik 1981:142-143). At Cochiti, the skin was returned to the village and the skull is buried by medicine men under a rock. The skin was paraded around the village, sprinkled with prayer meal, ceremonially washed, and returned to the person who killed the bird (Lange 1959:134-136). At Jemez, while some eagles that were snared were brought back to the pueblo to be kept in wooden cages on rooftops, others were immediately killed, their bodies hung up for four days, washed, skinned, and buried (Parsons 1925:68). There are no descriptions, to my knowledge, of nestlings being killed immediately after procurement, only adults.

Any of these eagle procurement practices were not necessarily exclusively used at a given pueblo. For example, the taking of both eaglets and adults has been documented at Hopi, and birds were both killed right away or kept in captivity depending on the circumstance at Zuni and Jemez. Therefore, the list of pueblos known to have historically kept eagles as captive birds (whether taken as nestlings or adults), usually as donors of feathers and sometimes as eventual sacrifices, includes Zuni, Taos, Pecos, Jemez, Cochiti, Zia, Santa Ana, San Felipe, Picuris, San Ildefonso, Ohkay Owingeh, and multiple Hopi villages. Most descriptions of captive eagles speak either exclusively about the golden eagle, or the "eagle" in general without clarifying which eagle is meant. Specific references to the bald eagle are rare, and it seems the practice of keeping captive eagles was and is most often used for the golden eagle. Henshaw, however, noted the presence of “perhaps a dozen [bald eagles] kept in wicker inclosures[sic]” (Henshaw 1875: 427) at Zuni.

At Hopi, eagle hunting is “so thoroughly institutionalized” that for up to sixty miles surrounding the Hopi mesas land is apportioned to different clans for the taking of eagles (Tyler 1979:48; see also Voth 1912). The ownership of these territories is dictated by the migration narratives of each clan (Fewkes 1900a:76), and birds taken from these territories, if taken by a member of an inappropriate clan, must first be offered to the owning clan. Each bird collected, even if cared for by an individual, is clan property (Fewkes 1900a:692-693; Tyler 1979:48). Collection of eaglets from their nests takes place in the spring (Voth 1912). It is believed “wrong” to take all eaglets from a single nest at once or even in the same year (Fewkes 1900a:702; Voth 1912:107), a practice that helps maintain stable local population sizes. At most pueblos that capture eagles live, whether as nestlings or as adults, these birds are returned to the village to be kept in captivity.

Captive Wild Birds

There is ample documentation that historically, multiple Pueblo groups kept wild birds in captivity after procuring them live, either as adults or nestlings, caring for them until they died or for a set amount of time before ritually dispatching them. This practice has been documented in some form for eagles (both bald and golden), several types of hawks, and macaws at 15 different pueblos, as well as ravens, mockingbirds, jays, and sparrows at least at Zuni (Ladd 1963;

Schroeder 1968:108). Due to confusion about the use of wild and domestic turkey, these birds are discussed separately below.

Whether eagles were procured live as adults or nestlings, they were returned to the village and cared for until they at least had their major feathers, if not much longer. At Zia, Santa Ana, Taos, Picuris, San Ildefonso, and multiple Hopi villages eagles were kept in wooden cages (with the location of the cages unreported) (Mearns 1896:395; Schroeder 1968:110; White 1962:28, 47). At Jemez, these eagle cages were placed on roofs (Parsons 1925:15, 68; Schroeder 1968:110). Eagles have been seen tied to roofs, without cages, at Zuni, Hopi, and Santa Ana (Fewkes 1891:6-7; Voth 1912: Plate XLIIA; White 1942:281), though eagles at Zuni were reportedly kept also in wooden cages on the ground (Schroeder 1968:110), and in “wattled corrals” adjacent to the pueblo and in the plaza (Fewkes 1891:6-7, footnote 1). In one instance, at Zia, an eagle was kept in an abandoned room (White 1962:28, 47). Eagles were kept under unknown circumstances at San Felipe and Ohkay Owingeh (Schroeder 1968:110). Though it is not well documented, historically and presently certain hawks may also be kept in a manner similar to eagles, especially at Hopi, and especially what is referred to as the “red eagle” (Voth 1912:107), which is the red-tailed hawk (*Buteo jamaicensis*), discussed further below (Tyler 1949: 40). Ladd (2001:11) also notes that hawks were taken as young birds from the nest and kept for their feathers. Here, red-tailed hawks were raised in cages until the early 1900s, their feathers harvested each time they molted (Ladd 2001:16). Parsons (1939:510) also indicates that at Hopi, both eagle and hawk nestlings were taken from their nests in the spring, and sacrificed the morning after the Niman ceremony.

Treatment of these captive eagles varies from pueblo to pueblo. Except at Hopi, there are few detailed accounts of the nature of eagle captivity, how long the bird is kept, how it is killed, and what is done with its remains after death at other pueblos. Evidently, historically at Hopi baby eagles taken in the spring were carried back to the village strapped to miniature cradleboards, like those used for human infants (Bahti 1990:137). Their heads were washed upon arrival, and they were tethered to roofs by one leg (Bahti 1990:137; Fewkes 1900a:702). They were fed small mammals and given a bowl of water (Voth 1912:107, Plate L). The washing of the eagle's head has been documented at both Hopi and Jemez, and at the former the birds are also named. These acts represent the initiation or introduction of the bird into the society to which it belongs (Parsons 1939:454). The birds were ritually dispatched in July the day after Niman, in a way that was intended to prevent the shedding of blood (Fewkes 1900a:702; Voth 1912:108). The large feathers were plucked and the bird was skinned, which was dried to preserve the smaller feathers. Prayer feathers were tied to the wings and legs of the bird's body, and the bird was carried to a designated cemetery exclusively for eagles, where it was buried with offerings of food (Voth 1912: 108). This sacrifice represents the "sending home" of the eagle, with the prayer feathers tied to its body intended to encourage the bird not only to return again next year to provide more feathers, but to provide more offspring who can do the same (Fewkes 1900a:701; Parsons 1939: 287). Beaglehole (1936:22) asserted that on Second Mesa, adult eagles were either buried in the owner's cornfield or were burned in the fissures of cliffs. When they were buried in cornfields, they were placed with their heads facing the buttes from which they came (Parsons 1939:367). On the occasion that a captive eagle was released at Hopi, prayer feathers were tied to its leg (Parsons 1939:287).

At Zuni, after eagles are taken in the spring as nestlings, they are raised for "a number of years" (Ladd 1963:16) and kept as sources of feathers. Upon death, the bird is buried with ceremony in a field outside of the village, buried under a floor, or infrequently it is deposited in trash heaps (though purportedly this was never done in the past (Ladd 1963:16, 88). Hawks, especially the red-tailed hawk, were also occasionally kept in captivity, and, upon death, were buried or thrown in trash (Ladd 1963:17). Far less detail exists for the treatment of eagles at other pueblos. At Jemez, live eagles are brought, physically and symbolically, into the community through the washing of their bodies (Parsons 1939:187).

While eagles are the most ubiquitous captive birds across the Pueblos, there is wide acknowledgement and ample documentation that until recently macaws were also kept in captivity. According to Crown (2016b:335), live macaws were noted by 19th century documents at Zuni, Laguna, Isleta, San Felipe, and Kewa Pueblo (Santo Domingo) (Schroeder 1991:18-20). One macaw in a cage was seen at Kewa Pueblo (Henderson and Harrington 1914:45), and White (1947:226) asserted that parrots were kept in the homes of their owners at the Keresan Pueblos. Macaws are no longer kept in numbers or as commonly across the Pueblos as they were before. Around the time and before Neil Judd gave a scarlet macaw to the Macaw clan at Zuni1in 1924, two live macaws were said to be privately owned at Kewa Pueblo (Crown 2016b:335; Judd 1954:263). Judd's macaw died in 1946 (Crown 2016b:335). There has been, however, much discussion especially recently of captive macaws in the prehispanic Southwest. Both scarlet macaws and military macaws have been found at Ancestral Puebloan archaeological sites (see Crown 2016b: Table 1), both species whose ranges have never extended into the Southwest. Because they are nonlocal birds, they would have had to have been traded in, presumably as live birds, and kept in captivity. Their remains have been recovered from across the US Southwest and Mexican Northwest, including Southern Arizona, the Mimbres and highland Mogollon areas, Chaco Canyon and the southern and middle San Juan, Northern Arizona, the Rio Grande, and Northern Chihuahua (Crown 2016b: Table 1).

Besides the eagle, macaw, and turkey (discussed below), various other kinds of birds have been kept either as pets or for their feathers. The most complete description exists for Zuni (Ladd 1963). As pets, Ladd (1963:17-18, 131-133) reports mockingbirds, American kestrel ("sparrow hawk"), Steller's Jay, white-crowned sparrow, grasshopper sparrow, lark sparrow, and parrots. These small birds were kept in small, screened-in wooden cages (1963:17). The American kestrel was particularly popular as a pet, and was typically fed grasshoppers by children (1963:17, 90). John Bourke observed a pet raven at Zuni in the late 1800s (Schroeder 1968:108). Fewkes (1891:6-7, f.1) observed that the mockingbird was kept as a pet by many families, and that these too were fed grasshoppers caught by children. Parsons noted that several ducks were kept at Zuni (Parsons 1939:29), and while Ladd (1963:14) never mentions keeping them, he does state that they only recently became a part of Zuni diet, and that no information exists on if they were eaten in the ancient past or not. Beyond Zuni, the ethnographic literature is not rife with descriptions of pet birds. White (1962:47) specifically reports that, aside from the eagle kept captive for its feathers at Zia, there were no birds kept as pets. Roediger (1941:75-76) asserted that small birds, such as roadrunner, bluebird, oriole, and hummingbird, were "kept in small cages on the housetops," but provides no indications of which pueblos did this, and provides no citation for the statement. While the keeping of these types of birds is certainly possible, there has been no evidence encountered in ethnographic literature that these specifically were kept, despite Roediger's assertion (1941:76). Based on the above descriptions, eagle, hawk, and macaw have been commonly kept for their feathers. At least at Zuni, a variety of smaller birds were also kept as pets, especially the mockingbird and the American kestrel.

Primary and Secondary Products

Primary products are those that require taking an animal's life to obtain. In the case of birds this includes meat, skin, and bone. Secondary products can be taken from an animal without the need to kill it; for birds this includes feathers.

Feathers. Feathers feature prominently in the manufacture of all sorts of objects of ritual and ceremonial importance and use. They are used to adorn ceremonial masks, regalia, and paraphernalia involved in ceremonial dances (both katsina and non-katsina), they are used to convey prayers to deities and ancestors, they adorn the altars of different societies, and they are used as tools/objects in the performance of certain ritual acts. Their import is particularly clear when it comes to the manufacture of items that are meant to convey prayers. Feathers are used singularly as prayer feathers, in bunches as prayer feather bundles, and attached to prayer sticks. Feathers are especially chosen as the medium through which prayers can be conveyed because they are lightweight, and with prayers attached to them, they "float like clouds" to the intended destination (White 1932b: 127).

Feather choice is highly prescribed in many situations, and is dictated by the nature of the ceremonial occasion, the needs of the giver of an offering, the request being made to the universe, who the supplication is directed to (the spirits involved), or the desired outcome. Prescriptions are dictated by custom, tradition, and belief; a feather that is simply pretty but has no recognized importance is not important in ceremonial and ritual objects (White 1947:224-225). The most important factor in feather choice is the type of bird providing the feather, as the bird will lend its perceived qualities (e.g. hunting ability) and symbolic associations (e.g. with the sun) to the object being fashioned or the occasion in which it is being used. The second factor in feather choice, dictated by the species chosen and often of equal importance, is the color of the feather. This may be especially true where a certain color is related to one of the cardinal or intercardinal directions. For example, the color yellow belongs to the north in Zia cosmology (White 1962:110), which is why the Western Tanager, a beautiful songbird with a bright yellow breast and nape, also belongs to the north. Therefore, the primary consideration in feather selection may be the symbolic associations of the species of bird, the perceived qualities of the bird, the color of the feather, or the symbolic associations of that color.

There are still other considerations in the selection of feathers, including the part of the body of the bird from which the feather was taken. While primary and secondary feathers of the wing and tail (the largest feathers of a bird) do feature prominently in regalia (especially on masks and headdresses) as well as prayer objects, other feathers have an equally important role to play and are selected not as second-choice feathers, but because of their own qualities. Downy feathers are particularly important in ceremonial attire adhered to different parts of the body with sticky substances (see Gnabasik 1981: 144-176 for examples) and are also used in the manufacture of prayer sticks (Bunzel 1992:500), and feathers from the breast, back, under-tail, and so forth are also used.

Another consideration in selecting feathers is how the feather was acquired. For example, feathers used by katsinam at Hopi should be gotten from live birds (Parsons 1939:291), and ideally eagle feathers would be dropped in flight, “given” by the birds themselves (Crown 2016b:336; Stevenson 1904:114). The lightness of a feather from a living bird is greater than one from a dead bird, and is therefore better at conveying prayers (Crown 2016b:336; Parsons 1939:291). A counter example today is the irrelevance of the origin of a feather at Zuni described above, with even birds killed on the highway salvaged for their feathers. This practice may also be related, however, to restrictions imposed by US wildlife legislation on the taking of wild birds, inspiring the need to procure birds and feathers by whatever means possible.

While the use of a single feather transfers the properties or associations of the bird to a prayer being offered, multiple feathers can be compiled in feather bunches and on prayer sticks to compound the meaning of the prayer. Cushing (1920:161-164) described the manufacture of a prayer stick used to consecrate a field, using feathers from eagle, turkey, duck, "Maximillian's Jay" (Pinyon jay), common nighthawk, "yellow-finch" (American goldfinch), and "ground-sparrow" (unknown species): "having taken the cloud-inspiring down of the turkey, the strength-giving plume of the eagle, the water-loving feather of the duck, the path-finding tails of the birds who counsel and guide summer," the farmer hoped to inspire the waters to run strong and to find his fields, appropriating the qualities of the birds from whom the feathers were taken.

A variety of different birds are important in the Pueblo world for the use of their feathers as prayer feathers, in bunches, or on prayer sticks. The descriptions that follow of the types of items using feathers were garnered from a range of ethnographies written on various pueblos, and several synthetic works that collate many references to birds (e.g. Gnabasik 1981, McKusick 2001; Schroeder 1968, 1991; Tyler 1979).

The details that follow by no means comprise an exhaustive list of the uses of different birds in the manufacture of ceremonial objects, but are meant to provide some examples of the use of different feathers and to collectively convey the extensive degree to which feathers are involved in ceremony and ritual. In the manufacture of prayer sticks, feather bunches, and the use of prayer feathers, turkey and eagle feathers are perhaps the most commonly used, followed by a variety of other birds that are colorful and/or symbolically significant. Turkey and eagle feathers have been documented as singular prayer feathers at Cochiti, Jemez, Taos, Kewa, Zia, Hopi, San Felipe, and Zuni (Ladd 1963; Lange 1959; Parsons 1925, 1936; Stevenson 1894; White 1932a, 1935). When these are not used alone, they are often tied together into feather bunches/bundles with one another, and frequently accompanied by blue or yellow feathers. Bluebird and blue jay feathers have been documented in feather bundles at Cochiti, Jemez, and Taos (Gnabasik 1981:136-137; Parsons 1925, 1936). Yellow warbler feathers were featured in prayer bunches at Jemez (Parsons 1925:50, 104), hawk feathers in those at Jemez and Kewa (Parsons 1925; White 1935), and woodpecker at Taos (Parsons 1936:102, 109).

In the manufacture of prayer sticks at Zuni, a number of feathers may be used but the two in the uppermost positions are the most important (Bunzel 1992:500). These are often followed by the feathers of colorful birds such as jays and orioles, or ducks. Specifically, the duck feather is used at Zuni because the katsinam are said to travel in the form of ducks (Bunzel 1992:500, 517). Based on Edmund Ladd's (1963) documentation of Zuni prayer sticks, it is clear that a large but restricted variety of birds are used. Ladd (1963:31) reported that at Zuni, most prayer sticks contain between five and seven feathers each. The feather in the primary position on the stick, and tied on first in its manufacture, is always from a turkey, golden eagle, or bald eagle. In the second position can only be a feather from a golden or bald eagle, hawk, goose, or duck. In the third position is a feather from the goose, duck, or jay (Steller's or Woodhouse's). Which feathers follow the turkey, eagle and duck feather depends on what feathers are available, but they must be from a specific range of birds (Ladd 1963:30-31). Most commonly these seem to be colorful "summer" birds, as Ladd depicts six prayer sticks that feature feathers of night hawk, sparrow hawk, jay, yellow warbler, robin, bluebird, red-shafted flicker, tanager, and sparrow (plates II-VII). Besides these, a large range of species are used on prayer sticks in the fourth to eighth positions, including various jays, woodpeckers, sparrows, towhees, American goldfinch, yellow warbler, blackbirds, tanagers, bluebirds, lazuli bunting, red-shafted flicker, American kestrel, and others (Ladd 1963: Table 1).

Prayer sticks at other pueblos also feature feathers of turkey and eagle, such as at Cochiti, Jemez, Taos, Kewa, Zia, Hopi, and San Felipe (Lange 1959; Parsons 1925, 1936; Stevenson 1894; White 1932a, 1935). Other birds include duck at Jemez and Kewa (Parsons 1925:64; White 1935:104), and hummingbird at Zia (Stevenson 1894). Hummingbird feathers are tied to yucca rings offered for rain at Zia (Stevenson 1894:91-92).

The same associative and symbolic logic evident in the use of feathered prayer objects also applies when feathers are chosen to be used in ceremonial regalia and paraphernalia, on objects such as ceremonial garb/dress, headdresses, masks, standards, altars, and used as tools in the performance of ritual acts. To note some general uses of bird feathers in ceremonial regalia (denoting items worn on the body of a participant) and paraphernalia (objects not worn but which accompany ceremony, such as standards), eagle feathers again feature prominently. They have been used in regalia and paraphernalia at least at Cochiti, Jemez, Zia, San Felipe, Isleta, Acoma, San Ildefonso, Kewa, Santa Ana, Hopi, Picuris, and Zuni (Ladd 1963; Lange 1959; Parsons 1918, 1921, 1925; Schroeder 1968; Voth 1912; White 1932a, 1935, 1942: 281, 1962; Whitman 1947). Feathers of various hawks and falcons were noted at Cochiti, Jemez, Taos, Kewa, Zia, Zuni, and San Felipe (Ladd 1963; Lange 1959; Parsons 1925, 1936; Stevenson 1894; White 1932a, 1935, 1962), and owl feathers at Cochiti, Kewa, Zia, San Felipe, Zuni, and Picuris (Ladd 1963; Lange 1959; Schroeder 1968; Stevenson 1894; White 1932a, 1935). Feathers of turkey are widely used at Cochiti, Jemez, Kewa, Zia, San Felipe, Laguna, San Ildefonso, Zuni, Picuris, Tesuque, Isleta, Hopi, Acoma, Zia, and Taos (Ellis 1959a; Ladd 1963; Lange 1959; Parsons 1925; Stephen 1936:22, 605; Stevenson 1894; White 1932a, 1935; Whitman 1947), as well as those of macaw/parrot (not always distinguished by ethnographers, though the two are not equivalent) at Cochiti, Jemez, Taos, Kewa, Zia, San Felipe, Acoma, and Zuni (Ladd 1963; Lange 1959; Parsons 1918, 1925, 1936; White 1932a, 1935, 1962).

The feathers of many other birds are also used, albeit less ubiquitously, in ceremonial garb, including those of goose at Cochiti (Lange 1959), mourning dove at Zia specifically and the Keresan Pueblos generally (White 1947, 1962), roadrunner at San Felipe, Zia, and Cochiti (Lange 1959; White 1932a; 1962), blue jays at Zia and Cochiti (Lange 1959; Parsons 1925; Stevenson 1894), duck at Cochiti (Lange 1959), and American kestrel at Kewa, Zia, San Felipe, Cochiti, Jemez, and Zuni (Ladd 1963; Lange 1959; Parsons 1925; Stevenson 1894; White 1932a, 1935, 1947, 1962).

Specific examples of the use of feathers on ceremonial regalia and paraphernalia include the application of feathers to masks. Eagle, turkey, and parrot feathers have all been used to this end at Cochiti, Jemez, Kewa, Zia, and San Felipe (Lange 1959; Parsons 1925; Stevenson 1894; White 1932a, 1935), roadrunner at Jemez, Zia, and San Felipe (Lange 1959; White 1932a, 1962), and American kestrel feathers at Kewa, Zia, and San Felipe (White 1932a, 1935, 1962). Feathers of these same birds are also worn in the hair or on the head across the Pueblos as well, with the addition of the use of the Steller's jay at Zia (Stevenson 1894), blue jays in general at Cochiti and Jemez (Lange 1959; Parsons 1925), and owl at Picuris (Schroeder 1968). The Hunt Chief at Ohkay Owingeh, in both practice and in origin narrative, wears the feather of a "carrion eater" in his hair (Ortiz 1969:14, 34). Additionally, feathers may be worn on the body as part of ceremonial clothing, or attached with a sticky substance. The latter is especially true of downy feathers, mentioned above. Parrot feathers seem to feature prominently in ceremonial clothing, documented at Cochiti, Taos, Kewa, Zia, San Felipe, and Acoma (Lange 1959; Parsons 1918, 1936; White 1932a, 1935, 1962).

Parrot feathers are attached to standards that are carried during ceremonies at Cochiti, Zia, and Santa Ana (Lange 1959:348; White 1962:312-313; White 1942:343-344). Feathers were also used in the decorations of the altars of many societies. Simply flipping through the many depictions of Zuni society altars produced by Stevenson (1904) reveals that feathers were hung pendant above nearly all of them. Eagle feathers are commonly used at Zia (Stevenson 1894), as are turkey feathers at Kewa Pueblo (White 1935). The Quirana societies of multiple pueblos make specific use of the American kestrel, often with Steller's jay, at Kewa, Zia, and Cochiti (Gnabasik 1981:137-139; Lange 1959: 308; Stevenson 1894: plate 28; White 1935:204). Additionally, eagle feathers are used in burial ceremonies at Cochiti, Jemez, Kewa, Zia, and Hopi (Lange 1959; Parsons 1925; Stevenson 1894; Voth 1912; White 1935, 1962). At Hopi, an eagle feather was placed to the west of a grave so that it would show the deceased "the road to the skeleton house" (Voth 1912:109).

Feathers on ceremonial regalia and paraphernalia are used repeatedly. When they are not in use, and when ceremonial garb is deconstructed after each ceremony, the feathers are stored in wooden boxes or wrapped in deer skin (Bunzel 1992:500; Crown 2016b). These wooden boxes at Jemez were stored in the rafters of a back room of an individual's house (Parsons 1925:40).

There are still other ways in which feathers are used on ceremonial or ritual occasions. Eagle feathers have been used in curing ceremonies at Taos (Parsons 1936:58-59), Isleta (Parsons 1920:62), Laguna (Ellis 1959a:331), Kewa (White 1935:122, 124), and Zia (Stevenson 1984:75; White 1962:289). The feathers were used to sprinkle a sick person with medicine water, brush the body with the feathers in order to remove whatever ails the person, or to extract foreign objects from the patient's body placed there by a witch (Gnabasik 1981:155-158). Feathers of Swainson's hawk, marsh hawk, and macaw are used to sprinkle in ritual at Santa Ana (White

1942:283). Additionally, eagle feathers were fletched to arrows at Laguna (Ellis 1959b:91) and Hopi (Beaglehole and Beaglehole 1935:19), while those of owls were used at Picuris (Schroeder 1968:110). An eagle feather was tied to the whips of Snake Priests that were used in snake hunts (Voth 1912:109). Also at Hopi, hummingbird and warbler feathers were used to make brushes for a rain ceremony (Powell 1972:28-29).

Feathers are also used in the manufacture of many other objects not covered systematically here, including fetishes used in altar setups, and especially feathers used on corn ear fetishes, *iariko,* at least at Zuni, Acoma, Cochiti, Hopi, Zia, Kewa, San Felipe, Santa Ana, and Jemez (Parsons 1925:107; Stevenson 1894: plate 9; Tyler 1979:Table 5; White 1932a:43-44, 1935:54, 1942:339), which feature feathers of eagle, mockingbird, parrot, turkey, roadrunner, duck, wren, and magpie, among surely others (Gnabasik 1981:140-214; Tyler 1979; White 1962:307). Additionally, other bird products are used in various ways. At Taos, the droppings of turkey vulture were burned and the smoke used to revive an unconscious person (Parsons 1939:415, 467). The droppings and eggshells of bobwhites were rubbed on the feet of children who have difficulty walking at Taos (Parsons 1936:41).

In considering all of the objects discussed above to which feathers were attached, including feathered prayer objects and ceremonial regalia and paraphernalia, several noteworthy patterns and associations become evident. First, turkey and eagle feathers are most ubiquitously used across and within pueblos. Eagle and/or turkey feathers are often tied together with yellow or blue feathers, from bluebirds, blue jays, or warblers. This is true of offerings at least at Cochiti and Jemez that combine eagle, turkey, and bluebird or yellow warbler (Gnabasik 1981:137; Parsons 1925:42, 50). At Tesuque, feathers of turkey and eagle are tied together with those of warbler and jay in prayer feather bundles (Parsons 1939:839), and the combination of turkey, eagle, duck, and yellow warbler is used at Santa Ana (White 1942:352). Similarly, blue jay feathers are often associated with those of birds of prey. The combination of blue jay and American kestrel is worn by katsina dancers on their masks at Cochiti (Lange 1959:472, 506), while an eagle and blue jay feather are coupled on a Jemez prayer stick (Parsons 1925:102). Descriptions of multiple prayer sticks and bundles exist at Hopi that combine raptor (eagle or hawk) and yellow or blue feathers (Stephen 1936: e.g. 774, 776, 800-801, 876-877, 879-801).

Another frequently noted combination is that of eagle and parrot. Feather fans of the two birds are worn in the Buffalo dance at Cochiti (Gnabasik 1981:150; Lange 1959:327), and at Jemez a fan of eagle feathers with a single parrot feather is worn on women's heads during the Flute dance (Parsons 1925:82-83). At the Taos Deer Dance, an eagle feather and a parrot feather are worn on the head (Gnabasik 1981:140; Parsons 1936:91). The altar of the Hunting society at Santa Ana includes multiple bunches of eagle and parrot feathers combined (White 1942:338-339). A stuffed parrot involved in the altar of the Knife society at Zia had eagle feathers tied below its beak (Stevenson 1894:103).

While eagle, hawk, turkey, and parrot feathers seem to be particularly important (or widely used across the Pueblos) in the manufacture of both feathered prayer objects and ceremonial regalia/paraphernalia, a range of other birds have been noted as important for these objects as well, including particularly the American kestrel, blue jays and bluebirds, yellow birds, duck, roadrunner, hummingbird, and mourning dove. This list is of course limited by what past ethnographers witnessed or decided to document. An extensive list of the birds whose feathers are used in the manufacture of ceremonial items at Zuni is reported by Ladd (1963). This list includes *at least* 45 different types of birds whose feathers were used on prayer sticks, and at least 55 whose feathers were used in ceremonial regalia. Likely similar richness was used at other pueblos as well.

Stuffed Birds. Significantly fewer descriptions of stuffed birds were found in the ethnographic literature, and this practice is unsurprisingly less common than feather use. Examples do exist, however, of different types of birds with either whole bodies or parts stuffed and used as props. At the Pueblo of Zia, stuffed parrots (of unreported species) were used on the altars of multiple different societies, especially in rain ceremonies (Gnabasik 1981: 165; Parsons 1939:688; Stevenson 1894:78, 83, 92, 103, 109), while a stuffed parrot was also reported from San Felipe, carried around during a dance in a basket (Gnabasik 1981:189; White 1932a:51). At Zuni, during initiations for young men, a whole stuffed duck was carried, while the stuffed head and neck of a duck formed a component of a mask in two dances (Ladd 1963:83). A stuffed American coot was used in a ceremony of the Clown Society (Ladd 1963:93). An entire raven was reported mounted on a stick, comprising a standard, at Hopi (Stephen 1936:95). At Acoma, a stuffed canyon wren and a stuffed mockingbird were noted on an altar (Parsons 1939:885).

Whole Skins and Portions. The use of whole, feathered skins has also been documented in Pueblo ceremony. A feathered turkey skin was reported as worn on the head of a female Buffalo dancer at Jemez (Parsons 1925:115, 118). A duck skin was worn on the head at Taos during the Deer Dance (Gnabasik 1981:140; Parsons 1936:89, 91). A “dried hawk’s skin” was observed by Stephen (1936:882) at Hopi. Though the skin is not further described, the context of the description indicates that the skin was being stored elsewhere and was brought into the kiva where the observation was made, seemingly for the manufacture of prayer sticks. Several instances of the use of bird skins at Walpi are described by Parsons (1939:607, 703), where the skins of birds of the appropriate directional color are placed in the appropriate directions in ceremony or ritual. There are also several descriptions of the use of whole wings of birds in ceremonial regalia and paraphernalia. At Hopi, eagle wings were noted attached to the arms of a dancer (Stephen 1936:19). At Taos, two hawk wings were worn on a headdress, while the same dancer also held a wing in each hand (Parsons 1936:88). The seed-filled skin of a duck, wearing shells around its neck, is used as a rattle at Zuni (Stevenson 1904:67).

Taboo and Avoidance. Another consideration in feather use is the avoidance of certain types of birds. While these practices are not as well-documented in ethnographic literature, the case of Zuni can be used as an example (Ladd 1963). Two birds are completely taboo at Zuni, the scaled quail and the rock wren, with a seemingly partial taboo on a third, the pinyon jay. The justification for each taboo is related to the bird's behavior. The scaled quail was reportedly not used because it is an "elusive" bird that hides, "'and therefore is not a proper offering'" (Ladd 1963:90-91). Because the movements of the rock wren are thought to be "erratic," this bird is said to be insane and a "witch bird;" anyone who touches it therefore risks becoming insane (Ladd 1963:115). The feathers of the pinyon jay are not commonly used because "'it feeds on the corn fields,'" though it is reserved for use by the Bow Priests in times of war (Ladd 1963:15, 18, 113). Aside from these taboo birds, other local species simply are not used for their feathers, including the horned lark, mourning dove, house sparrow, house finch, junco, and western gnatcatcher (Ladd 1963:13). Other birds are barred from having their feathers adorn prayer sticks or from being used as offerings, though their plumes can be used on ceremonial regalia: raven, crow, owls, and turkey vulture, because "'they eat dead things'" (Ladd 1963:13). Similarly, the use of crow feathers is avoided at Cochiti (Gnabasik 1981:139; Lange 1959:302). Still other birds are reserved for use by certain societies at Zuni: violet-green swallow, rough-winged swallow, cliff swallow, white-throated swift, hummingbird, roadrunner, purple martin, magpie, killdeer, pinyon jay, sharp-shinned hawk, cooper's hawk, western meadowlark, American coot, and sandhill crane (Ladd 1963:15). In general, a greater variety of birds seem to be used in ceremonial regalia at Zuni, but fewer on prayer sticks, indicating that the latter was more restricted in terms of which birds could be used (Ladd 1963: Table 1, Appendix C). Outside of Zuni, Parsons (1939:929) notes that at Isleta, there is a taboo against killing eagles (Parsons 1939:929).

Bone. There is limited description of the use of bird bone in ethnographic accounts of the Pueblo region. Obviously, the introduction of industrial materials has changed the way that tools and other objects are manufactured. Ceremonial objects may still however be made from animal bone. This is especially true of whistles and flutes. All descriptions of these objects encountered in the texts consulted for this chapter describe their manufacture from eagle bone. Hough (1918:295) asserted that "the ancient and modern tribes used whistles of bone and of the wing of the eagle, like those used by most Indian tribes." Indeed, eagle bone whistles were reported from Hopi (Stephen 1936: Fig. 289; Voth 1912:109). Whistles made specifically from a "wing element" (almost certainly the ulna) are described for the Keresan Pueblos writ large, where shamans wear them to fight witches (Parsons 1939:380), and at Zia specifically, where they are worn around the neck during a dance (White 1962:177). Talons and skulls of birds, especially eagles, also feature in ritual and ceremony. At both Santa Ana and Zuni, the skulls of skinned eagles are placed in caves (Parsons 1920:66-67), while at Cochiti they are offered at shrines away from the pueblo (Lange 1959:143). Eagle talons are used in the manufacture of ceremonial paraphernalia and regalia. At Cochiti, for example, medicine men wear necklaces of eagle talons, which are believed to "impart the power to hunt and attack witches who have the gift of flying" (Dumarest 1918:212; see also Gunnerson 1998:235).

Birds as Food

There are remarkably few mentions of the consistent and repeated use of birds as a major source of food in the modern and historic Pueblo world. Most birds that are eaten are occasional sources of food, or even “delicacies.” The possible and confusing exception to this is the turkey, which is discussed below. In general, however, very few birds are described as being eaten. Henderson and Harrington (1914:4) conclude that:

> “Most of the species of birds and mammals which occur abundantly are altogether too small and too difficult to obtain with crude weapons to be useful as food…. During the autumn grouse and turkeys were probably obtained in considerable numbers, and, with the ducks and other water birds along the river, constituted the only really important food birds of the region.”

As the above discussion will have made clear, the overwhelmingly predominant use of birds in the modern and historic Pueblo world is as sources of feathers in ceremonial regalia, paraphernalia, ritual practice, and prayer offerings. For this reason, Tyler (1979:135) hypothesizes that the Pueblos overall believe that the meat of those birds who are important ceremonially or ritually is “unsuitable” for consumption, and because such an extensive range of birds is used in this way, they are reluctant to eat most birds.

In the most complete ethnoornithological account written for the Pueblo world, Ladd (1963:13) reports that birds are not an important part of Zuni diet, and when they are eaten, they are “delicacies” rather than as a main course. Seventy-one types of birds that have some use or significance to Zuni are reported in his Appendix C. Of these, only one was consistently taken for food. The horned lark was taken in large numbers, skinned, and roasted over an open fire (1963:13, 106). Only one other species is listed as definitely having been eaten, the western robin. An additional six birds were not prohibited from being eaten, though this was not commonly done: Steller's jay, Woodhouse's jay, western bluebird, mountain bluebird, grasshopper sparrow, and lark sparrow. The jays, however, were used more for their feathers, and in the case of the Steller's jay, kept as pets. It is not clear to what degree ducks have been a part of the diet; Ladd reports that he does not know if they were eaten in the past, but recently they are eaten on occasion, though they are not hunted or kept for this reason (1963:14). The remaining 62 birds reported were not eaten, meaning that only 11% of the types of birds reported as used by Zuni were consumed, and even then they were only done so occasionally.

By all consulted accounts, birds do not—and did not—presently or historically form a major part of Pueblo diet, in part likely because so many birds are valued for the ceremonial importance of their feathers, and the symbolic associations that they or their feathers maintain. This is not to say that an individual bird or a type of bird cannot be both eaten and used for its feathers, and perhaps the best example of this practice concerns the turkey, the dominant use of which, whether ceremonial or dietary, has likely shifted back and forth over time.

Turkey. Developing a full understanding of the use of turkeys, both in the present and past Pueblo world, has been somewhat labored. Scholars of the Southwest have struggled to understand and describe their use for several reasons. First, unlike some other birds, their use cannot be assigned neatly to either of the overly-restrictive binary categories of "ritual/ceremonial" or "quotidian/mundane." Second, our understanding of the nature and timing of turkey domestication, and the use of both wild and domestic turkeys, is continually unfolding.

Two overlapping axes of turkey type and use explain why we struggle to understand the role these birds have played over time (Figure 2.1). One axis, that of type of turkey, runs from wild turkeys to domestic turkeys. A second axis that can be used to describe two of the major uses of turkeys and their parts runs from ceremonial to dietary, which need not be exclusive but sometimes are. The conceptual challenge is that both wild and domestic turkeys have been used for all kinds of activities. To say that turkeys are presently used across the Pueblos in only one way, or that they were used in only one way within a given time period of the past, or to say that wild turkeys have always been used only for their feathers while domestic have been used for their meat (or vice-versa) is simplistic. In reality, when we zoom out, the picture of turkey use across the Pueblos and throughout time is complicated and not easily understood. They and their parts (feathers, bone) have been used for a wide range of purposes, including the direct involvement of birds in ritual practice (i.e. burial), the use of their feathers in the manufacture of ceremonial regalia and paraphernalia, as well as fetishes and other ritually-oriented objects, the use of their feathers in more quotidian clothing, blankets, and arrows, and of course, their consumption as food.

We struggle to deal with turkeys because we cannot as effectively pigeonhole them as well as we can some other birds. Additionally, the use of turkeys and their parts for any purpose may have shifted over time, with fluidity in their use based upon need and desire, perhaps never maintaining an exclusive ceremonial or non-ceremonial identity. Further complicating the picture is the lack of explanation given by ethnographers on the degree to which domestic and wild turkeys were considered and used as different birds, and whether or not rules prescribed which was to be used in a particular instance. While there is plenty of description of the use of turkey feathers, rarely is it known whether or not they came from a domestic or wild bird.

The subject of turkey domestication in the New World is especially complicated. Ancient DNA analysis of turkey bone recovered from archaeological sites continues to provide increasing insight into how multiple independent domestication events unfolded over time. In the Southwest, turkeys may have been domesticated as early as 200 CE (Speller et al 2010). Evidence suggests, however, that even as ancient Southwest peoples managed domestic turkey stock, they continued to exploit local wild turkey (*Meleagris gallopavo merriami)* at the same time. Due to the inherent difficulty in distinguishing osteologically between wild and domestic turkey (both are the same species, *Meleagris gallopavo)* solely on visual analysis, it is exceedingly challenging to determine whether peoples used domestic turkey and wild turkey for different or overlapping purposes.

Somewhat greater clarity comes, in the ethnographic record, at the level of the individual pueblo, where we may have knowledge of whether or not domestic turkeys were kept, whether wild turkeys were still hunted, whether or not either was consumed, and how their feathers were used. While it may not matter how the feather is acquired at some pueblos (e.g. Zuni), it may be prescribed elsewhere; and while there may be a taboo against eating the birds (e.g. Hopi), this may be absent in other places.

To attempt to develop a more exhaustive understanding of how turkeys were used by the modern and historic Pueblos, mentions of turkeys were culled from ethnographic sources. In general, many scholars seem to agree that the *primary* use of turkeys in the modern and historic Pueblos is for their feathers to be used in ceremonial objects (regalia, prayer sticks, in ritual) rather than as a source of food. Cushing (1920:357) reports that the Zuni told Coronado that they did not eat turkey: "they eate them not, but that they keepe them onely for their feathers." Though feather use may be predominant, Lange (1950) argues that the wide-spread, incorrect, assumption that turkey was *never* eaten comes from an erroneous translation from the *Relacion del Suceso*, provided by Bandelier, that says of the turkey that "they [the pueblos] keep [them] for feathers rather than to eat, because they make pelts of them" (Bandelier 1892:48; Lange 1950:204). Lange (1950:204) argues, however, that a more direct and accurate translation should read "[they] are kept *more* for their feathers than for eating" [emphasis my own].

Indeed, based on compiled ethnographic evidence (Gnabasik 1981:203), turkey meat (either wild, domestic, or both) was consumed at Isleta, Taos, Laguna, Cochiti, Santa Ana, and the Piro Pueblos (Henderson and Harrington 1914:35; Lange 1950:207; Parsons 1936:23; Reed 1951:199, 202; White 1942:281). On the contrary, Lange (1950:207) reports that Hopi had a taboo against eating turkey, based on the bird's ceremonial importance, and this taboo existed among the Rio Grande Tewa as well (Parsons 1939:22; Tyler 1979:75). The feathers of turkey (again, either wild, domestic, or both) are used in ceremonial objects at many pueblos, including Cochiti, Zuni, Jemez, Taos, Kewa, Zia, Hopi, San Felipe, Laguna, San Ildefonso, Picuris, Tesuque, Acoma, and Isleta.

Captive, presumably domesticated, turkeys were kept by some pueblos. Several turkey pens and 5-18 turkeys were noted at Zia (White 1962:54, 89), and the birds were noted in enclosures at the Tewa Pueblos (Henderson and Harrington 1914:35) at Jemez

(Parsons 1925:15), and at Zuni (Hammond and Rey 1966; Simmons 1979). Early Spanish chroniclers describe turkeys being raised and penned for food at the Piro Pueblos (Gnabasik 1981:202-203). Domestic turkeys were also kept at Taos, Laguna, Santa Ana, San Felipe, and Acoma (Gunn 1917:26; Parsons 1939:22; Schroeder 1968:108-110). Interestingly, some texts mention that turkeys were not kept at Hopi (Gnabasik 1981:203), though Stephen's later account (1936:22, 605) contradicts this when he describes several turkeys penned for their feathers. At Cochiti, the birds were kept for food, while their shed feathers were picked up and saved for ceremonial regalia (Gnabasik 1981:204; Lange 1959: 112-113).

Wild turkeys prefer forested habitats. Therefore, limited or absent hunting of these birds at some pueblos should not surprise us based on their geographical locations. Wild turkey was hunted at Zia and Zuni, though it is not specified for what purpose (Gnabasik 1981: 203-204; Ladd 1963: 92; White 1962:107). Taos, Santa Ana, Isleta, Laguna, and the Piro Pueblos, however, were known to hunt wild turkey as a source of food (Gnabasik 1981:203-204; Parsons 1936:23,1939:22l; White 1942: 281, 1947:225, 1962:180). Prior to the 1920s, Parsons asserts, turkeys were not kept captive at Taos, and wild turkey was both eaten and its feathers were used in ceremonial paraphernalia. Apparently, only the feathers of wild turkeys were used for the latter, as those of domestic turkey were considered impure for ritual (Parsons 1936:23). At Cochiti, wild turkey was both eaten and used for its feathers (Lange 1959: 112, 122, 132).

Because ethnographers were not always clear in their descriptions of the use of turkeys—whether the birds were wild or domestic, or how each was used—Figure 2.1 and Table 2.1 should not be taken to provide exhaustive lists or to note the absence of practices. This table and figure collate all of the mentions that could be found in ethnographic and secondary literature. Figure 2.1 displays cases only where both axes are known for a pueblo: wild or captive, *and* dietary or ceremonial (this figure does not consider several other uses of turkeys, notably, feathers for the manufacture of blankets, clothing, and arrows). Therefore, we can see that there is plenty of evidence that modern and historic Pueblos hunted and ate wild turkey, while some also ate domestic turkey (Cochiti and Piro). We can also see that both wild and domestic turkeys were used for their feathers in the manufacture of ceremonial items.

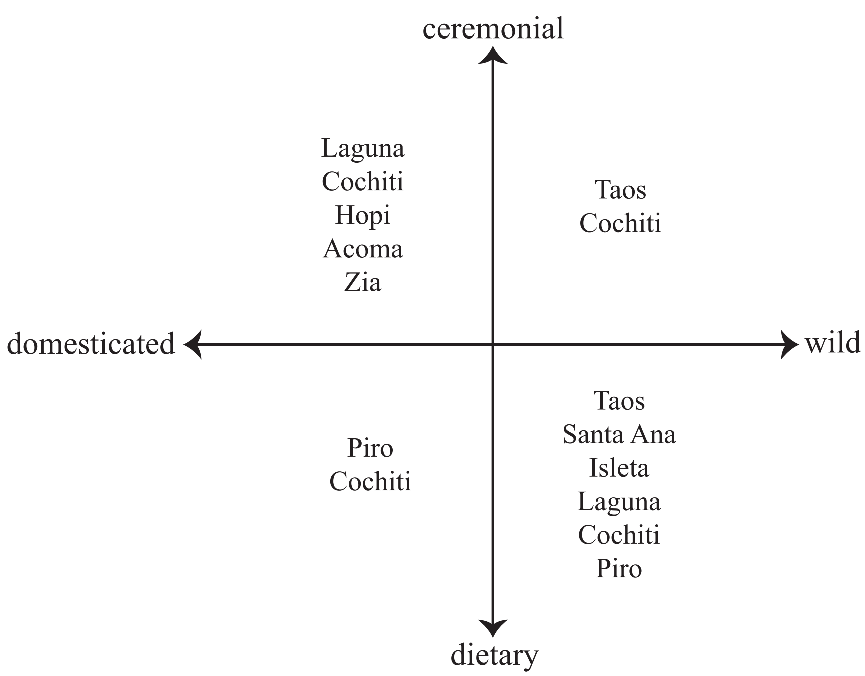

Figure 2.1. Two axes of turkey use, domestic versus wild birds (x-axis) and ceremonial versus dietary use (y-axis), showing pueblos documented as having used turkeys in these ways.

Table 2.1, on the other hand, lists pueblos for which there is evidence for the hunting of wild turkeys, the keeping of captive turkeys, the eating of turkeys, and the use of turkey feathers (without creating links between the two axes), where perhaps not each axis is always known. We can see that *both* wild and domestic turkeys were used at some pueblos, and that turkeys (whether wild or domestic) were both eaten and used for their feathers at others. Unfortunately, because this is simply presence of evidence dictated by ethnographer observation, we cannot say explicitly that a certain type of turkey was used exclusively for a certain type of activity at a given pueblo. An exception to this is at Taos, where, prior to the 1920s, only the feathers of the wild turkey were used for ceremony (to the exclusion of feathers from domestic birds), though domestic and wild turkeys were both eaten (Parsons 1936:23).

Table 2.1. Uses of turkeys mentioned in ethnographic literature.

Type		**Use**	
Domesticated (captive)	**Wild**	**Dietary**	**Ceremonial**
Acoma	Cochiti	Cochiti	Acoma
Cochiti	Isleta	Isleta	Cochiti
Hopi	Laguna	Laguna	Hopi
Jemez	Piro	Piro	Isleta
Laguna	Santa Ana	Santa Ana	Jemez
Piro	Taos	Taos	Laguna
San Felipe	Zia		Picuris
Santa Ana	Zuni		San Felipe
Taos			San Ildefonso
Tewa (unspecified)			Kewa
Zia			Taos
Zuni			Tesuque
			Zia
			Zuni

Two additional ways of depicting this information are displayed in Figures 2.2 and 2.3. Figure 2.2 is an iteration of Figure 2.1, but with the addition of the pueblos where only one of the axes is known (either it is mentioned that the wild or domestic were present but not known for what purpose, *or* where turkey use is described but whether the birds were wild or domestic is not known). For those pueblos where one of these axes was unknown, these were relegated to positions on the X- or Y-axis. For example, wild birds are known to have been hunted at Zia, but it is not known for what purpose, while domestic birds were kept at Tewa Pueblos, Taos, Jemez, Zuni, Santa Ana, and San Felipe but again their purpose was unstated in ethnographic literature. For those pueblos listed directly on the Y-axis, we know that turkey feathers were used in ceremony, but not whether the birds were domestic or wild. Figure 2.3 simply draws connections for the reader to digest this information in a different way.

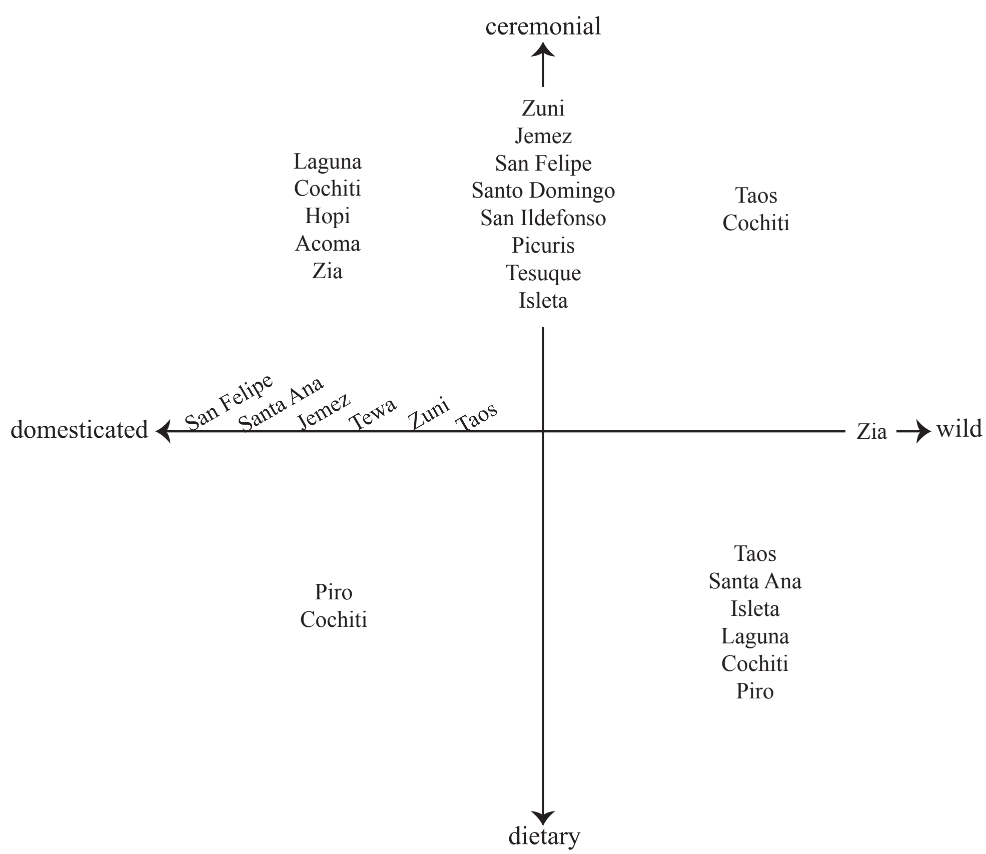

Figure 2.2. Two axes of turkey use, domestic versus wild birds and ceremonial versus dietary use, including pueblos for which one of the axes was unknown.

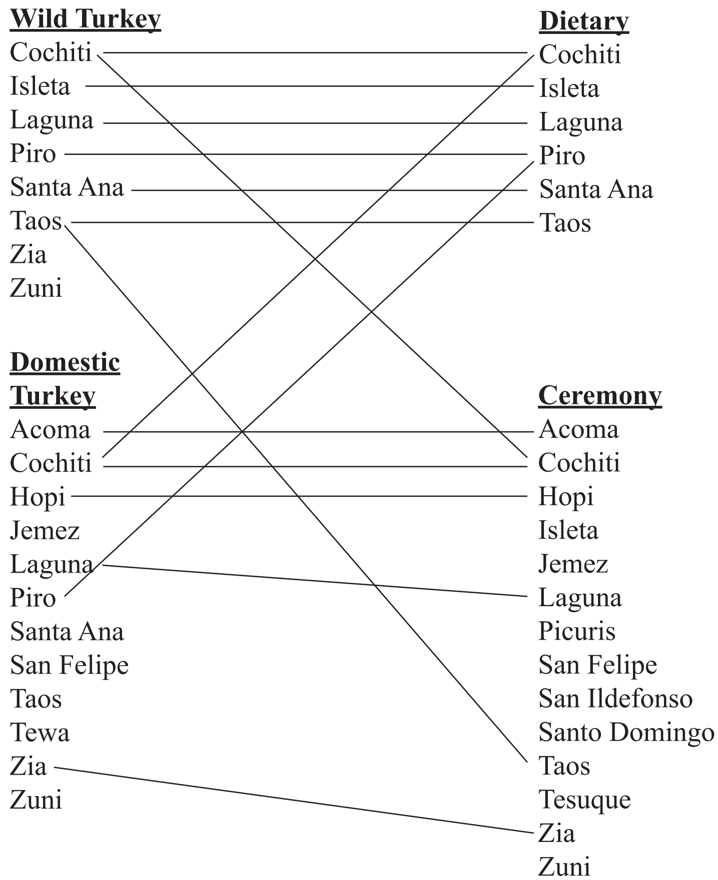

Figure 2.3. Links between domestic and wild turkeys and their uses.

Together these graphs make several things about modern and historical turkey use clear. Considering the Pueblos at large, both wild and domestic turkeys are eaten, and both wild and domestic turkeys are used in the manufacture of ceremonial objects (Figure 2.1). A greater number of pueblos appear to use turkeys (whether domestic or wild) for their feathers in ceremony, evidence that supports the idea that turkeys are primarily important for their feathers (Figure 2.2). Some pueblos use both wild and domestic turkeys, and several use some kind of turkey for both ceremonial and dietary reasons (Figure 2.2). The greatest overlap in the axes of wild/domestic and dietary/ceremonial are at Cochiti Pueblo, where both types of turkeys are used for both purposes, and at the Piro Pueblos, where both wild and domestic turkey were eaten.

From the evidence collated and described here, it is clear that the assumption that turkeys are or were never eaten by the Pueblos is erroneous. There is plenty of evidence that both wild and domestic turkeys (but especially wild) have been eaten, that domestic turkeys have been kept and that wild turkeys were hunted (at some pueblos simultaneously), and that the feathers of both (but especially domestic) are used in ceremony. Clearly this bird, in both its domestic and wild form, has had diverse purposes and significance in the Pueblo World.

Other Types of Birds Eaten. Other birds have been mentioned in various ethnographies as occasionally being eaten by different pueblos, including duck, quail, flicker, dusky grouse, blackbird, mourning dove, and finch. Most of these are relatively small-bodied, supporting Ladd's (1963) assertion that birds are more often an occasional delicacy rather than a consistent source of food. While duck may seem like an obvious choice for consumption, Tyler (1979:115) asserts that overall, the Pueblos hunt ducks for their feathers rather than for food. They are specifically not eaten at Hopi (Mearns 1896:396). Duck has recently become an occasional part of Zuni diet, though it is not known if it was consumed in the past (Ladd 1963:14). At Santa Ana, White (1942:281) noted that while ducks were taken from the Rio Grande for the use of their feathers in ceremony, neither they nor goose appeared to be used for food.

Quail, of which there are several species present throughout the Southwest, may also seem like an obvious food bird. There are few mentions of its consumption, however. White (1947:225-226) notes that they are taken during rabbit hunts at the Keresan Pueblos and subsequently eaten, specifically at Santa Ana (White 1942:281). Quail were evidently taken on communal hunts that also procured rabbits and rodents at

Cochiti (Lange 1959:129). The dusky grouse, another potentially obvious food choice as a meaty galliform, is reported as having been eaten by the Tewa (Henderson and Harrington 1914:41), as well as the mourning dove, the yellow-headed blackbird, and the red-winged blackbird (1914:36, 41). The gray-crowned rosy finch, a very small bird, and the robin, slightly larger though not substantial in body size, were also trapped or snared and subsequently consumed at Hopi and the Keresan Pueblos respectively (Bradfield 1974: 33; White 1947: 225-226). Though examples clearly exist of small birds being eaten, it is hard to imagine that any of these would have constituted a major or frequent food source.

Symbolic consumption. Several examples of symbolic consumption of birds have been noted in ethnographic literature, where a bird may be consumed so that a person might assume the perceived qualities of the bird. One such example is given at Hopi, where a young man kills a roadrunner and intends to eat it in order to be swift and tireless like the bird (Tyler 1979:224). In other situations, a bird may be chosen not for the assumption of qualities, but because its qualities are symbolically relevant to the ritual being conducted. At Ohkay Owingeh (San Juan Pueblo), at the water-giving rite-of-incorporation performed by the chief of the Winter moiety (the purpose of which is to incorporate infants) new mothers are given the meat of sandhill crane, geese, and ducks (Ortiz 1969:35, 171-172). These birds, who arrive in the fall, stay for the winter, and leave in the spring, are also symbols of the change of seasons. It is for this reason that these birds are the gift (rather than the meat of other birds) to the mothers of the infants undergoing the important life-status change of incorporation, marking the occasion with the meat of birds who themselves symbolize an important periodic change (Ortiz

1969:171-172). Importantly, these birds are traditionally supposed to be obtained through trapping and suffocation, so that their blood is not spilled (1969:172).

To conclude our discussion of birds as a food source, by and large, there is abundant evidence to support the conclusion that birds in the Pueblo world are and were primarily important for ceremonial use. Few birds are known to have been eaten ethnographically, and of these, they are not frequent staples of the diet, but rather supplements to a meal or delicacies. The overwhelming majority of birds are therefore reserved for the use of their feathers. It should be noted, however, that early ethnographers may have been less interested in recording dietary practices than ceremonial ones, which could alter slightly our understanding of bird consumption. However, if birds were a robust component of diet, this should have emerged in the Pueblo ethnographic record.

Birds in the Naming of Clans

Birds feature prominently in clan names in the Pueblo world. Many different types of birds are used as clan names, including specific birds (e.g. eagle, turkey, crane), colored birds (e.g. names that translate to "yellow bird"), or simply nondescript "bird" clans. Using Hodge's report of Pueblo clans (1896), as well as nine other ethnographic sources, patterns in the use of bird names for clans were observed. Pueblos for which these data were gathered are Acoma, Cochiti, Hano, Orayvi, Walpi/Sichomovi, Isleta, Isleta del Sur, Jemez, Laguna, Nambe, Pecos, Picuris, San Felipe, San Ildefonso, Ohkay Owingeh, Santa Ana, Santa Clara, Tesuque, Zia, and Zuni. Twenty-one distinct types of bird clans were found to be present in clan naming: eagle, parrot/macaw[2], turkey, roadrunner, crow, crane/heron[3], turtledove[4], dove, duck, goose, hawk, bluebird, hummingbird, "chicken hawk[5]," "pigeon hawk[4]," magpie, bunting, "yellow-bird," turkey buzzard, swallow, and "bird."

Of these bird clans, eagle is by far the most ubiquitous, occurring at 19 of the 20 recorded pueblos (Table 2.2). A far second is parrot/macaw clan, followed by turkey clan. It is interesting to note that, as discussed above, the feathers of these three types of birds are perhaps the most important used in the manufacture of ceremonial objects. Several groupings are evident in bird clans. Birds of prey feature prominently, including the eagle, hawk, chicken hawk, and pigeon hawk. Water birds include the duck, crane/heron, and goose. A variety of small, colorful birds are given as clan names: hummingbird, bluebird, yellow-bird, bunting, swallow, as well as the larger yet still brightly colored parrot/macaw. Two corvids are named (crow and magpie) followed by the dove and turtledove, the roadrunner, the turkey, and a generic "bird" clan. These names may highlight the types of birds that are of great ceremonial significance in the Pueblo world. Indeed, in many ways this supposition plays out in the use of these birds in ceremonies and ritual described above.

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[2] These terms are often used interchangeably in the literature. At Isleta, Santa Clara, Orayvi, and Walpi, these were reported as "parrot" clans (Fewkes 1900b:584; Parsons 1920:56-57; Schroeder 1968; Titiev 1944:Table 3; Whiteley 1985). At Acoma, Laguna, Zia, Santa Ana, and San Felipe, it is unclear if these clans are parrot or macaw (Ellis 1959a:329-330; Hodge 1896; Parsons 1920:58, 64, 67; Schroeder 1968; Stevenson 1894:19). Zuni reportedly had both a parrot clan and a macaw clan (Cushing 1920:127; Hodge 1896; Schroeder 1968).

[3] Like the case of the parrot/macaw, it is not always clear what is meant here. For Zuni, Zia, and Hano the clan is listed as "crane or heron" by Hodge (1896).

[4] Unless this clan is of recent development, this is possibly Mourning Dove, which at times has been called in common language the "turtledove." There is no turtledove native to North America.

[5] Confusion is introduced when ethnographers who first translated these names used colloquial English names that have since changed due to the clarification or refinement of Linnaean taxonomies. Chicken hawk could be Cooper's hawk (*Accipiter cooperii*), sharp-shinned hawk (*Accipiter striatus*), or red-tailed hawk (*Buteo jamaicensis*), while pigeon hawk is likely the merlin (*Falco columbarius*). The latter is confirmed in Ladd (1963:85) who calls *Falco columbarius* the pigeon hawk.

Table 2.2. Frequencies of clans named after birds at 20 pueblos.

Bird	Number of Pueblos	Pueblos	Sources
Eagle	19	Zuni, Acoma, Laguna, Santa Ana, Cochiti, Jemez, Isleta, Isleta del Sur, Picuris, Ohkay Owingeh, Santa Clara, San Ildefonso, Tesuque, Nambe, Pecos, Zia, San Felipe, Orayvi, Walpi/Sichomovi[1]	Cushing 1920:127; Ellis 1959a:329-330; Fewkes 1900b:584; Hodge 1896:350; Parsons 1920: 56-58, 64, 67; Schroeder 1968:108-110; Stevenson 1894:19; Titiev 1944: Table 3; White 1932b:35; Whiteley 1985: Table 1
Parrot/Macaw	10	Isleta, Santa Clara, Zuni, Acoma, Laguna, Zia, Santa Ana, San Felipe, Orayvi, Walpi/Sichomovi	Cushing 1920:127; Ellis 1959a:329-330; Fewkes 1900b:584; Hodge 1896:351; Parsons 1920:56-58, 64, 67; Schroeder 1968:108-110; Stevenson 1894:19; Titiev 1944: Table 3; White 1932b:35; Whiteley 1985: Table 1
Turkey	9	Zuni, Acoma, Laguna, Santa Ana, San Felipe, Cochiti, Pecos, Zia, Walpi/Sichomovi	Cushing 1920:127; Ellis 1959a:329-330; Fewkes 1900b:584; Hodge 1896:352; Parsons 1920:58, 64, 67; Schroeder 1968:108-110; White 1932b:35;
Roadrunner	7	Zuni, Laguna, Acoma, Zia, San Felipe, Isleta, Walpi/Sichomovi	Ellis 1959a:329-330; Fewkes 1900b:584; Hodge 1896:351; Parsons 1920:56-58, 67; Schroeder 1968:108-110; White 1932b:35;
Crow	7	Zuni, Jemez, Pecos, Zia, San Felipe, Orayvi, Walpi/Sichomovi	Cushing 1920:127; Fewkes 1900b:584; Hodge 1896:350; Titiev 1944: Table 3; Whiteley 1985: Table 1
Crane/heron	4	Zuni, Zia, Hano, Orayvi, Walpi/Sichomovi	Fewkes 1900b:583; Hodge 1896:350; Cushing 1920:127; Schroeder 1968:108-110; Stevenson 1894:19; Titiev 1944: Table 3; Whiteley 1985: Table 1
"Turtledove"	4	Laguna, Santa Ana, San Felipe, Isleta del Sur	Schroeder 1968:108-110
Dove	4	Zia, San Felipe, Santa Ana, Walpi/Sichomovi	Fewkes 1900b:582; Hodge 1986:350; Parsons 1920:64
Duck	3	San Felipe, Laguna, Isleta	Bandelier 1890; Hodge 1896:350; Parsons 1920:57
Hawk	3	San Ildefonso, Zia,	Fewkes 1900b:584; Hodge

		Walpi/Sichomovi	1896:351
Goose	2	Isleta, Isleta del Sur	Hodge 1896:350; Parsons 1920:56-57; Schroeder 1968:108-110
Bluebird	2	San Ildefonso, Walpi/Sichomovi	Fewkes 1900:584; Hodge 1896:349
Hummingbird	1	San Felipe	Hodge 1896:351
"Chicken hawk"	1	Orayvi, Walpi/Sichomovi	Titiev 1944: Table 3; Whiteley 1985; Table 1
"Pigeon Hawk"	1	Walpi/Sichomovi	Fewkes 1900b:583
Magpie	1	Walpi/Sichomovi	Fewkes 1900b:584
Bunting	1	Walpi/Sichomovi	Fewkes 1900b:584
"Yellow-bird"	1	Walpi/Sichomovi	Fewkes 1900b:584
"Bird"	1	Walpi/Sichomovi	Fewkes 1900b:584
Turkey Buzzard	1	Walpi/Sichomovi	Fewkes 1900b:584
Swallow	1	San Felipe	Hodge 1896:352

[1]Clans from Walpi and Sichomovi are given together by Fewkes (1900b: 582-584) as the clans from "East Mesa" (First Mesa) and includes "extinct" clans as well. "Extinct" clans from other pueblos were also included in this table, insofar as they were mentioned by the reference.

Ornithological Nomenclature

As noted above, birds are recognized as a distinct class in the Pueblo world, separate from other animals. In what might be called "Pueblo ornithology," or the perception and ordering of the different types of birds in the natural world, the category of bird seems to be first and foremost determined by the ability to fly, and which therefore includes bats, but which excludes flying insects. Within the category of birds, native taxonomies vary by language group, pueblo, and even at the level of the individual person in how to classify different birds that a Linnaean taxonomy perceives to be separate species. In the case of ornithology, the rank-based "scientific" Linnaean classification distinguishes birds based on physical appearance, morphometrics, behavior, and genetics. A native taxonomy does something similar, in a non-ranked way and without genetic observations, by determining what differences and similarities observed in birds constitute meaning for different *types* of birds. Additionally, a native taxonomy is not necessarily the byproduct of a concerted and pre-determined or pre-meditated effort to create a system of classification for the natural world, but is a general framework for how that world is perceived and thought of (Tyler 1979:9).

Distinguishing between Linnaean taxonomy and Native taxonomies as different systems by no means implies that one is inferior to or greater than the other. They each observe the characteristics of animals that are decidedly significant to those doing the observing. Rather, conducting any research on the Pueblo use of birds using only a Linnaean framework assumes that the world of birds is mentally ordered in the same way everywhere, imposing the significance of the concept of species where it doesn't exist in the same manner, and assuming that the same birds which are perceived to be species to a Linnaean taxonomy are separated in the same way to Pueblo people. These assumptions *a priori* inject bias into a mental framework where the concept of species is not necessarily paralleled, and where different "groups" of birds (at the level of genus or family, for example) are not always perceived to be internally similar groups in a native taxonomy. Applying the categories of a Linnaean taxonomy to the exclusion of understanding anything about native taxonomies therefore affects how we interpret the use of different birds in the Pueblo world, and has the potential to obscure patterns of use and significance that may otherwise be visible when approached from the perspective of native taxonomies.

A Linnaean framework is still the dominant framework employed in zooarchaeological studies, not only because it is the framework which many of us have learned in scientific training, but also because it allows us to consider important details of the behavior and physical characteristics of different animals. In the case of archaeo-avifaunal studies, for example, identifying a bone as from a sharp-shinned hawk still provides concrete information on behavior and physical appearance that is relevant to understanding human-animal relationships in the past. This system does not, however, necessarily provide insight into the cultural importance of different groupings of birds. Even if we cannot fully know native taxonomies, simply acknowledging that they are different than a Linnaean taxonomy and that the concepts in one do not necessarily hold cultural significance in the other, makes interpretation of Pueblo bird use a little more robust.

Salient features that distinguish birds or create groupings of birds in native taxonomy are based on visual observations of birds in terms of physical appearance and behavior, and which features are salient is related to the bird's use and importance in Pueblo life. Few targeted ethnozoological studies have been conducted on animals or birds specifically in the Pueblo Southwest. These do exist for Zuni (Ladd 1963), the Tewa (Henderson and Harrington 1914), and the Keresan Pueblos (White 1947). Other works provide lists of ornithological vocabularies, at Acoma (White 1943) and Hopi (Bradfield 1974; Mearns 1896). The lists are often many pages long, with names for a great variety of birds with which people interact or interacted, strengthening the argument that a great richness of birds is involved in Pueblo ceremonial life.

Considering Pueblo ornithological vocabulary gives insight into how different "species" and groupings of birds fit into a mental framework of the birds of the Pueblo world. For example, White (1943:354) reports that at Acoma he could not find a word for "hawk" as a general type, rather each type of hawk had its own name. Whereas at Hopi, the term "*kwa'yo*" (Bradfield 1974:16) or "*qua'yüh"*(Mearns 1896:397) indicates hawk in general, while another term is affixed before the word to indicate a specific hawk ("*pa'la kwa'yo*" as red-tailed hawk) (Bradfield 1974:16). Mearns also points out that, regarding the red-tailed hawk, observers "understand the various ageal and irregular phases of plumage and apply the same term *–päh'lä* (red)—to all specimens of this species" (Mearns 1896:398). White (1947:228) reports that the same term, *cpiya*, is applicable to many hawks (Ferruginous, red-tailed, sharp-shinned, and Swainson's) in the Keresan Pueblos, though some of these have secondary names that distinguish them. At Zuni, there is one word that refers to three species of hawk, sharp-shinned, "duck hawk" (Peregrine falcon), and pigeon hawk (Merlin), and these birds are used in the same ways (Ladd 1963:55).

To provide other examples, White (1943:355) reports only one word for hummingbird at Hopi, *miter*, and a shared word for woodpeckers, Arizona woodpecker and hairy woodpecker, though several different types are recognized (White 1943:354-355). Similarly, hummingbirds also all share the same name at Zuni (Bailey 1928; Ladd 1963: 100), and both the hairy and downy woodpeckers share a name (Ladd 1963:103). Several types of ducks share a name at Zuni, the mallard, American pintail, and cinnamon teal, and are used interchangeably in the same ways (Ladd 1963:82-83). The term *onoj lhika* is used for a range of colorful birds, including the Bullock's oriole, western tanager, and black-headed grosbeak (Ladd 1963:124-126). The green-tailed towhee, spotted towhee, canyon wren, and Abert's towhee all share the same name despite their markedly different appearances (1963:129), as do the grasshopper sparrow, Baird's sparrow, song sparrow, vesper sparrow, and white-crowned sparrow (1963:131). In the Tewa language there is one word for ducks, modifiable by descriptive terms for different types of ducks, three jays share the same name (Steller's, Woodhouse's, and the grey jay), and the same term is used for the crow and the raven (Henderson and Harrington 1914).

These examples provide insight into how birds might be grouped in mental frameworks. It is important to note, however, that observations of the lack of a distinct term for a given species, or the proliferation of terms for different individuals of the same species based on age or sex, cannot be directly translated to produce a list of birds that people do or do not recognize as separate birds. For example, the use of a singular word for multiple species (e.g. *miter* for hummingbird), with no additional modifiers to differentiate the species, does not necessarily indicate that all the species subsumed under that term are thought to be the same animal, or that the differences between the species are not recognized. Rather, it reveals groupings related to mental concepts and categories of significance (e.g. that "hummingbird" as a category is important). For example, the category of bird *miter* has significance, with the different species of hummingbird recognized and visually distinguishable as variations of the same concept of *miter*, with all potentially being capable of filling the same position in the framework/native taxonomy. Similarly, the use of one term for three types of towhee and a wren, or for five sparrows (Ladd 1963:129) does not necessarily indicate that the differences between these are not recognized, but that together they form a significant grouping, the importance of which may supersede their treatment as separate "species."

In situations where there are terms for both the different species of a type of bird and for the overarching category (e.g. sharp-shinned hawk and hawk), clearly the differences between different species are recognized, yet together they have significance as a category. For example, where different species of hawk are individually named, and there is simultaneously a unifying term for "hawk," this might indicate in practice that different ceremonial situations may have different requirements involving these birds. The feathers of a specific type of hawk (species) may be required, for example, in the manufacture of a given prayer stick. Whereas if the quality wishing to be conveyed is something shared by all hawks, such as hunting prowess, a feather from multiple acceptable species in the category of "hawk" may do. Thus, types of birds do not simply possess significance at the level of species, but also at higher levels of grouping, and which bird is used depends on the given situation. A concrete example of this is the use of jay feathers at Zuni, where the feathers of Woodhouse's scrub jay can be substituted for those of Steller's jay (two distinctly-different looking jays) in the manufacture of ceremonial paraphernalia, yet the birds are recognized by different names and as different birds (Ladd 1963:109-110).

A particularly relevant example to this dissertation is the use of the term "eagle" at multiple Pueblos, a term that is capable of subsuming more than those birds that are considered to be eagles in the Linnaean taxonomy. Both golden eagle (*Aquila chrysaetos*) and bald eagle (*Haliaeetus leucocephalus*), the only two "true" eagles in North America, are local to the Southwest, though the former is relatively more common. While the "category" of eagle is a concept that includes both of these birds, the two are recognized as distinct and are referred to with separate terms at Zuni (Ladd 1963:87-88), Hopi (Mearns 1896) and the Keresan Pueblos (White 1943). For the Tewa, Henderson and Harrington (1914:36-37) don't report a term for golden eagle (though surely it exists), though they do reference an unidentified "white eagle," which may be a juvenile golden eagle. According to Tyler (1979:41), the "white-headed eagle" refers to the bald eagle at Taos. While the golden eagle seems to figure more prominently in ritual and ceremony and is captured more widely and more commonly across the Pueblos, the bald eagle has varying reputations. On one hand, unlike the golden eagle it eats fish, an act that creates an important association between this bird and water (Tyler 1979:41). However, it is also more willing than the golden eagle to consume carrion or steal prey caught by other raptors, and is less aggressive than the golden eagle in the defense of its nest, factors that contribute to its perception, in some cases, as the weaker of the two eagles (Tyler 1979:41).

Aside from the two "true" eagles recognized in western taxonomy, for different Pueblo groups there are multiple other types of eagles. The term "red eagle" (at Hopi) references the red-tailed hawk (*Buteo jaimaicensis*), and "black eagle" references (also at Hopi) the common black hawk (*Buteogallus anthracinus*) or elsewhere used to refer to juvenile bald and golden eagles (Tyler 1979:40). "Water eagle" is the Hopi and Keres term for the osprey (*Pandion haliaetus*), which in western taxonomy is in its own family (Pandionidae) apart from that to which eagles belong (Accipitridae). Each of these "eagles," golden, bald, red, black, white, or water are all considered eagles, though they are also recognized separately and their feathers called for, or their entire beings treated differently, in ceremonial requirements.

Any research into the use of birds in the Pueblo world, past or present, can employ both a Linnaean taxonomic framework and considerations of native taxonomy, to create a more well-rounded approach to understanding the dynamics of human-bird relationships and the cultural value and significance of birds. We can never be completely divorced from a Linnaean taxonomy, since the observations of modern and historical ornithology are grounded in this scheme, and thus it provides us important information on bird behavior and biology. We can, however, shuffle and restructure the groupings as we see them into those that may have more significance in the Pueblo world. It is clear that, especially in attempting to understand bird use in the Ancestral Pueblo world, it is worth considering different types of birds at many different levels, not just different species (in the Linnaean sense), but different culturally significant groupings of birds at different levels (e.g. hawks, eagles, birds of prey, water birds, etc).
At an even higher level, types of birds can be sorted into categories of overarching symbolic importance, relating the use of different birds to different themes in Pueblo thought. Hamilton Tyler did just this when he re-sorted birds from a scientific classification into a Pueblo "order,"

(1979:9), organized into culturally significant categories under which are subsumed multiple types of birds. Many themes came out of this effort, and which types of birds were assigned to each was determined based on an analysis of the appearance of birds in narratives and stories, as well as their actual use in Pueblo life.

Symbolic Associations

It would be exceedingly challenging to produce a list of simple one-to-one symbolic associations for different species of birds recognized in the Pueblo world for two reasons. First, while some general meanings are shared across multiple Pueblo groups at higher levels of ornithological classification (e.g. raptors marked by strength, hunting abilities, and sharp vision), differences exist between different pueblos. Second, as Tyler (1979:9) pointed out, no one bird is associated necessarily with any one theme to the exclusion of others. For example, while the turkey represents the earth on one hand (an association understandable in light of this bird not being a strong flyer), on the other it is associated with the dead and the underworld (Tyler 1979:10). Understanding the associations of different species with other natural and other-worldly concepts contextualizes and in many cases, explains *why* living representatives of different species (and their feathers) are used in certain ways in the Pueblo world. In fact, understanding the two are intertwined: in order to understand Pueblo bird use, meanings of birds must be understood, while understanding Pueblo bird use can often clarify and make evident their meanings. Here, I will briefly outline the themes discussed by Tyler (1979), but refer the reader to this work for more detailed explanation and countless examples of how different birds are related to these themes.

The general themes or categories into which Tyler (1979) sorts the birds of the Pueblo world (based on their appearance in narratives and their use in ceremonial life) are the following:

birds of the sun; of the sky; of the earth and the dead; rain birds; water birds; of winter and summer; of dusk, night, and the moon; of balance between nature and man; of speech; of the hunt, racing, and clowns; of horticulture; of war; and of purification. The first seven of these themes fall under the larger umbrella of "Nature" themes, while the latter six under that of "Culture." Having compiled information from oral narratives and stories, ceremonial use of feathers, and notes on any type of engagement in general between Pueblo groups and birds, different birds are assigned to these different themes. The first three, relating to the sun, sky, and the earth/dead are the most important and frequently used birds in Pueblo life. Birds of the sun include macaws, so associated because of their red color, and by extension the related parrots and parakeets are also associated with the sun (Tyler 1979:13). These birds are also associated with the south, their geographical home. Secondary associations include, because of the multi-coloredness of their feathers, both tri-colored corn and the rain (through the implied reference to the rainbow) (Tyler 1979:13). Especially when joined with the eagle, macaws symbolize the sky, though this theme is most dominated by the eagle. By extension of this association, macaws are also connected to salt, because as the sun (macaw) dries up the water of salt lakes, salt is left behind (Tyler 1979:25).

Eagles and other birds considered by many Pueblo groups to be eagles (large hawks and the osprey) are birds of the sky. The relationship is obvious here, since this is where these birds spend most of their time, and because they are capable of flying higher than other birds, so high that they are believed to exit through a hole in the above, and travel to the house of the Sun (Tyler 1979:39). They are therefore the bird primarily associated with the zenith, noted at Zuni, Jemez, and among the Tewa and Keresan pueblos (Dozier 1970: Table 8). Because Eagle can visit the Sun's house, he also maintains an association with the sun (Tyler 1979:49). At Hopi, the tail feathers of the eagle represent the rays of the sun when they are used in costuming (Voth 1912:109). Interestingly, the eagle can also be associated with both the dead/underworld and curing, and the reader will recall descriptions above of eagle feathers used in burial ceremonies or placed with the dead (Lange 1959; Parsons 1925; Stevenson 1894; Voth 1912; White 1932a, 1935, 1962) and used in curing rituals (Ellis 1959a:331; Parsons 1920:62, 1936:58-59; Stevenson 1894:75; White 1935:122, 124, 1962:289). These birds are respected for their good eyesight and hunting abilities. Eagles, along with other predators like the mountain lion, are sources of power for hunt societies at Acoma, Zuni, Santa Ana, Cochiti, Laguna, Hopi, Tewa, Jemez, and Ohkay Owingeh (Gunnerson 1998:233; Parsons 1939:187-188), and at San Felipe, medicine men get their power from the major predators, including eagle (Gunnerson 1998:235; White 1932a:43-44, 56, 58).

The turkey and, by extension, several other weak flyers like the quail and grouse, are birds "bound to the earth" upon which people walk (Tyler 1979:71). Because they are of the earth, they are companions to people in life and death, and for the same reason they are associated with the dead, who rise from the earth to the clouds (Tyler 1979:55).

Many birds are associated with water in Pueblo thought, but there is a distinction to be made between water that falls from the sky and standing or running water. Rain birds include swallows, swifts, hummingbirds, and doves, all related to rain because of their congregation around water. Swallows, and swifts by extension, hover around waterways, doves are found near pools and springs frequently drinking, and hummingbirds both resemble the rainbow (a sign of rain) and by their rapid flight are messengers to the spirits for rain (Tyler 1979:91-92, 105). Where these birds differ from the water birds associated with standing water discussed next is that they are not birds who are adapted to live *on* water; rather they are birds of the air who for various reasons spend time around water. Therefore, while the dove calls for rain with its song, the hummingbird reflects the rain through the rainbow, and the swallow/swift brings rains as they swoop above water ways (Tyler 1979:112).

Birds associated with standing or running water of the earth are the more traditional "water birds," including the duck, goose, snipe, killdeer, and sandhill crane. Ducks are the primary bird associated with water, but ducks, geese, and cranes—all migrants to the region—all bring rain clouds that travel with them on their migrations, and, because they all eat seeds, they are seed-bearers as well (Tyler 1979:113-114). Additionally, at Zuni the katsinam are said to travel back to their home in the form of ducks (Bunzel 1992:500, 517; Tyler 1979:115). Cranes are especially related to the theme of guardianship, since, as they congregate in groups, one sentinel crane is always keeping watch, ready to alert the flock of any on-comer (Tyler 1979:113-114, 129). The crane is further associated with winter, as it is a winter migrant into the region, and the example given above from the Pueblo of Ohkay Owingeh of the consumption of sandhill crane highlights this relationship (Ortiz 1969:171-172).

There are multiple species that fit into the category of summer and winter birds. Summer birds seem to be qualified by the presence of yellow feathers anywhere on the body, with specific focus on flycatchers, vireos, tanagers, finches, warblers, orioles, and meadowlarks. All of these, except the resident meadowlark, are summer migrators to the region, so with them they bring the summer (Tyler 1979:133). These birds are said to be the pets of the Sun, who during the winter locks them up, but releases them again for the summer (Tyler 1979:148). Stephen (1936:782) remarks that the yellow symbolizes also the pollen that the birds transfer from plant to plant, and therefore is related to the themes of fertility, summer, and the summer rains that enable summer plant growth. Winter birds, the horned lark and the two species of bluebird present (mountain bluebird and western bluebird), are all local residents, but in the winter they descend from higher elevations to lower ones, so they also appear at the change of the seasons. With them they bring "winter water," meaning snow and ice (Tyler 1979:14).

The last of the "nature" themes is that of dusk, night, and the moon. Unsurprisingly, these are the nocturnal owls, poorwills, and nighthawks. The most prominent among these symbolically is the owl, whose associations include night, omens, witches, and balance. At many pueblos, they are associated with witches, as the owl and the crow are the two birds into which a witch changes (Beaglehole and Beaglehole 1935:5; Gnabasik 1981:185-186; Lange 1959: 252-253; Parsons 1936:61; Tyler 1979:168; White 1932a:42, 48, 1935:120, 169-170, 199, 1962:287; Whitman 1947:124). At other pueblos, owls represent the balance between goodness and evil, as they have tendencies towards both (Tyler 1979:157). Their meaning is a bit shrouded in mystery: "as signs they are ambiguous, and man's attitude toward them is ambivalent" (Tyler 1979:172).

Other birds which represent balance, this time the balance between nature and man, are crows and ravens. Like owls, their meaning is a bit ambiguous. Witches can also turn into crows, but crows are associated with the dark clouds that bring the rain, and because katsinam actually bring the rain, crows are associated with katsinam (Tyler 1979:175). Crow is closely related to humans, unlike the god-like lofty eagle, because he eats their food (Tyler 1979:173). Because crows and ravens eat dead things, they are also associated with war, and to some, crow can be a bad omen or is evil (Tyler 1979:178-179). While crow and raven are recognized as different birds, they fulfill many of the same ceremonial roles and have similar symbolic meanings (Tyler 1979:174).

The birds of speech are the mockingbird, and by extension, the shrike. Mockingbird is thought to be gifted with speech and the knowledge of many languages, he is therefore a communicator, a conveyer of information (and consequently not a good secret keeper), and though he can talk he is not always thought to be wise, but simply gifted at mimicry (Tyler 1979:185-186). In the Hopi emergence narrative, it is mockingbird who assigns languages to each tribe that comes into this world from the below. After assigning the four different Pueblo language families he runs out of languages, and therefore gives out Navajo, Apache, Mojave, and "Mexican" (Tyler 1979:190; see also Parsons 1939:239). At Zuni, Ladd (1963:17) describes that a child might be fed the tongue of a mockingbird in order that he "be gifted with many languages." Similarly, at Jemez a live mockingbird is held to the mouth of a child in order that he may be a good singer (Parsons 1925:29).

Hawks and falcons are less powerful than the eagle and larger hawks, though they are still good hunters (Tyler 1979:193). The association with hunting, as birds of prey, is obvious. Because these birds are swift, agile, and tireless, they also have an association to racing. The American kestrel seems to hold special significance. While it is not a great hunter, taking only small prey and insects, it is the "little brother" to hawks (in part probably due to its diminutive size), and consequently this relates them to novices or initiates (Tyler 1979:198). The kestrel is even referred to as the little brother of eagle. In the Zuni narrative that explains the origin of corn, Eagle is sought in order to help with locating the vanished Corn Maidens (Cushing 1920:43-54). When Eagle cannot at first pass find them by flying high into the air and surveying the land, he declares that he cannot see under rocks or bushes, and therefore instructs the people: "'Send for my younger brother; he flies nearer the ground than I.' So the warriors went to seek the Sparrow-hawk [American kestrel]. They found him sitting on an ant-hill." (Cushing 1920:45). The kestrel also returns, unsuccessful at finding the Corn Maidens. The people are next instructed to turn to the crow, "Ole Heavy Nose," who in turn also could not find the

Maidens (Cushing 1920:48-54). This hierarchy of birds relates the kestrel as the younger brother of eagle, but values both for their ability to locate something missing, with their powerful flight and their good eyesight. At Hopi, the kestrel is thought of as a great hunter. It was Sparrow Hawk who carried the boomerang stick under his wing, which he gave to the Hopi (Parsons 1939:188). Interestingly, both the eagle and the kestrel have been documented as pets or captive birds at Zuni (Ladd 1963; Schroeder 1968:108-110), as has also the raven, which seems to be considered interchangeably or the same as crow (e.g. Henderson and Harrington 1914:41).

The link between horticulture and the magpie is not a pan-Pueblo theme, though Tyler asserts the association for Taos (Tyler 1979:201). Potentially the symbolic connection lies in the relationship with Magpie, the narrative character, who in a Taos story is married to both Blue Corn Girl and Yellow Corn Girl. The latter drowns herself from jealousy of the attention that her sister receives from Magpie, but as she does so, an ear of corn emerges from where she drowned, having sacrificed herself to give blue corn to the people (Tyler 1979:204-205). At Hopi and Zuni, magpies are purported to be rain birds (Tyler 1979:207).

The birds of war include nuthatches, wrens, woodpeckers, jays, and the roadrunner. Nuthatches are only associated with war because they often hang upside down to eat, and because war is a reversal of normal life, all things upside down or backwards are war-like (Tyler 1979:210). Wrens are thought to be erratic and crazy in their movements, which is a skill that can confuse the enemy in war, while woodpeckers are constant drummers, the sound of which is associated with war (Tyler 1979:211). The pinyon jay flies around uttering war cries and mobbing its predators (Tyler 1979:216). Lastly, the roadrunner is fast on the ground, leaving behind a confusing trail of prints, precisely what warriors should do to confuse their enemies (Tyler 1979:220).

The last of the “cultural” themes concerns the bird of purification, the turkey vulture. Any contact with death, spirits, or the underworld must be followed by a purification ritual to return harmony to the balance of the living world (Tyler 1979:225). It is the turkey vulture who mediates in the instances of contact between the living and spirit world, since he is a medicine man or priest. Turkey vultures, as scavengers, quite literally clean the world by consuming the carrion left by other hunters (Parsons 1939:191; Tyler 1979:228). At Taos, the turkey vulture is forbidden from being killed, as it is this bird that recovers slain warriors in battle (Parsons 1936:60; Tyler 1979:226). At Laguna, feathers of this bird were used in exorcisms (Parsons 1939:191).

At all or nearly all pueblos exists a system of symbolic associations attached to the circuit of cardinal (or intercardinal) directions. While everywhere these directions have associated colors, some pueblos also assign different types of birds, which have feathers of the given directional color, to each direction. Table 2.3 documents the directional birds for the Pueblos of Zuni, Santa Clara, Zia, and multiple Hopi villages. The first three have birds associated with the four cardinal directions, the zenith (above), and the nadir (below), that together comprise the 3-dimensional world extending outwards from the pueblo, which is usually the center place. At Hopi, birds are also assigned to the intercardinal directions, and which birds are thought of or used depends upon the ceremony at hand (Tyler 1979: Table 2). Yellow “summer birds” take their place in the northern direction, except at Santa Clara where there is eagle. While the western birds are unknown at Zia or Santa Clara, Zuni and Hopi use jay or bluebird. Red birds are the southern birds, while magpie and rufous-sided towhee, which both have black and white feathers, belong in the east.

Table 2.3. Several reported bird-directional associations at several pueblos.

	Zia[1]	**Santa Clara**[2]	**Zuni**[3]	**Hopi**[4]
N	western tanager	eagle	yellow-breasted chat	flycatchers, warblers, oriole
W	"shasto"	?	Steller's jay	bluebird
S	cardinal	macaw or red-tailed hawk	macaw	parrot
E	magpie	?	rufous-sided towhee	magpie
ZENITH	eagle	unknown; term translates to "corn bird"	purple martin	hepatic tanager
NADIR	roadrunner	unknown; term translates to "leaf bird"	painted bunting	roadrunner or blackbird
NW				oriole, yellow-headed blackbird, warbler, "yellowbird"
SW				mountain bluebird, bluebird, or mountain jay
SE				parakeet, macaw, red-shafted flicker, or robin
NE				magpie or whippoorwill
Zenith				yellow-headed blackbird, blackbird, crow
Nadir				whippoorwill, rock wren, white-winged blackbird, lark bunting, hepatic tanager

[1]Stevenson 1894:70. Note that White (1962:112) gives these slightly differently: N is western tanager, W is cardinal, S is unidentified, E is magpie, Zenith is unidentified, and Nadir is a "night bird, like poorwill but larger"
[2]Harrington 1916:43
[3]Stevenson 1915:89
[4]Tyler 1979:Table 2; after Dorsey and Voth 1901

Conclusions

This chapter has demonstrated the truly remarkable degree to which birds are and have been involved in Pueblo life. They are powerful, sentient, valued beings in the natural world, and are perhaps the type of animal most heavily involved in ceremonial, symbolic, and ritual life. Oral histories and narratives are replete with specific bird characters or mentions of birds, and they symbolize all corners of the cardinal plane. They even feature commonly in the naming of clans. They carry many symbolic associations, to different colors, directions, and to important components of the natural and cultural world, such as to the sun, the sky, water, and the earth. Their importance in ceremonial life is pan-Puebloan and clearly of great time-depth, and many themes, associations, and specific uses are widely shared.

Beyond the importance of birds in symbolic thought, birds of the living world are important in a variety of endeavors. They are both hunted and taken as live nestlings or adults, sometimes being raised in captivity as pets, sources of feathers and food, or members of clans. Birds, bird parts, and feathers are perhaps one of the most ubiquitous materials employed in ceremonial paraphernalia, regalia, and ritually utilitarian objects. Feathers are integral to manufacturing ritual garb and paraphernalia, as well as prayer sticks, prayer bunches, and as individual prayer feathers. Whole skins, stuffed birds, talons, skulls, and implements made from long bones are used. A great range of birds is used in the manufacture of these objects, and heavy prescription determines what feathers are to be used when, a choice that is made relative to the qualities or behaviors of the bird, its color, or its symbolic associations. While eagles, turkeys, and macaws seem to feature most prominently in ceremonial life, water birds and colorful passerines hold special significance, and in general a huge range of birds is important. Sometimes, though infrequently, birds are consumed, either for sustenance or in the act of symbolic consumption. Even the turkey, for whom there is ample evidence of consumption, appears to be primarily important for its feathers. Pueblo ceremonial life is saturated with birds and bird symbolism, and birds and their parts are almost exclusively important in ceremonial contexts.

Given the overwhelming evidence that the primary involvement of birds in modern and historic Pueblo life is in ceremonial pursuits and activities, and given their evident symbolic importance, it does not seem too unreasonable to approach the analysis of avifaunal remains and the prehispanic use of birds in the Pueblo world from a similar perspective. Being careful not to commit the "sin" of direct analogy, we can acknowledge the relevance of our understanding of the modern and historic Pueblo world to understanding the ancient Pueblo world. If we are willing to take general practices that are widespread among the Pueblos today and historically, and entertain the possibility that such broadly observed strong patterns may have also held true in the past, then we can consider the possibility that the primary role of birds in the prehispanic Southwest was also ceremonial and ritual. This is the starting point from which most studies of the use of the birds in the prehispanic Southwest operate.

As one of the most frequently, consistently, and widely-used components of ritual and ceremony in the modern Pueblo world, I can imagine few better material proxies than avifaunal remains through which to address ancient ritual and ceremonial life. It is already known that birds featured in ritual in Chaco Canyon, but also that they—especially turkeys—were to some degree consumed, and that their bones were used in the manufacture of utilitarian objects such as awls and needles. Our starting point for the remainder of this dissertation will be that the *majority* of *unmodified* avifaunal remains that feature no evidence for dietary consumption are the direct remnants or products of either ritual practice itself, or of activities conducted in ceremonial pursuits (procuring, for example, feathers). It therefore follows that avifaunal remains qualify as an excellent proxy for understanding the nature and organization of Chacoan ritual and ceremony.

Chapter 3: Social Zooarchaeology and a Practice Theory Approach to Ritual

Multiple theoretical perspectives, frameworks, and methods structure the analysis and interpretation of the data marshalled to address the three research objectives laid out in chapter 1. In this chapter I situate the research within the broader framework of both a social zooarchaeology and an avian zooarchaeology, and provide the necessary background to understand the agenda, the theoretical orientation, and the frameworks developed and employed to interpret avifaunal remains. The chapter proceeds as follows: first, I discuss the perspectives of social zooarchaeology and define the focus of an avian zooarchaeology, highlighting the significance of taking a zoontological stance that affords birds agency in their interactions with humans. Next, I outline the fundamental components of a practice theory approach to ritual. From here, I develop an analytical framework that operationalizes this approach to ritual, and I provide guidelines with which to recognize and analyze the nature of ritual practice. This framework is used to address the second research objective. Lastly, in order to address the third research objective, I develop a framework of expectations, informed by ethnographic models, for different models of ceremonial organization.

Social Zooarchaeology and Avian Zooarchaeology

For much of its life as a specialized branch of archaeology, zooarchaeology has taken as its research focus the dietary and economic role of animals in past human societies. Even research that looked beyond diet was still driven primarily by the utilitarian roles of animals, such as for milk, wool, and labor (Russell 2012:7). The value of animals to prehistoric peoples, however, extended far beyond subsistence and economy to almost every aspect of life. Animals have always been an integral part of the human experience, and a vast range of interactions have characterized human-animal relationships. Animals have been companions and pets, deities and heroes, and symbols in religious systems; they have provided meat, wool, skin, fur, feathers, and bone; and they have been partners in mutually influential relationships of all kinds with humans.

The realization of the breadth of animal involvement in human societies, and the subsequent acknowledgement that animal remains could therefore be used to address a variety of research questions on different aspects of human culture was formalized during the gestation of "social zooarchaeology." Now a recognized approach, social zooarchaeology gained traction in the late 1990s and early 2000s, especially after the publication of the hallmark book of the same name by Nerissa Russell (2012). While the primary focus of the majority of zooarchaeological research continues to be on the role of animals in subsistence, there has been a florescence of studies on other aspects of human-animal relationships, including trade, craft production, ritual practice and religious belief, symbolic systems, and companionship.

Birds are a unique class of fauna in the animal kingdom, capable unlike others (with the exception of bats and flying insects) of the power of flight. This quality and others have earned them the attention of humans throughout the world and throughout time, in many cases inspiring reverence, worship, or respect, and often connecting them to a celestial "above". In pursuit of a social zooarchaeology, relationships between humans and birds exemplify the potential of faunal remains to speak to issues beyond diet, especially concerning religion, ritual practice, symbolic thought, and art.

Avifaunal remains continue to be relatively understudied compared to the attention that mammalian remains have received in faunal analysis. There are a variety of reasons for this, centered primarily around the feasibility of conducting this type of analysis and issues of preservation. First, the taxonomic identification of avifaunal remains often takes greater effort than the same level of identification for traditionally-studied mammalian remains. This is in part because the class Aves is species rich, and because skeletal morphological variability between different species is relatively less pronounced compared to that within other classes of fauna. In other words, there can be a great number of species within one genus in the class Aves (take for example, genus *Anas* (ducks)) between whom skeletal morphological variability is poorly pronounced; therefore, in attempting to identify a single bone, there may be many possibilities which may be virtually indistinguishable from one another. The analysis of avifaunal assemblages, therefore, can rarely be conducted without the aid of an extensive comparative collection.

The issue of identifiability in avifaunal remains is further compounded by destructive taphonomic processes that may disproportionately affect some avifaunal remains compared to often more robust mammalian remains. While the folk-wisdom that is passed among archaeologists that all hollow bones are bird and all bird bones are hollow is actually markedly *untrue*, bird bones are in some ways more susceptible to breakdown due to post-depositional taphonomic processes (Higgins 1999:1449). This is not, however, because they are exclusively "hollow." The "hollow" nature of some bird bone is actually the result of pneumatization, or the replacement of bone marrow by air-filled cavities. The degree of pneumatization, however, varies between taxa and by element within a single bird. In reality, not all bird bones are pneumatized, some are marrow-filled, and many mammalian skeletal elements (not to mention some of reptiles and amphibians) have non-marrow-filled, hollow (though not pneumatized) bones (Higgins 1999:1450-1451). Therefore, it is erroneous to say that bird bones are more "fragile" *because* they are "hollow." Instead, what contributes to the overall lower survivability of avifaunal remains compared to those of mammals is the *combination* of thin cortical bone wall and pneumatization, which together render them more vulnerable under taphonomic strain.

For the reasons described above, the identification of avifaunal remains from archaeological sites can sometimes pose a great challenge to zooarchaeologists. These remains therefore are often simply sorted as “Aves” (sometimes in varying size classes) or a more specific but still general level (such as “Passeriformes”), not because the specimen is inherently unidentifiable, but because the requisite skill or necessary comparative collection is not present. Because avifaunal identifications often must be made in deductive fashion, the identification of a single specimen may take a great deal of time. Even where taxonomic identifications may be made to any degree beyond class Aves, remains are often reported simply as a list of taxa, not always subjected to the same level of in-depth analysis (recording information such as heat treatment, fracture and breakage, tool modification, pre- and post-depositional effects, et cetera) that non-avian remains may receive (Higgins 1999:1449). The lack of attention afforded avifaunal remains from archaeological sites therefore results in an uneven and incomplete understanding of human-animal relationships in the past, and ignores a particularly interesting class of fauna. Fortunately, this situation has been changing over the last fifteen years (see the bibliography of Serjeantson 2009 for examples), and avifaunal analyses have become particularly common in the UK and to some degree in the United States Southwest.

Avian Zooarchaeology, Avian Agency, Ontological Taxonomies

The osteological study of birds can be pursued from multiple different perspectives. Some of these perspectives include, for example, an interest in birds themselves (e.g. evolution of birds, historical distribution), a bird-forward interest in human-bird relationships (e.g. the effects of human presence on bird habitat and distribution), or a human-forward interest in human-bird relationships (e.g. the ways that humans incorporated birds into their daily lives).

Several composite terms could be used to describe any research that studies avifaunal skeletal remains, with different terms implying different perspectives in research. *Ornithoarchaeology, avian paleontology,* and *paleoethno-ornithology* all combine the necessary words to convey the study material (Serjeantson 2009:3). Ornithoarchaeology and avian paleontology, however, place emphasis on the birds themselves, which while of interest, is usually not the primary concern of anthropological archaeologists who study bird remains. Instead, *avian zooarchaeology* or *the zooarchaeology of birds* both include reference to the material being studied, and imply that the concerns of zooarchaeology are driving the analysis of this material (Serjeantson 2009: 3-4).

It is an avian zooarchaeology that characterizes the research presented in this dissertation. Because this dissertation is an anthropological study of the role of birds in prehispanic life in Chaco Canyon, it operates necessarily from a human-forward interest in human-bird relationships. This research does not, however, treat birds as yet another resource to be consumed by humans (as food, feathers, or otherwise). Traditionally, zooarchaeological research has positioned animals at the distal end of a one-way relationship with human actors, where they are a passive resource consumed as food, raw material, symbol, sacrifice, or otherwise (Hill 2013:117; Overton and Hamilakis 2013:114). To approach human-bird relationships of the past with this attitude would not acknowledge the complexity of these relationships, where both actors (humans and birds) were responsible for "co-shaping" their interactions with one another (Overton and Hamilakis 2013:114). This relationship is thoughtfully described as a "society of people and birds" by Chandler et al (2016:2), a concept that embraces the idea that humans and nature (including birds) live together in a reciprocal world, where birds are "non-human agents" that engage in social interactions (rather than purely exploitative interactions) with humans.

Approaching past human-bird relationships from this perspective makes room for embracing ontological (native) taxonomies, where, even if the details of ancient ontological taxonomies cannot be directly recorded, it can be recognized that knowledge systems "lend social and cultural order to the natural world" and "are the product of phenomenological knowledge about birds and their behaviors, as well as the interconnected nature of local ecological systems, people, non-human persons or entities, and universal forces" (Chandler et al 2016:2). In other words, while it may be easiest to approach the study of avifaunal remains from the perspective of birds-as-a-resource used by humans, the reality is that birds were (and are) non-human agents coexisting in the natural world, whose agency is observed, respected, and intertwined with that of humans in mutually influential relationships. Complex ontologies influenced the ways that humans and birds interacted in the past, ontologies that both directed the involvement of birds in human life, and were directed by the nature and qualities of birds themselves.

Birds in the Southwest U.S.

The prehispanic Pueblo Southwest is arguably an ideal place to study human-bird relationships. Based on a detailed and extensive ethnographic record (discussed in chapter 2), ancestral-descendent relationships between Ancestral Puebloan archaeological sites and modern tribes, and observation of the ritual importance of birds in the archaeological past, our starting assumption can be that birds were (and are) socially, ritually, symbolically, and religiously significant to Ancestral Pueblo groups. Additionally, the arid environmental conditions that characterize the desert Southwest are beneficial (or relatively less detrimental) to the preservation of avifaunal remains. In the case of Chaco Canyon, so much of the assemblage was in such excellent preservation that 41.5% of analyzed specimens were complete or nearly complete elements. In fact, many colleagues who stumbled into the laboratory while I was conducting the analysis for this dissertation remarked that on first glance they thought I was working with modern skeletal material. Because the effects of post-depositional processes on the assemblage are relatively minimized (though by no means absent) compared to other environments (resulting potentially in larger avifaunal assemblages), and because a rich ethnographic record helps us to justify and understand the likely importance of birds in the past, the Southwest is an ideal place to carry out avian zooarchaeology, especially to answer research questions of importance to a social zooarchaeology, on the nature of a *variety* of aspects of human-bird relationships.

Furthermore, because birds seem to have been especially involved in the non-dietary aspects of ancient life in the Southwest, avian zooarchaeology is capable of addressing the more esoteric interests of archaeological research, such as the study of religion, in a *quantitative* way. One of the strengths of traditional zooarchaeology is its scientific robustness and its groundedness in the observation of physical characteristics, which together comprise data used to address research questions. One of the strengths of social zooarchaeology is its commitment to understanding the role of animals in the past beyond economy and subsistence. And one of the important aspects of avian zooarchaeology is that the subject matter is a type of animal that was used in a variety of ways prehistorically. The articulation of these agendas provides an opportunity to ground the study (in the case of this dissertation) of ritual, ceremony, religion, and symbolism in the quantitative (and qualitative) non-destructive visual analysis of the skeletal remains of birds who were involved in the activities of these aspects of past life.

It is from the perspective of social zooarchaeology, and in the acknowledgement that human-bird relationships of the past were varied and mutually-influential, that the first of the three research objectives of this dissertation is addressed. This first objective seeks to establish an understanding of the nature of human-bird relationships and bird involvement in life in Chaco Canyon through a zooarchaeological analysis of avifaunal remains. After developing this foundational understanding, higher-level research objectives concerning the nature of ritual practice and principles of ceremonial organization can be addressed.

Ritual and Religion in Archaeology

Much ink has been spilled in defense of the ability of archaeological research to study ritual practice and the symbolic and religious aspects of human society in the past. Much has also been said to the contrary. In this chapter I have already argued for the relevance of studying avifaunal remains, and (hopefully) given ample justification in Chapter 2 to the starting assumption that the overwhelming importance of birds in the Pueblo world is and was ceremonial in nature. Thus an argument has already been made that there is justification for examining this material class to address ritual practice. To take one step backwards, I will ground this assumption in particular theoretical perspectives that I believe guide the interpretation of these remains as reflective of ritual in the past.

Two approaches have dominated the anthropological study of religion and ritual. A religion-first view, exemplified by early structural-functional approaches, maintains that religion, as a set of intangible beliefs, is enacted through ritual (e.g. Durkheim 1965; Geertz 1973; Levi-Strauss 1981). In this view, the goal in studying prehistoric religion is to identify the underlying meaning of ritual acts in order to infer religious belief (Fogelin 2007a). This approach sets up a fictitious dichotomy between religion and ritual, as belief and action respectively, a dichotomy that still plagues the study of religion and ritual today (Bell 2009a). On the other hand, a ritual-first view is interested in the ways in which the experience of ritual can contest, reaffirm, or modify religious beliefs and the social order. Here, the social power of ritual is acknowledged (Fogelin 2007a).

Persistent scholarly doubt about whether or not prehistoric religion can be inferred using the archaeological record is based on a religion-first view. This view has become outdated as archaeologists have continued to theorize ritual and religion in archaeology. Research in the past thirty years has pressed the point that religion is not a corpus of intangible beliefs occupying the thoughts of prehistoric individuals; religion is also something people *do* (Fogelin 2008a:132). Ideological concepts are embedded within human practice, and religion leaves material traces that can be identified archaeologically (Fogelin 2008a,b). This ritual-first perspective is grounded in practice theory and has been advanced by the work of Catherine Bell (2009a,b). A practice-theory approach sees religion as manifested in a variety of ways in daily life. (Ritual) practice exists in a recursive relationship with structure, being produced by *and* (re)producing structure. Instead of rituals preserving stable religious beliefs, ritual can also modify religious beliefs. Because anthropological archaeologists are concerned with reconstructing past behavior from material remains, and because people *practice* religion, "the archaeology of religion, conceptually and methodologically, is as easy or as difficult as any other branch of archaeological research" (Fogelin 2008a:131).

A Practice Theory Approach to Ritual

Practice theory has enjoyed particularly widespread use in anthropology and anthropological archaeology since the 1970s (Bourdieu 1972, 1977), in part due to the breadth of its subject matter: all human action. In the work presented here, practice theory forms the basis of other theoretical work that provides structure to the interpretation of ritual in the past. Exhaustive synopses and treatments of practice theory have been written elsewhere (Bourdieu 1972, 1977, 1990; Giddens 1984; Ortner 1994; Sewell 2005); here several brief points will be made, relevant to establishing the basis of the theoretical framework employed in this dissertation, concerning a practice theory approach to archaeological ritual.

Fundamentally and in origin, the primary focus of practice theory has been the desire to understand how and why human agents both transform the world in which they live and how they reproduce systems of belief and practice, especially through the concept of *habitus* (or the *structure of the mind,* the set of internal dispositions that characterize a group of people) (Bourdieu 1990). Later work by Giddens (1984) examined the relationship between structure and agency, declaring that practice both (re)produces and is produced by structure, where *structure* consists of the "rules and resources recursively implicated in social reproduction" (Giddens 1984:xxxi), and *structuration* is the process by which social systems are reproduced in iterative fashion through social practices (Giddens 1984:25). While structure informs and directs the actions of human agents, these actions are recursive. It is through action that the social conditions that made possible the action in the first place are reproduced. In this sense, Giddens emphasized the duality of structure, where the structural properties of social systems are both medium and outcome of the practices they organize (Giddens 1984:25). That the recursive nature of social life, between action and structure, is grounded in repetitive actions (Giddens 1984:xxiii) is particularly relevant in a practice-oriented approach to ritual.

Another elaboration on practice theory that has proven useful in its application to understanding ritual is Sewell's (2005) expansion of the notion of social change as episodic. Here, the unit of analysis is the *event,* where events are transformations of the structure, and structure is thus the cumulative outcome of past events. In this sense, structure defines and shapes events, but events (re)define and (re)shape structure (Sewell 2005:199-200). It is when existing cultural practices (structure) are applied to novel circumstances that structural change occurs in the form of an event (Sewell 2005:219).

To base one's work in practice theory simply requires accepting that human action is not the routinized playing-out of mental frameworks and concepts shared by a society or cultural group, but that action (practice) exists in a recursive relationship with structure, belief, *habitus*. Arguably, the major contribution of practice theory to anthropological archaeology has been to create a shift in interest from the explication of human action to a focus on the critical role that action plays in perpetuating and negotiating social and societal practices, behaviors, norms, and beliefs. The notions that human action, perceived as such, is both repetitive and episodic are crucial for understanding ritual practice.

As a high-level theoretical framework, it is not quite accurate to say that practice theory can be "applied" to archaeological research, insofar as its primary study—human practice—is not directly observable to archaeologists. The application of practice theory to archaeology, then, may better be conceptualized as providing a set of high-level theoretical guiding principles that influence the questions that are asked and the interpretations of the material remains of practice. Because human practice cannot be directly observed in the archaeological record, archaeologists have focused on recognizing the material correlates of practice as repetitive or distinctive action. Material culture is both the "medium and the outcome" of practice (Giddens 1984:174); the way for archaeologists to study the practices enacted by actors is through patterning in the material objects used in practice. What is uncovered in the archaeological record, then, is the outcome of the dialectic relationship between material culture and practice, from which can be inferred the dialectic relationship between practice and structure. In other words, from the "ground up", material culture (involved in practice) allows for the inference of practice (behaviors), which allows for theoretical speculation on the relationship between practice and structure. Because most human action involves material objects in some sense, the study of practice in archaeology is "the investigation of prehistoric domains of activity, their archaeological correlates, and their sociopolitical implications" (Lesure 1995:6). *Habitus* becomes particularly relevant; if habitus is the structure of the mind acquired or developed through the activities of daily existence, and if daily and repeated activity creates material patterning in the archaeological record, habitus appears to archaeologists as spatially bounded patterns of material culture (Dobres 2000; Eckert 2008:3).

Ritual Practice and Ritualization

The work of Catherine Bell (2009a,b) significantly advanced the anthropological study of ritual by reframing it as a form of practice. Ritual practice exists in a dialectical relationship with the structure that it both affects and is affected by, as do all forms of practice. In the case of ritual practice, it can create, reaffirm, contest, and modify belief and structure. Ritualized action "negotiates authority, self, and society" (Bell 2009b:8). Ritual as practice is capable of reproducing or reconfiguring a vision of the order of power in the world, and therefore is particularly adept at restructuring power relationships (Bell 2009b). In this sense, ritual is inextricably linked to social organization and power structures.

Reframed through the eyes of practice, ritual becomes what Bell (2009a,b) has called *ritualization*, a "strategic way of acting" (2009b:7), through which ritual action is distinguished in relation to other activities. No longer the "thoughtless…routinized, habitual, obsessive, and mimetic" (Bell 2009b:19) set of activities traditionally thought to comprise ritual and simply reflect belief, *ritualization* transforms the concept of ritual into a strategic way of acting through which particular social actions are differentiated in relation to others (Bell 2009b). Actions that are ritualized draw significance from their contrast with other actions, by being set apart as special, more powerful, or more important from non-ritual actions.

While there are no universally-employed methods or ways in which action is ritualized, ritual practice may achieve its privileged position differentiated from other activities through six common mechanisms, or strategies, of ritualization: *formalism, traditionalism, invariance, rule-governance, sacral symbolism,* and *performance* (Bell 2009b). The use of each of these mechanisms modifies the practice or the space in which it is conducted in order to distinguish the act as different from other activities. While ritual practice itself cannot be observed, the strategies employed by ritualization leave material traces in the archaeological record. The repetitive nature of ritual in particular contributes to the creation of more visible patterning in the archaeological record that helps identify the loci of ritual activities (Fogelin 2007b; Marcus 2007; McAnany 2002). Material which appears in its context to be the result of activity which was differentiated from other, more quotidian activities in what seems to be formalized, fixed, repetitive, and perhaps prescribed ways, may then be the material remains of ritual practice. The concept of ritual as practice has garnered increasing archaeological attention in the last fifteen years, and has been fruitfully applied in a number of archaeological studies (e.g. Bishop 2014; Fogelin 2003, 2006; Inomata and Coben 2006; Lesure 2011; Moore 1996; McNiven 2013; Sabo 2008; Swenson 2008).

Mechanisms of Ritualization

While the six mechanisms of ritualization were developed from modern observable or historically documented ritual and thus are most relevant to studying documented or witnessed behavior, elsewhere I have argued that they have promising relevance for structuring the archaeological study of ritual (Bishop et al 2018; Bishop 2014), and the work of others has also demonstrated this point (e.g. Lesure 2011; McNiven 2013). Previous scholarly applications of the mechanisms of ritualization in archaeological research have focused on *performance* and *formalism*. Here, I will argue that all six mechanisms have relevance, and that four are particularly promising in their application to studying the material remains of ritual practice in the archaeological record.

I refer the reader to Bell (2009b) for a lengthier discussion of each mechanism of ritualization, but here they are briefly summarized. It is through one, several, or many of these mechanisms that actions can be *ritualized*, where each mechanism can be an effective means of differentiating or setting apart a given action, activity, or event as ritual. Through the use of *formalism*, a contrast is created between informal and formal behavior. Formalized gestures and speech render the activity restrained and impersonal. The principle of formalism can also be considered relative to the locus of ritual practice, considering the architectural spaces where ritual occurs and the nature of that space (Bell 2009a:139-144; Lesure 2011). Ritual action can be authenticated through the mechanism of *traditionalism*, where references to an antecedent practice or idea are made to legitimize the ritual. When not anchored in tradition, rituals may be perceived by participants or witnesses as anomalous or irrelevant (2009a:145). Where *invariance* characterizes ritual, the act of repetition “subordinates the individual…to a sense of the encompassing and the enduring” (2009a:153). The range of acceptable actions and behaviors in ritual are prescribed by *rule-governance,* which forces controlled interaction (2009a:154). *Sacral symbolism* distinguishes the people, spaces and objects involved in ritual through their connection to a sacred, higher power or entity (2009a:157-159). Lastly, *performance* as a mechanism that distinguishes ritual practice describes the creation of a complex sensory experience for participants (2009a:160-161). Therefore, if ritual action is conceived of as ritualization, then our focus as archaeologists in identifying and understanding ritual action should be on the material correlates of the processes of differentiation.

Much of the application of the mechanisms of ritualization to the study of ritual in the archaeological record works best when examining primary depositional contexts, since this is where the mechanisms would have been employed in ritual action as discrete acts or series of acts (e.g. dedicatory deposits). This is especially true of *formalism* and *performance*, and perhaps why they have been the mechanisms so frequently relied upon in the application of Bell’s work to the study of prehistoric ritual. These two mechanisms are arguably the most visible and easiest to identify, as they can be specifically read or inferred from the architectural spaces or locations in which ritual acts are believed to have taken place. The formalization of space, such as the construction of platforms on which ritual may have occurred (e.g. Lesure 2011), is directly inferable from archaeological remains. While the mechanism of performance is less directly visible, by extension from formalism, the *performative* aspect of ritual may be implied in part by the degree to which a space is formalized. The formal nature of the space in which ritual took place would accentuate the experience of participants and viewers, rendering it more performative. Both performance and formalism have implications for public and private ritual, with the expectation that in general, public ritual may be more performative and more formal than private ritual. One modern example is the formal, public ritual carried out in the weekly liturgical experience of a church, that take place in a designated, formalized space (e.g. a sanctuary) that is otherwise not typically used for other activities. Of the remaining four mechanisms, *traditionalism, invariance,* and *rule-governance* have been under-utilized in archaeological analyses, but hold special potential for aiding the interpretation of ritual practice.

In order to clearly structure my analysis of the nature of ritual practice, I have developed a series of archaeological expectations for each of Bell's mechanisms. While these mechanisms may be relatively more readily observable in contemporary documented ritual, our inability to witness behavior directly in the archaeological record necessitates that the expectations of each mechanism be translated to the material correlates of expected behaviors, reflective of each mechanism. The material (archaeological) expectations of each behavioral mechanism of ritualization are presented in Table 3.1; these expectations are broadly relevant to the interpretation of ritual in the archaeological record, and can be read as guidelines for transitioning Bell's mechanisms to the interpretation of material culture in the absence of behavior as the observable unit of analysis. Table 3.1 further provides avifaunal-specific examples of how each mechanism might be evident in primary contexts.

Mechanism of Ritualization	Definition	Archaeological Manifestation	Primary Context Examples
Traditionalism	The reliance on an antecedent practice to lend a sense of authenticity to the ritual practice (Bell 2009b:145)	Specific ritual practices appear to have been practiced repeatedly over a long duration of time. The longer the practice was used, the greater the sense of traditionalism. Evident in multiple instances of similar primary ritual deposits spanning a range of time, or simply by the general presence of the same types of ritually significant objects revealing traditions of use in a given site or type of space	Repeated use in separate instances of deposition of the same bird types, in the same contexts, with the same associated materials, enduring over time. May include the curation of older remains or objects
Invariance	The use of repetition and control in an act that "subordinates the individual…to a sense of the encompassing and the enduring" (Bell 2009b:153)	Challenging to see archaeologically, except where the same materials are repeatedly used in the same way, within a single primary deposit reflective of a single event, indicating repetitivve, invariant behaviors in a single ritual	Large deposits in primary contexts of the remains of multiple birds (especially of the same taxa) that might imply their deposition in sequence within a short-time span
Rule-Governance	The use of rules to dictate the performance of a ritual, creating controlled interaction by prescribing the way that participants *should* act (Bell 2009b:154)	Visible in the standardization of the ways that different rituals were enacted, and the materials and spaces used. This standardization may be avident in primary context by conistent, similar assemblages and depositional practices recovered from primary ritual context, or in non-primary context in consistent associations between types of materials	Specific types of birds used/deposited repeatedly in the same ways, same types of contexts, at the same site, and/or with the same associated materials, indicating that their use and deposition was rule-governed
Sacral Symbolism	The establishment of a connection between the objects, people, and places involved in ritual to a greater or higher "sacred" power (Bell 2009b:157-159)	May be indicated by reference to concepts that are known, through prior research both archaeological and ethnographic, to have been sacred. This reference can be made through the deliberate placement of remains in primary context, or their general association with other objects in non-primary context	Reference to the sacred may be evident in the deliberate placement of birds (or their parts) in deposits that contain other materials, objects, or layouts meant to reference the sacred, which could specifically include, for example, reference to the quadrapartite orientation of the universe or to Mesoamerica
Formalism	The creation of contrast with informal and casual behavior through the use of formal speech and gestures, rendering an activity restrained and impersonal (Bell 2009b:139,144)	The differential use of formal architectural features/spaces (sensu Lesure 2011) and embellishments to elevate the status of ritual practice where it physically occurs	Avifaunal remains occur in prepared, formal spaces that are more carefully constructed or simply "nicer" (having required more effort in preparation or construction) than other spaces
Performance	Marking an act as deliberate by invoking complex sensory experiences, including sight and sound, for participants (Bell 2009b:160-161)	May not be directly observable, but is implied by increased formalism and visibility/accessibility of a space. The more formal a ritual, and the larger the audience, the more performative it may have been	Use of avifauna in large, formalized, accessible spaces that could have accommodated multiple individuals to witness the performance. Of course, occurrence in smaller, more restricted spaces does not imply non-ritual, just a lesser--though still present-- degree of performance

Table 3.1. Mechanisms of ritualization, archaeological manifestations, and examples.

Having established the archaeological correlates of the mechanisms of ritualization in Table 3.1, it is through this framework and from the perspective of practice theory and ritual as practice that the second research objective can be addressed, and an understanding of the nature of Chacoan ritual can be developed. The third research objective can then be addressed to understand higher-level patterning in ceremonial organization. A necessary intermediate step is making the case for how the distribution of artifacts/ecofacts from many types of depositional contexts can reveal patterns in or principles of ceremonial organization at multiple different scales. The value of many different types of contexts, beyond sacrificial, votive, or offertory deposits, especially to the second and third research objectives of this dissertation, is defended below.

In Defense of Many Contexts

"Archaeologists have tended to conflate the votive offering of artifacts with all ritual behaviors that move objects from contexts of use into the archaeological record" (Walker 1995a: 67). However, materials and objects involved in ritual or ceremonial practice can end up in almost any archaeological context. While the most obvious may be primary-context ritual deposits such as burials and caches, it is likely that the accouterments of ritual practice were used again and again, removed to their storage locations in between ceremonies, and eventually discarded in a designated act of retirement or otherwise. Spaces in which ritual performances took place were likely swept clean in between events, rather than left to slowly accumulate a palimpsest of ritual objects (Kryiakidis 2007:18-20). This fact—that the objects involved in ritual often end up outside of their systemic contexts—should not be understood as a reason why we *cannot* study prehistoric ritual. Rather, because the objects involved in the ceremonial life of a community are eventually dispersed into a variety of locations, many depositional contexts are relevant.

Multiple scholars have theorized the types of cultural formation processes and behaviors that created ritual deposits or deposits that contain objects used in ritual. The most explicit type of ritual deposit, and that most often relied upon in studies of ritual, are primary, sealed and undisturbed deposits, such as burials, offerings, caches, and deposits of dedication and closure. These are unequivocal examples of ritual deposits created often in a single-instance, and which offer some of the most direct insights into the ritual behaviors that produced them. Such deposits have been termed "sacrificial" by Walker (1995b: 99), insofar as they remove from circulation and/or use objects, animals, and people that are not exhausted or that still have use-lives.

Other types of deposits created by ritual activities and behaviors that were not sacrificial in nature have been recognized. Examples include the creation of structured deposits, often in repeated acts occurring over longer time spans intended to decommission or consecrate spaces, to venerate ancestors and/or deceased kin, or even to create small-scale reproductions of the ordered universe. For example, at villages in the Homol'ovi region ash was used in the creation of structured deposits that served to ritually decommission ceremonial structures (Adams and Fladd 2017). These structured deposits included materials taken from their systemic use contexts and deposited in the creation of intentionally layered and thoughtfully produced closure deposits that appear as archaeological room fill. Such deposits can be created over an extended period of time, and at Homol'ovi included ash as well as whole and intentionally broken objects, rare objects, articulated animal and human bone, projectile points, shell, and other materials (Adams and Fladd 2017). The example of structured deposits at Homol'ovi demonstrates that room fill can often reflect intentional and ritual acts of closure.

In the case of Chaco, many artifact-based studies have demonstrated the density of objects, especially of ritual significance, that were deposited and left at great houses in the canyon (see especially Neitzel 2003). These include animal burials (Hill 2000), turquoise (Mathien 2001, 2003), ceramic vessels (Crown and Wills 2003; Crown and Hurst 2009), wooden objects (Vivian et al 1978), ritual fauna (Bishop and Fladd 2018), ornaments (Mattson 2015, 2016), and shell (Mills and Ferguson 2008). Indeed, "the quantity of material that…can be called ritual or inalienable objects at Chaco Canyon sites far exceeds that from any other area of the Southwest" (Mills 2008:101). These significant types of objects were intentionally taken out of circulation and ritually retired in rooms, were involved in dedicatory deposits and in ritual closures, in the deconsecration of ritual spaces, the filling in of spaces, and in the memorialization of ancestors (Mills 2008). Interestingly, even the debris and unworked fragments from the ritual production of objects of turquoise, shell, and other materials, was placed in sealed deposits with the finished products, "considered to be as valuable or inalienable as the finished objects" (Mills 2008:99). Even the byproducts of ritual production were considered to be and treated as "part of the materiality of ritual practice" (Mills 2008:99).

A prime example of the repeated use of a space to place ritual objects in both primary and secondary contexts is Room 33 at Bonito, which contained both primary and secondary burials, as well as more than 30,000 objects, deposited over a span of 300-400 years (Plog and Heitman 2010). Given these examples, the rooms of Pueblo Bonito in particular were not simply filled with trash, but rather with precious objects, the discard of which was often intentional and significant.

An additional example of fill-like (non-sacrificial) deposits that still reflect ceremonial concerns and ritual behaviors are what Walker (1995a,b) calls *ceremonial trash*. Ceremonial trash results from the discard of ritual objects whose use-lives are exhausted, due to "wear and tear" over time (Walker 1995a: 75; 1995b: 98-99). Sometimes they are intentionally broken in order to mark the termination of their use, and they are often deposited in holy or ceremonial spaces, spaces adjacent to or around ceremonial spaces, or in more natural locations such as caves or bodies of water (Walker 1995a: 75). Examples in "mainstream" religions include exhausted bibles and hymnals, broken chalices, and torn Torah covers, this discard of which is prescribed and special. The discard of ceremonial trash can lead to the formation of distinct deposits containing these objects (Walker 1995b: 100).

Objects that end their lives being discarded as ceremonial trash are "singularities" (rather than "commodities", Kopytoff 1986), meaning they are restricted from exchange and have specific, controlled life histories (Walker 1995a: 72). Such objects with singularized pathways in life also have singularized deposition requirements, disposed of in ways that are "designed to maintain the singularities of life in death" (Walker 1995a: 72). In his review of 7 religious institutions (all Jewish, Christian, Muslim, or New Age), Walker (1995a: 73-75) found that sacra and religious objects were often burned or buried. It was not suitable to discard them with non-ceremonial trash because of their significance. Interestingly, this requirement also extended to objects that were ceremonially- or sacred-adjacent, objects that were not themselves sacred but were considered too special through their association with other objects and with religious services to be discarded of as normal trash. This calls to mind Mills' (2008:89) description of the caching of the byproducts of ritual production along with finished materials in Chaco Canyon, where these materials were sacred enough through their association with the finished product to receive special discard. Another prehispanic example comes from Homol'ovi, where the partial body of a red-tailed hawk, missing wings and legs, had been discarded above the roof debris of a formerly-used kiva (Walker 1995a: 77-78). This example in particular highlights a practice of relevance here; the major use of feathers by Pueblo groups presently, historically, and in the past would have necessitated the disposal of the byproducts of feather acquisition, including many components of the skeleton not selected for tool or bead manufacture, entire axial skeletons, or other unused parts that, based on their association with ritually-significant materials (feathers) may not have been suitable for regular disposal.

Adams and LaMotta (2006) use the term "enriched deposits" to encompass a variety of ceremonial or ceremonial-like deposits, that contain high frequencies of unbroken or exotic goods. Ceremonial trash (Walker 1995a,b) is just one type of "enriched deposit", containing the "residues" from the manufacture of ceremonial goods and exhausted ritual items. Other types of enriched deposits include sacrificial/offertory deposits, or even caches of complete every-day objects (such as ceramic vessels) that may be the "residues from ceremonial support activities" (e.g. feasts) (Adams and LaMotta 2006:59).

The above examples should demonstrate how the wide range of behavioral practices that include ceremonial and ritual objects makes relevant all sorts of deposits in the archaeological record, beyond just interments, sacrifices, and votive offerings. It stands to reason that objects that had ritual value and were sacred in their lives would be disposed of in thoughtful and prescribed ways. Thus, important to this dissertation is accepting that deposits of many kinds are relevant to studying ritual, and therefore avifaunal remains from all different contexts provide valuable insight. Nonetheless, it should be cautioned that even though an analysis of the involvement of birds in ritual tells us something about the nature of ritual in general, all that is visible in assessing the archaeological record is the ultimate location of deposition for objects that were undoubtedly used in many ways before ending up in their final resting places. Because birds were likely involved extensively and in many ways in ritual practice, not all of which would result in obvious or even visible reflections in the archaeological record, inherently part of the picture of ritual practice will always be missing. This problem is by no means limited to the study of avifaunal remains, and characterizes almost all artifacts. While our interpretations concerning, ritual involving birds may be limited to understanding final depositional practices, these are still highly informative for understanding the nature of Chacoan ritual.

The focus on any singular material class from many depositional contexts to inform studies of ritual requires demonstrating the likelihood that that material type was predominantly used in ritual pursuits, and being critical in excluding from analysis remains that clearly were not used in or related to ritual. Based on both regionally specific archaeological research and the ethnographic record, birds and their parts are likely to have been relegated to primary use in ritual activities above all others in Chaco Canyon. Focusing on a single material type opens up the analysis to include a greater variety of contexts, acknowledging that materials that held ritual significance in their use lives are informative objects of study regardless of how they were discarded. While dedicatory depositional contexts containing avifaunal remains will be examined with special interest, the entire avifaunal assemblage, containing remains from many types of contexts, can be used to address both the second and third research questions.

Ceremonial Organization

Here analytical frameworks are presented for interpreting evidence for the presence of horizontal and vertical organization in the use of birds in Chaco Canyon. Expectations for horizontal organization are inspired by documented ethnographic forms of social organization among the modern and historic Pueblos. Expectations for the presence of social inequality based in the control of ceremonial knowledge and resources are based on the work of Elizabeth Brandt (1994) and William Haviland (1975).

Horizontal Ceremonial Organization

As outlined in the introduction, there has been much debate concerning the social organization of Chaco. Scholars have argued whether the predominant organizational system was based on the presence and operation of two complementary moieties (in the Eastern Pueblo/Rio Grande style), or on the predominance of multiple clans and lineages (in the Western Pueblo/Hopi style) (sensu e.g. Eggan 1950; Dozier 1970). Arguments are so far more developed and more numerous for the presence of moieties, but both sides cite architectural layouts, the positioning of sites throughout the canyon, and the distribution of artifacts as evidence. An overview of the different arguments has recently been given by Plog (2018: 251-256), but I will summarize them in brief here.

Multiple scholars have found evidence of dualism as a predominant theme at Chaco sites. The possibility was first suggested by Fox (1967:31-32), who cited the presence of two prominent kivas at some Chaco sites, one perhaps for each different moiety. Multiple lines of evidence at different scales were referenced by Fritz (1978, 1987), including dual symmetry in the layouts of features within great kivas (specifically the isolated great kiva Casa Rinconada) and the overall layout of Pueblo Bonito and Chetro Ketl. He also hypothesized that an axis running from Casa Rinconada to the space between Bonito and Chetro Ketl divided the canyon, with approximately the same number of great houses on either side of the line. To Vivian (1970, 1990), the east and west wings constructed off the original northern core of Bonito served as evidence of two moieties, as well as the two burial clusters located in the northern core and the presence of 1-2 great kivas at several other great houses. Bishop and Fladd found patterns of duality in the distribution of ritual faunal remains throughout Pueblo Bonito (Bishop and Fladd 2018) and at other sites (Bishop et al forthcoming). Thus, arguments for duality as an organizing social principle have cited the distribution of artifactual remains, the layout of internal kiva features, the number of great kivas at great houses, the presence of burial clusters, symmetry in the layout of different great houses, and the spatial placement of sites across the canyon.

Whiteley (2015) sees evidence of both duality and plurality varying spatially at Chaco. Wijiji, which has only two kivas, appears binary, with other sites like Kin Ya'a, Kin Bineola, and Hungo Pavi being suggestive of the same. But in contrast to the many scholars who have seen duality at Pueblo Bonito in the form of the center dividing wall, burial clusters, and artifact distributions, Whiteley (2015) sees the number and distribution of kivas at Bonito as indicative of pluralism, with the same argument extending to Chetro Ketl. Importantly, Whiteley has argued that the organizational system was adaptive, with both duality and plurality being capable of co-existing at the same time. Additionally, communities may change their organizational strategies, shifting temporally between the two (Whiteley 2015). Ditto (2017) has also found evidence for pluralism in Chaco Canyon based on the contents and diversity of primary context assemblages at multiple sites.

Ware (2014) has argued that, by the 800s CE, organization in Chaco Canyon consisted of ranked corporate kinship-based organizations that controlled access to farmland and community ceremonies, and that these groups were ranked based on their order of arrival in Chaco Canyon. After 1040 CE, larger sodalities that cross-cut these corporate kinship groups emerged at multidescent-group communities. These sodalities would have eased tensions between multiple descent-groups in the same community, and Ware argues in Chaco, eventually detached themselves from kin group control. In other words, "Chaco Canyon shifted from closed, kin-based leadership to open-sodality-based leadership" (Ware 2014:122-13). This transition marks the "incipient crystallization of Eastern-Pueblo style, sodality-based organizations on the plateau" (Ware 2014:122-123). At some modern Eastern pueblos, the controlling sodality groups are dualistic, forming two opposing and complementary moieties, as in the Summer People and Winter People at Ohkay Owingeh (Ortiz 1969). Ware also suggests that evidence for dual sodalities is present in Chaco Canyon, but that this emerges at the tail end of Chaco's primary occupation, in the 12th century (Ware 2014:70).

The aim of the third research objective of this dissertation is not to identify the presence of moiety organization and/or plural-style organization in Chaco Canyon, nor is it to test the hypotheses or arguments of those scholars listed above. Rather, I seek to identify basic principles of ceremonial organization rather than social organization. Instead of searching for evidence of moiety-like or multiple clan/lineage-style organization, in research objective 3, I examine evidence for duality and plurality as structuring principles of ritual practice. In this sense, the inferential leap is narrower. Dual or plural patterns in the distribution of avifaunal remains are not inferred to represent the presence of moieties or clans/lineages as the predominant organizational structures; rather they represent prominent themes in how ritual was organized across a site, between sites, and across the canyon. Such patterns may, in turn, be suggestive of certain styles of social organization, but such interpretation is outside the scope of this dissertation. In theory, strong dual patterning, such as binary opposition of the use of different birds between different sites, or even different halves of a single site, may suggest that two prominent groups of people had different ritual responsibilities meant to serve the greater community, and conducted distinct sets of ritual practices, that included different materials, occurred in different spaces, had different intended outcomes, and resulted in differential reflections in the archaeological record. Thus, there may be evidence for ceremonial duality that reflects the control of two overarching opposed and complementary groups conducting ritual, which might imply moiety-like organization. Here, however, the interest is in identifying patterns in the distribution of remains that may indicate patterns in the organization of ritual practice and ritual groups.

As argued above, because birds feature so strongly in ceremonial life throughout the present and past Pueblo world, and because ceremonial objects and the byproducts of their construction occur in all sorts of deposits in the archaeological record, avifaunal remains from many different types of contexts are well-suited to address the third research objective. This is especially true because this research objective operates at a greater scale than the others. Primarily, patterning will be looked for at coarse intra-site levels (e.g. between two halves of a site, between different room types, between different sets of kivas), and between sites (e.g. between different great houses, between great houses and small houses categorically, between different clusters of sites). At these scales, all types of deposits should be relevant. For example, if a golden eagle is used for its feathers and its body discarded as ceremonial trash, it is unlikely that the body would be disposed of on the opposite side of a great house from where it was processed, let alone at another site, especially if access to golden eagles was restricted. This may be true because rules existed about how and where to discard such remains, but also for reasons of practicality.

Three types of patterns may be expected in addressing the third research objective: duality, plurality, and unstructured patterning, the latter representing a null hypothesis. Table 3.2 provides a schematic of some patterns in the distribution of avifaunal remains that might be expected if these principles were important structuring elements of ritual practice in Chaco Canyon. The key is that, for duality or plurality to be evident, there should be patterning concerning the types of birds used, the contexts of their deposition, and the types of spaces and the sites at which they occur. If there is binary patterning in any of these criteria, duality is indicated. But if there is a greater number of distinct, separate ritual practices evident, plurality is indicated.

Table 3.2. Expected patterns in avifaunal remains relative to principles of horizontal organization.

	Avifaunal Remains
Duality	Organizing principle of duality structures ritual practice, indicating the importance of ritual opposition and/or complementarity *Possible Evidence:* • Binary pattern in distribution of predominant bird types, either as two different bird types, or groups of bird types, across space • Binary opposition in the spatial distribution, treatment, and context of birds within or between sites • Relative consistency in the use of the mechanisms of ritualization between ritual dualities
Plurality	Great variety of distinct ritual practices involving different types of birds in different ways *Possible Evidence:* • Greater variability in predominant bird types used in ritual • Spatial clustering of different bird types in multiple discrete spaces • Different types of birds consistently associated with different types of contexts and associated materials • Less consistent use of the mechanisms of ritualization between ritual contexts
Unstructured	Limited or no prescriptions concerning how birds are used in ritual *Possible Evidence:* • Many different bird types used, no dominant types • No patterning in spatial distribution, context of deposition, or associated materials • No consistency in the use of the mechanisms of ritualization between different ritual contexts

Where the principle of duality structures or influences ritual, opposition and/or complementarity are important themes. Duality as an organizing principle could be expressed in several ways. In an analysis of bird remains, we might expect to find two different, opposing, spatially demarcated patterns of bird usage, indicated by the presence of different bird types, their spatial distribution, and/or the contexts in which they are found. This opposition could be evident through the use of two separate bird types (e.g. raptors versus parrots), or, more broadly, two different patterns in the use of birds in general.

Duality in patterns of bird use may be expressed spatially at multiple different levels: between two sections of the same great house (e.g. Bishop and Fladd 2018; Creel and McKusick 1994:519-521), between two adjacent great houses or two adjacent small houses, between great houses and small houses categorically, or between sites of different layout types (e.g. Potter and Perry 2000). Spatially-expressed opposition of dual ritual organization may indicate ritual complementary and interdependence between two oppositions (e.g. Potter and Perry 2000), and speak to the "ownership" of specific ritual practices and exclusive access to specific materials. Duality in the organization of ritual may also be evident in an analysis of the contexts in which avifaunal remains are found, and in the other materials with which they are associated. For example, different bird types may be found in opposed types of spaces (e.g. rectangular and round rooms, court kivas and great kivas), may be associated with different suites of other symbolically important objects (e.g. turquoise, shell), and may have received different treatment (e.g. deposited in fill, in prepared pits, on floors). We may also expect dualism to be evident in the enactment of ritual practice indicated by an analysis of the mechanisms of ritualization (Bell 2009b).

Where the principle of plurality organizes ritual, multiple, complementary ceremonial themes or practices are to be expected. Insofar as different ceremonies are performed for different reasons and outcomes, they may be expected to use different birds in unique ways. There should be greater variability in the bird types used and in the spatial clustering of different types in multiple, discrete locations, either within a single great house or between multiple adjacent great or small houses. Plurality may also be evident in the contexts in which avifaunal remains are found (kiva, rectangular room, plaza, etc.), the ways they were treated, and in associated materials. Patterns in spatial distribution, context of deposition, and associated materials should ideally differ between bird types, but be consistent within type (e.g. eagles treated one way, macaws another). Contrary to a system of duality, one of plurality indicates that there are multiple parts of the same ritual whole. Instead of two interdependent and complementary halves of a cooperative ritual whole comprised of two sites or halves of a site for instance, multiple cooperative parts should have separate responsibilities that together make up a larger, complete set. For example, variability in predominant types of birds and treatment between small houses may indicate that different small houses were responsible for different ceremonies. Because different ceremonies are conducted at different scales and for different reasons, are of differing importance, and are potentially conducted by different groups, there should be less consistency in the use of the mechanisms of ritualization between ritual contexts, relative to dually-organized ritual. The greater the variability in the performance specifics of the ritual, its intended outcome or purpose, and the participants involved, the greater the variability in the mechanisms used.

The organizing principles of dualism and pluralism are not mutually exclusive; it may be the case that both structured ritual simultaneously at any given time, or that the importance of one principle waxed or waned in response to that of the other. Though simultaneity may complicate patterns, dualism and plurality may still be distinguishable where they employed different sets of ritual materials and concepts.

Where ritual practice and ceremonial life was unstructured, a lack of patterning may indicate that there were limited prescriptions concerning the use of birds. Unfortunately, lack of patterning may also indicate problems with recovery bias. Where a lack of patterning may be indicative of human behavior rather than problems with the archaeological record, we should expect the use of multiple different bird types, with no variation in spatial distribution, context type, associated materials, and the mechanisms of ritualization that structured deposition.

Vertical Ceremonial Organization

In addition to horizontal ceremonial organization (duality and plurality), patterns in the distribution of avifaunal remains can also speak to the presence of social inequality based in ritual authority. Debates concerning the presence, nature, and basis of inequality in Chaco Canyon were briefly described in Chapter 1. Given the ceremonial importance of Chaco Canyon, many scholars have argued that the basis of any leadership and inequality in the canyon was in control over ritual knowledge and ritual practice (e.g. Heitman and Plog 2005; Kantner 1996, 2010; Kantner and Vaughn 2012; Nelson 1995; Plog and Heitman 2010; Saitta 1997, 1999; Van Dyke 1998, 1999; Vivian 1990).

Earlier assumptions by archaeologists and ethnographers working in the Pueblo region that the ethnographic and historic pueblos were egalitarian and non-hierarchical were based both on the writing of Eggan (1950) and on misinterpretations of Eggan's writings (Brandt 1994:10-14). However, it is demonstrably the case that Pueblo societies of the Southwest are hierarchically organized with rank distinctions among individuals, clans and lineages, and higher-order groups. The Pueblos have "inequalities created and maintained by a well-developed system of information control managed through societies, surveillance, and privacy" (Brandt 1994:13-14). These inequalities have been documented by nearly every ethnographer in both the eastern and western pueblos.

Table 3.3. Haviland's (1975) correlates and Brandt's ethnographically-derived descriptions.

Criteria #	Description[1]	Examples from Pueblo ethnography[2]
1	"hierarchically ranked groups with relatively permanent positions"	In Pueblo societies, clan groups, lineages, households, and religious societies are ranked by ideological justification (criteria #5) (Brandt 1994:14)
2	"differential sources of power relative to the group's ranking"	In Pueblo groups, there are multiple possible bases for rank, including for example the importance of ceremonial property that a group possesses, the size of the group, the amount of time that the group is responsible for leadership of the community (e.g. Ortiz 1969), the resources controlled by the group, and the relative importance of the knowledge or ceremony controlled by a group (Brandt 1994:15)
3	"differential access to resources"	Many types of resources may be controlled by the leaders of religious societies, including: ceremonial knowledge, ceremonial property, specialized knowledge concerning specific minerals, plants, and animals and how and where to obtain them (Brandt 1994:15-16)
4	"cultural and individual distinctions"	Leaders have both special privileges and restrictions on their lives, especially concerning their needs, fasting, purification, pilgrimages, knowledge, and limitation on their movements (Brandt 1994:17)
5	"an ideology providing a rationale for the system"	The ideology behind the justification of rank of different groups, and therefore individuals in these groups, is based in the order in which different groups emerged into this world, and the importance of the knowledge that an individual or group controls. The possession and display of symbols of authority and public performances that display a leader or group's power legitimize elite position (Brandt 1994:17).
6	"a relative degree of inequality of reward and privileges"	Leaders are responsible for the allocation of rewards and resources to others, such as land, housing, jobs, and material resources (Brandt 1994:18)

[1]Haviland 1975
[2]Brandt 1994

After twenty years of ethnographic work in the Pueblo region, Elizabeth Brandt (1977, 1980, 1994) felt that status differences and social inequalities were "indisputable" realities in Pueblo societies (Brandt 1994:13). Haviland (1975) put forth six criteria that are usually present in societies with social stratification; Brandt (1994:14-19) used these to provide ample documentation and explanation of the presence, nature, and basis of hierarchical organization among the Pueblos. Table 3.3 presents each of Haviland's (1975) criteria and Brandt's (1994) descriptions from Pueblo ethnography. I refer the reader to this table and to Brandt (1994) for a full description, but several main points are worth highlighting here. Overwhelmingly, hierarchical organization of individuals and groups in the ethnographic Pueblos is based on the possession and control of ceremonial property and knowledge, which is "protected through elaborate mechanisms of secrecy...[that] serve to preserve the value of this property" (Brandt 1994:15). Groups and individuals control access to specific resources, including animals, and specialized knowledge concerning these resources, and can allocate them to other groups.

In this dissertation, I examine evidence in support or in rejection of the notion that some individuals were ascribed authority based on their ceremonial knowledge, ability to conduct specific rituals, or otherwise carry responsibility for ceremonial life. Related to the correlates and descriptions of Table 3.3, Table 3.4 presents expectations for the Chaco avifaunal assemblage to evaluate evidence for the presence of social inequality based in ceremonial and ritual authority. Important considerations for assessing the presence of vertical organization include the types of birds involved in ritual (especially exotic or high-investment taxa), their spatial distribution, and the degree to which ritual involving birds may have taken place in areas with restricted access. In Chapter 6, the Chaco avifaunal assemblage is evaluated in light of a model where inequality in the canyon was based in ritual leadership. It need not be the case that all types of ritual are restricted. Even if ritual leaders are present, this does not mean that all ritual practices involving birds were necessarily restricted. Some types of ritual may be open, public, and visible, while others may be private. Such is the case in many of the modern pueblos, where some ceremonies are performed publicly, while others have restricted audiences (Levy 1992; Ortiz 1969; Whiteley 1988).

Table 3.4. Expected patterns in bird use relative to ceremonially-based hierarchy.

	Ceremonially-Based Hierarchy Present	**Ceremonially-Based Hierarchy Absent**
Explanation	Leadership or authority is based on possessing special, esoteric knowledge, being in charge of specific ceremonies or ritual responsibilities, or otherwise being respected for fluency and responsibility in ceremonial life. Consequently, some individuals or groups are considered to be ceremonial leaders.	Non-restricted, community-wide access to ritual involving birds. Concerning ceremonial and ritual life, mutual responsibility among equal participants or groups, with no clear individuals or groups being "in charge" in a way that restricts access.
Implications for Ritual Practice	Specific types of ritual involving birds were restricted in participation, who could witness them, and/or who could conduct them. Some (but not necessarily all) ritual is esoteric in nature.	Ritual is largely practiced collectively or even individually but there are no restrictions on where it occurs, what it involves, and who can participate
Locus of Ritual	Evidence that some ritual involving birds took place in spaces to which access could have been controlled.	Loci of bird-related ritual in communal spaces; no indication that some people or groups were excluded or that access was restricted
Taxa Involved	Use of exotic or expensive to procure birds; access to these birds or their use in ritual appears to have been dictated by social rules or controlled by prohibitions	Limited use of exotic birds, or these are not restricted in how and where they are used
Archaeological Examples	Macaws or other taxa restricted in their deposition or not widely distributed; ritual involving birds takes place in spaces that may have had restricted access rather than in large communal spaces; greater use of valuable birds at great houses over small houses	Similar bird taxa used between great and small houses with limited evidence that one had greater access than the other; ritual involving birds takes place in large, open spaces, such as plazas or great kivas.

In this chapter I have attempted to provide a theoretical foundation for the analysis that follows. So far, I have made the case that (1) the primary role of birds in Pueblo life was and is ceremonial; (2) that human-bird relationships in the past were characterized by agency on both sides that influenced perceptions of birds; (3) that a practice theory approach to ritual and the mechanisms of ritualization put forth by Bell (2009b) can be operationalized for application to the archaeological record, a process that informs our understanding of the nature and enactment of ritual practice; (4) that many types of contexts beyond votive or dedicatory offerings are relevant to developing an understanding of ritual; and (5) that the spatial distribution of the material remains of ritual practice can shed light on the principles or themes that may have organized ceremonial life. From these perspectives follows my efforts to address the three research objectives laid out in Chapter 1 in the forthcoming chapters.

Chapter 4: Outline of Collections Examined, History of Excavation, and Methods

The dataset presented in this dissertation is a composite representing many museum collections, historical and recent excavation projects, and archaeological sites. It is the byproduct of nearly 130 years of formal archaeological research and exploration in the canyon. Over the years, work has been conducted at different sites, different scales, led by many different individuals, and sponsored by multiple different organizations. Consequently, material collected and excavated from Chaco Canyon is widely disbursed across a variety of museums and repositories. Avifaunal remains from six different museums or institutions were brought together into a dataset representing nearly 12,000 fragments of bird bone.

In order to contextualize the avifaunal collections within the historical timeline of Chaco Canyon exploration, a brief history of the major research fieldwork projects conducted in Chaco is provided here (for a more detailed treatment see Plog 2015). The methods by which the collections were recorded and analyzed are discussed below.

History of Archaeological Exploration in Chaco Canyon

Formal, large-scale excavations began for the first time in Chaco Canyon in the 1890s. In the late 19th and early 20th centuries, museums sponsored extensive projects that collected large quantities of artifacts to bring back to their home institutions for curation and display. Great houses[6], as the largest sites with the richest material assemblages, were the first to be excavated. The earliest formal excavations in the canyon were carried out by the Hyde Exploring Expedition, sponsored by the American Museum of Natural History and led by George H. Pepper and Frederic W. Putnam (Plog 2015:5-6). From 1896 to 1901, the Hyde Expedition

[6] The distinction between great houses and small houses or small houses was defined by the Chaco Project based on the number of rooms at a site (Truell 1992:10). That definition is followed here. Small houses or small sites have between 3 and 35 rooms, and great house 100-700 rooms.

focused primarily on Pueblo Bonito, with minimal exploration at Peñasco Blanco (Pepper 1920; Vivian and Hilpert 2002:208).

The next large-scale formal excavations took place from 1920 to 1928, sponsored by the National Geographic Society (Plog 2015:6-7). Excavations were led by Neil Judd of the Smithsonian's National Museum of Natural History (NMNH), and focused primarily on uncovering the remainder of Pueblo Bonito (Judd 1954, 1964) as well as portions of Pueblo del Arroyo from 1923 to 1927 (Judd 1959), and the trash mounds of several other sites. Excavations by NGS and the Hyde Expedition together resulted in nearly complete excavation of Pueblo Bonito, which is subsequently the most thoroughly studied site in the canyon (Heitman 2011:145).

In the 1930s and 1940s, excavations were sponsored alternatively by the University of New Mexico, or by UNM and the School of American Research together (Plog 2015:7). Led by Edgar Hewett, work took place at the great house of Chetro Ketl and across the canyon at many of the small house sites clustered around the isolated great kiva Casa Rinconada. Unfortunately, no monograph was ever published for the research conducted at Chetro Ketl, and the paucity of artifacts from this site held by museums today suggests that a large portion of the material is now missing or was never retained for curation (Plog 2015:7-8). The UNM/SAR excavations were, however, the first systematic excavations conducted at any small house sites, which had before this time received little attention. Bc 50, 51, 52, 53, 54, 55, 56, 57, 58, and 59 were all excavated completely or nearly completely, though monographs were only published for two (Brand et al 1937; Kluckhohn and Reiter 1939).

From 1947 to 1969, any work conducted was done so largely in the course of stabilization, mitigation, and salvage projects by NPS, including at Casa Rinconada, Kin Kletso, Chetro Ketl, and Pueblo del Arroyo (e.g., Vivian and Mathews 1965; Vivian et al. 1978; National Park Service 2015). In the early 1970s, however, the largest scale archaeological project in the history of canyon research was initiated by the National Park Service. The Chaco Project conducted a complete survey of parklands, documenting and collecting artifacts from just shy of 1,800 sites (Plog 2015:9; National Park Service 2015). Further, 70 sites were systematically tested and excavated. The largest of these excavations were at Pueblo Alto, where approximately 10% of the great house and portions of its trash mound were excavated (Heitman 2011:151; Plog 2015:9). This project generated huge collections now housed at the Chaco Culture National Historical Park Museum Collection in Albuquerque, New Mexico. Since the end of the Chaco Project, limited excavations have been conducted in the canyon. In the early 2000s, the Chaco Stratigraphy Project, directed by W. H. Wills and Patricia L. Crown of the University of New Mexico, exposed previously excavated contexts at Pueblo Bonito in order to clarify stratigraphy and gather additional information (Crown 2016a; Wills et al 2015). In 2013, Crown re-opened Room 28 in Pueblo Bonito to examine in greater detail the stratigraphy of the room, and to recover material suitable for dating (Ainsworth et al 2018; Crown 2020).

Scope of the Research Project and Collections Examined

In the avifaunal dataset discussed herein, six collections from six different museums or repositories were brought into a single, unified dataset that recorded the same variables for all collections. This dataset subsumes material from almost all of the projects described above: the Hyde Expedition, NGS/Smithsonian excavations, UNM/SAR field schools, NPS salvage and Ruins Stabilization projects, and the Chaco Project. The underlying goal of the data collection portion of the project was to analyze as close to as possible *every bird bone* recovered from any site in the canyon dating to the primary occupation of Chaco from 800 to 1150 CE, and to synthesize these remains into as complete a dataset of Chaco bird bone as possible. This goal was largely achieved, with a few exceptions noted below. This research resulted in the analysis of nearly 12,000 fragments of bird bone, representing just over 11,000 Number of Identified Specimens (NISP) (Table 4.1). Below, the archaeological projects and sites that are represented in the avifaunal data collected from each museum or institution are briefly outlined.

Table 4.1. Breakdown of Number of Fragments and NISP bird bone from each collection examined; parentheses are the shorthand versions used in the text to refer to each collection.

Collection	**Portion of assemblage**	**# Specimens**	**NISP**
American Museum of Natural History (AMNH)	20.2%	2374	2326
National Museum of Natural History (NMNH)	11.1%	1306	1204
Maxwell Museum of Anthropology (Maxwell)	9.2%	1083	976
Museum of Indian Arts and Cultures (MIAC)	0.6%	74	56
Chaco Culture National Historical Park Museum Collection (CCNHPMC)[1]	58.6%	6878	6438
National Museum of the American Indian (NMAI)	0.1%	14	14
Totals		*11729*	*11014*

[1]CCNHP is the abbreviation for the full name of the national park (Chaco Culture National Historical Park) and is used here to reference the park. "CHCU" is the National Park Service abbreviation code for the park, and is also the prefix to all catalogue numbers in the museum collections.

American Museum of Natural History: Avifaunal material housed in the collections of the Division of Anthropology of the AMNH were excavated by the Hyde Exploring Expedition (Table 4.2). Sites represented in this subset of the avifaunal data include both Pueblo Bonito and Peñasco Blanco. At Pueblo Bonito, 190 rooms (ground floor and upper story) of the estimated 350 (ground floor) rooms were excavated by the Hyde Expedition (Heitman 2011:145). There is a limited understanding of the nature of the work conducted at Peñasco Blanco; evidently some rooms were excavated, likely in the 1890s, but it is unknown who directed or sponsored this work (Judd 1954:345). Later, Frank H. H. Roberts Jr. trenched and tested the trash mound at Blanco for his doctoral research (Lekson 1984:94-104; Roberts 1927).

National Museum of Natural History: Avifaunal remains collected by the NGS/Smithsonian Expedition are curated by the Department of Anthropology of NMNH (Table 4.2). Bird bone was recovered from Pueblo Bonito, Pueblo del Arroyo, and Turkey House. At Pueblo Bonito, more than 160 rooms were excavated by the NGS/Smithsonian project, while excavations at Pueblo del Arroyo exposed approximately half of the great house. Turkey House was completely or nearly completely excavated by Frank H. H Roberts in 1926.

Maxwell Museum of Anthropology: Avifaunal remains housed in the collections of the Maxwell Museum of Anthropology derive from the joint UNM/SAR field school excavations. It is important to note, however, that while most of the material excavated by UNM/SAR is still at the Maxwell Museum, some is housed at MIAC and in the CCNHP museum collection described below (Table 4.2).

Table 4.2. All sites represented in the avifaunal dataset, locations of avifaunal collections, and associated projects.

Name	Smithsonian Trinomial	Avifaunal Collections	Associated Projects
Bc 50, Tseh So	29SJ 394	CCNHPMC Maxwell	UNM/SAR field schools UNM/SAR field schools
Bc 51	29SJ 395	CCNHPMC Maxwell	UNM/SAR field schools, NPS Ruins Stabilization Unit UNM/SAR field schools
Bc 53	29SJ 396	CCNHPMC Maxwell	UNM/SAR field schools UNM/SAR field schools
Bc 55	29SJ 1921	Maxwell	UNM/SAR field schools
Bc 57	29SJ 397	Maxwell	UNM/SAR field schools
Bc 58	29SJ 398	Maxwell	UNM/SAR field schools
Bc 59	29SJ 399	CCNHPMC	UNM/SAR field schools
Casa Chiquita	29SJ 1167	CCNHPMC	NPS Ruins Stabilization Unit
Chetro Ketl	29SJ 1928	CCNHPMC	UNM/SAR field schools; NPS Ruins Stabilization Unit

		Maxwell MIAC	unknown UNM/SAR field schools
Eleventh Hour site	29SJ 633	CCNHPMC	Chaco Project
Gallo Cliff Dwelling	29SJ 540	CCNHPMC	NPS Ruins Stabilization Unit
Half House	29SJ 1657	CCNHPMC	UNM/SAR field schools
Kin Bineola	29SJ 1580	CCNHPMC	unknown
Kin Kletso	29SJ 393	CCNHPMC	NPS Ruins Stabilization Unit
Leyit Kin	29SJ 750	CCNHPMC MIAC	UNM/SAR field schools UNM/SAR field schools
Peñasco Blanco	29SJ 410	AMNH	Hyde Exploring Expedition
Pueblo Alto	29SJ 389	CCNHPMC	Chaco Project
Pueblo Bonito	29SJ 387	AMNH NMNH NMAI CCNHPMC	Hyde Exploring Expedition NGS/Smithsonian Hyde Exploring Expedition NPS
Pueblo del Arroyo	29SJ 1947	NMNH CCNHPMC	NGS/Smithsonian NPS Ruins Stabilization Unit
Pueblo Pintado	29SJ 10166	CCNHPMC	NPS Ruins Stabilization Unit
Pumphouse Site	29SJ 519	CCNHPMC	NPS excavation
Rabbit Ruin	29SJ 390	CCNHPMC	Chaco Project
Rich's Site	29SJ 299	CCNHPMC	Chaco Project
Shabik'eshchee	29SJ 1659	CCNHPMC	Chaco Project
Spadefoot Toad Site	29SJ 629	CCNHPMC	Chaco Project
Talus Unit No.1	29SJ 1930	CCNHPMC	NPS Ruins Stabilization Unit
Three-C Site	29SJ 625	CCNHPMC	unknown (probably Chaco Project)
Turkey House	29SJ 2385	NMNH	NGS/Smithsonian
Una Vida	29SJ 391	CCNHPMC	Chaco Project; NPS
Voll's Site	29SJ 827	CCNHPMC	NPS Ruins Stabilization Unit
Zorro Bradley's Site	29SJ 589	CCNHPMC	NPS salvage project
	29SJ 1360	CCNHPMC	Chaco Project
	29SJ 329	CCNHPMC	unknown
	29SJ 423	CCNHPMC	Chaco Project
	29SJ 626	CCNHPMC	Chaco Project
	29SJ 627	CCNHPMC	Chaco Project
	29SJ 628	CCNHPMC	Chaco Project
	29SJ 724	CCNHPMC	Chaco Project

Museum of Indian Arts and Cultures: A small portion of the material excavated by the UNM/SAR field schools ended up at the Laboratory of Anthropology of the Museum of Indian Arts and Cultures. Avifaunal material is represented from Leyit Kin and Chetro Ketl (Table 4.3).

Chaco Culture National Historical Park Museum Collection: Avifaunal remains in the CCNHP museum collection were recovered by a variety of projects from many sites (Table 4.2). The majority of these were collected by the Chaco Project. Others were collected during Ruins Stabilization and salvage projects organized by NPS, and by the UNM/SAR Field Schools.

National Museum of the American Indian: A limited number of specimens have ended up at NMAI, primarily through the movement of materials between museums. Though most of the material collected by the Hyde Exploring Expedition was originally deposited at AMNH, a portion of these collections followed Hyde to the University of Pennsylvania in 1908. Soon thereafter, Hyde gave the collections back to AMNH, but retained a portion that was eventually sold to the Heye Foundation/Museum of the American Indian, which later became NMAI (Stephen Plog, personal communication 2019; Smithsonian: National Museum of the American Indian n.d.). All but one of the avifaunal specimens at NMAI has this origin; the remaining specimen was acquired from a private collector.

Prior Research on Birds in Chaco Canyon

Because of the historical nature of these collections, the public institutions who funded their collection, and their availability for study, several other researchers have studied and published on subsets of the assemblage presented here. To date, however, no synthesis of all available remains has been produced, nor has a systematic analysis/reanalysis of these materials been conducted in order to create one, harmonious dataset.

The first researcher to study archaeological bird bone from Chaco Canyon appears to have been Alexander Wetmore. Wetmore was a colleague of Neil Judd, and an ornithologist, avian paleontologist, and eventual Secretary of the Smithsonian. Wetmore made taxonomic identifications of the avifaunal remains excavated in the 1920s by the NGS/Smithsonian excavations at Pueblo Bonito (Judd 1954:xi). His identifications of the remains were never published separately, to my knowledge, and the remnants of his work exist in the form of hand-written paper slips that accompany the material itself in the collections of the NMNH. Though no dates accompany his hand-written identifications, they must have been made sometime between 1920 and 1954 (the publication of Judd's Bonito volume).

Later, in the 1960s, Lyndon Hargrave made updates and corrections on Wetmore's identifications in his own study of existing avifaunal remains at the time. Lyndon Hargrave was undoubtedly the most prolific in his work with bird bone from archaeological sites, and despite his many publications and reports on other subjects, is considered the father of Archaeo-ornithology in the Southwest. Hargrave and Wetmore appear to have been friends and colleagues, and Wetmore reviewed Hargrave's manuscript for his eventual publication on Southwest macaws (Hargrave 1970).

Throughout his career, Hargrave studied avifaunal assemblages from archaeological sites throughout the Southwest, producing a lengthy bibliography of published articles and unpublished manuscripts and reports. In 1961, Hargrave wrote to Neil Judd of his concerted desire and effort to study every bird bone yet excavated from Chaco at the time, and specifically of his desire to acquire some level of associated provenience information in order to calculate MNI, which he believed was a more valuable measure than the number of specimens (Hargrave

1961a). For this purpose, he requested that material from NMNH be loaned to him at SWAC. It is unclear if this loan was granted or if Hargrave traveled to the museum to analyze the material.

In 1956 Hargrave had begun to work at the Southwest Archaeological Center in Globe, AZ (Taylor and Euler 1980:479). SWAC had previously been the repository for all archaeological collections from NPS work in the park, before 1970 when collections were transferred back to the NPS, and eventually settled in the Hibben Center building on the UNM campus (this is the CCNHP Museum Collection analyzed for this dissertation) (National Park Service 2015). During Hargrave's tenure at SWAC, he produced many reports of avifaunal remains from various Chaco sites (Hargrave 1959a, b; 1960a, b, c; 1961b, c; 1962a, b; 1963a, b).

One of the primary outcomes of Hargrave's work at SWAC, funded by NPS and the Department of the Interior, was his book on Southwest macaws (Hargrave 1970). It was during Hargrave's time at SWAC that Charmion McKusick served as laboratory assistant to Hargrave and was trained in the identification of bird bone (Hargrave 1970:xi). With regards to avifaunal remains from Chaco, McKusick appears to have eventually done a reanalysis of much of the material previously examined by Hargrave, as well as produced an unpublished report on bird bone from Bc 288 (Gallo Cliff Dwelling) (McKusick 1971), McKusick has also published on avifauna from other areas of the Southwest (e.g. Creel and McKusick 1994; McKusick 1982, 1986, 2001).

During the course of the Chaco Project, a huge collection of faunal remains was amassed. Nancy Akins and Bill Gillespie, both Chaco Project staff members, were responsible for the analysis of faunal remains excavated by the Chaco Project (Mathien 1985:xix). Their remarkable and long-term work with the Chaco Project fauna produced an impressive series of unpublished manuscripts (Akins 1981a-g, 1982a, b; Akins and Bertram 1985a, b; Gillespie 1977, 1979, 1981a, b). From the synthesis of these analyses Akins (1984) addressed the larger and broader question of temporal changes in faunal use across multiple different Chaco sites. Thereafter, she used the same analyses to present the most comprehensive treatment of the fauna recovered by the Chaco Project (Akins 1985). Similarly, a later chapter focused solely on the immense amount of faunal material recovered from the Pueblo Alto excavations (Akins 1987). For all of the Chaco Project fauna, identifications of avifaunal remains other than those of mature turkeys were outsourced (Akins 1985:308; Akins 1987:445). While a small number (from 29SJ 628) were sent to McKusick, the majority were sent to Steven Emslie, the second-most prolific individual (behind Hargrave) to engage in hands-on work with avifaunal remains from Chaco. Emslie was trained in avifaunal identification by Hargrave at Prescott College (Taylor and Euler 1980), and beginning in 1979 was contracted by the Chaco Project and the NPS to carry out the identification of avifaunal remains from sites excavated by the Chaco Project.

The efforts of these three individuals, Hargrave, Emslie, and McKusick, represent an impressive legacy of early investment in avifaunal remains from archaeological sites. As phenomenal as this work was, most of it centered around making taxonomic identifications and occasionally assessments of age and sex, the results being species lists and unpublished reports that presented factual information and offered little interpretation on contextual or other details of the remains (Akins 1985:305). While Emslie was contracted to provide identifications rather than write reports or articles, Hargrave's extensive work with avifauna from Chaco never produced a synthesis that he was certainly capable of. Nor did Hargrave systematically record other important zooarchaeological variables such as modification and heat treatment, a lack that I seek to rectify through this dissertation research. It was Akins' published syntheses, analyses, and discussions (1984, 1985, 1987) that provided the first attempt at understanding the roles that different fauna, including birds, played in Chaco Canyon.

The data and interpretations published by Akins (1984, 1985, 1987) have subsequently been used by other researchers to address research questions outside of and within Chaco. In her comparison of avifaunal assemblages from Chaco Canyon to those from sites in the outlying Guadalupe Ruin community, Durand (Durand 2003; Roler 1999) found that Chacoan great houses had more diverse assemblages of avifauna than did Chaco small house sites, and that both had more diverse assemblages than sites in the Guadalupe community. Greater diversity was interpreted as indicative of a greater variety and frequency of rituals taking place at great houses relative to small house sites (Durand 2003:160).

There have been several more recent efforts to identify avifaunal remains and in some cases address the importance of birds in Chaco at smaller scales (such as individual sites or contexts), or in the course of broader faunal analyses. Ainsworth and colleagues (Ainsworth et al 2018; Ainsworth et al 2020) identified and analyzed bird bone recovered from the NEH-funded re-excavation of Room 28 at Pueblo Bonito by Patricia Crown. They argue that the Room 28 avifaunal assemblage had greater species richness and an abundance of wing elements compared to other Chacoan assemblages. Badenhorst et al (2016) analyzed the faunal remains recovered by the Chaco Stratigraphy Project. From the re-excavation of Neil Judd's backfilled trenches in the Pueblo Bonito trash mounds, they found an abundance of raptor remains but limited quantities of turkey. In the course of his doctoral research on the fauna of small house sites Bc 57 and Bc 58, Watson (2012) analyzed the avifaunal portion of the assemblage, finding a high frequency of wild bird species (Watson 2012:186), and that turkeys were likely raised at or near Bc 57

(Watson 2012:146). Recently, the macaw remains from Pueblo Bonito have been radiocarbon dated (Watson et al 2015) and analyzed for aDNA (George et al 2018).

Recent research by my colleagues and I has focused on re-coupling analyses of museum collections with archival information available from the Chaco Research Archive. One study included the analyses of avifaunal remains from Pueblo Bonito (Bishop and Fladd 2018), and another on the distribution of turkey, golden eagle, and macaws across 5 different Chaco sites (Bishop et al forthcoming). A third study focused on the role of different biological and behavioral characteristics of the species present in the Chaco avifaunal assemblage in influencing human-bird interactions (Bishop forthcoming)

Each of the studies and projects described above has provided invaluable insight into the ways that birds were a part of life in Chaco Canyon. These projects fall into several categories: those that conducted hands-on and original analysis of avifaunal remains from Chaco that had never been analyzed (work by Akins, Ainsworth et al, Badenhorst et al, Emslie, Gillespie, Hargrave, McKusick, and Watson), those that conducted hands-on and original re-analysis of material that had also been looked at previously by other researchers (Bishop et al, Hargrave), and those that have synthesized the primary data published by Akins (1985) (Durand/Roler).

The research conducted for this dissertation differs in several important aspects from all prior research on birds in Chaco Canyon. First, previous research has only ever relied on a sample of the total avifaunal assemblage, focusing on a sample of sites, a single site, or a single context within a site. In the analyses conducted for this dissertation, I sought to look at every avifaunal bone that could be found (with several minor exceptions noted below) to produce the largest and most complete dataset of bird bone from Chaco Canyon. Second, despite the availability of some primary data (e.g. Akins 1985, 1987) that could have been used to speed things along, the research conducted here did not rely on data generated by any other researchers, and generated only new, original data. In fact, available data was ignored during the course of my own data collection, in order to produce a new (re-)analysis of all material, uninfluenced by prior analyses.

In other words, the (largely achieved) goal of the data collection phase of this dissertation project was to conduct an original analysis of all avifaunal material from Chaco Canyon that could be located, producing a new and independent dataset with results from a single analyst, recording as many observational and quantitative variables as possible in a complete zooarchaeological treatment of the remains. These efforts united material from six different museum collections or repositories, and from four major long-term archaeological projects as well as NPS-organized excavation, stabilization, and salvage, into the same dataset.

Methods

Data collection was carried out primarily from August 2017 to December 2018. Most collections or museums were visited twice, if not three times, usually involving a reconnaissance trip and one or several return trips to complete data collection. Carrying out this data collection would not have been possible without the accommodations of so many museum staff who ensured that I had adequate time and space, and who helped me ensure that I had hunted down every bird bone. Most of the travel for this research was supported by grants from the National Science Foundation, the Fred Plog Memorial Fellowship, the PaleoWest Foundation, and the University of California, Los Angeles' Department of Anthropology, Cotsen Institute of Archaeology, and Graduate Division.

All but one of the collections listed in Table 4.1 were examined in person, the only exception being NMAI, where a report generated by collections staff was used to include the small number (14 specimens) of avifaunal remains. Otherwise all collections were examined on-site at each museum, with the exception of avifaunal material from the CCNHP museum collection, which was provided on loan and analyzed at the Cotsen Institute of Archaeology at UCLA.

In addition to the collections listed in Table 4.1, there was the possibility that several other facilities held Chaco avifaunal remains. All known possibilities were contacted to determine whether or not they had relevant collections. Once on site at each collection, every tool available was used to ensure that as close to all specimens as possible were found, including but not limited to repeated, varied, and exhaustive searches in museum catalogues, and in some cases, physically examining every cabinet and drawer known to contain any type of artifacts from Chaco.

Despite these efforts, several small collections are known to be missing from this dataset due to reasons of practicality or availability. Not incorporated into the analysis presented here are the following: six bones that were listed in museum catalogues but could not be found in collections; approximately 90 specimens that Hargrave analyzed but which were not located in my own data collection; remains recovered from the re-excavation of the Bonito trash mounds (376 NISP; Badenhorst et al 2016:196); and material recovered from the re-excavation of Room 28 at Bonito (115 NISP; Ainsworth et al 2020; Crown 2020). Additionally, five individual (MNI) macaws and three thick-billed parrots are known to have been recovered from Chaco but have subsequently been lost or could not be found (consequently their NISP is unknown). Together these missing or unincorporated remains comprise 5% of the overall assemblage NISP (excluding the macaws, whose NISP is unknown). At least 37% of these missing remains could not be identified beyond class Aves (Badenhorst et al 2016) and thus have minimal effect on most of the patterns discussed here.

The rest of this section briefly describes the methods that were used in analysis. For every bone, 41 categories of information were recorded (Table 4.3). First, every specimen recorded (or group of specimens in the case of some elements, such as rib fragments recorded in the aggregate) received a specimen number in a series than runs through all 6 collections. Next, information provided by or relative to each museum was recorded: the name of the *collection*, *accession number*, *catalogue number*, *storage location* of the material (unless redacted), the specimen's *provenience* provided by the museum, the specimen's *description* provided by the museum, *index term* for the specimen provided by the museum (often a shorter version of the *museum description*, e.g. "bone tool"), and the archaeological *project* that produced the material. Then, standardized provenience information was assigned using information from museum catalogues and many other sources (described below), determining *site*, an intra-site provenience (called *Provenience1*) if available (e.g. room), and an even more specific locus when possible (called *Provenience2*; e.g. level and layer, feature). After this basic and essential information was recorded or deduced, 29 direct and derived observations were recorded. Twenty-six direct observations, or variables, were recorded for each bone. Of these, 10 were biological observations: *taxon*, *element*, *side*, *condition*, *portion*, *proximal fusion/formation*, *distal fusion/formation*, *age*, *sex*, *pathology*; 3 were observations on natural modification: *origin of fragmentation*, *natural modification*, *gnawing*; and 6 were observations on human modification: *heat treatment*, *disarticulation*, *butchery*, *scraping*, *working*, *worked form*; and 7 were quantitative values recorded or measurements taken: *number of fragments*, *NISP*, *weight*, *length*, *width at midpoint*, *maximum proximal breadth*, and *maximum distal breadth*. Lastly, three derived observations were recorded: degree of likelihood that remains were *articulated*, degree of likelihood that they were *associated* (not but not directly articulated), and, where cases of articulation were clear, an *Individual ID* was assigned.

Table 4.3. Categories of information and variables recorded in analysis.

Type of Information		**Variable Name**	**Description**
Primary Identifier		Specimen Number	unique numerical identifier
Information provided by or about museum collection		Collection	
		Accession #	
		Catalogue #	
		Storage Location	
		Museum Provenience	
		Museum Description	
		Index Term	
		Project	
Provenience Information assigned by Bishop		Site	
		Provenience1	
		Provenience2	
Direct Obser-vations	Biological	Taxon	see description in text
		Element	
		Side	
		Condition	complete, nearly complete, or fragmentary
		Portion	portion of bone present (proximal, distal, etc.)
		Proximal fusion/formation	see description in text
		Distal fusion/formation	see description in text
		Age	see description in text
		Sex	see description in text
		Pathology	
	Natural Modification	Origin Fragmentation	recent, ante-/peri-depositional, or intentional breaks
		Natural modification	weathering, root-etching
		Gnawing	rodent, carnivore, or indeterminate gnawing
	Human Modification	Heat Treatment	carbonization, calcination, and low-temperature heat
		Disarticulation	evidence such as crushing of epiphyses and bone peeling
		Butchery	chop marks, cut marks

		Scraping	scraping indicative of skinning, cleaning, smoothing bone
		Working	scoring, snapping, polishing
		Worked Form	awl, tube bead, bead blank, waste products, needle, whistle
	Quantitative Information	#frags	see description in text
		NISP	see description in text
		Weight	see description in text
		Length	see description in text
		Width	see description in text
		Max Proximal Breadth	see description in text
		Max Distal Breadth	see description in text
Derived Observations		Articulation	see description in text
		Association	see description in text
		Individual ID	see description in text

Many of the above categories of information or variables are self-explanatory, and all of the direct observations are standard and essential zooarchaeological variables. Several, however, can vary in their use by analyst, and require further explanation.

Taxonomic Identifications

As described above, many researchers have studied portions of the Chaco avifaunal assemblage before. Thus, each had made taxonomic identifications on some of the material. Often, each researcher had left hand-written notes with their identifications, and/or the museum had noted who had made the identification on paper accompanying the material. Where the identifiers' name accompanied the material, I recorded who made taxonomic identifications on each specimen before me. With each of the 11,729 specimens I examined however, whether or not a previous identification existed, all specimens were either identified anew or reassessed. Specimens with previous identifications were checked visually and against a comparative collection when necessary to either confirm or reject the existing identification, and specimens that had previously not been identified were identified anew using comparative material. Thus, 100% of the avifaunal material was identified or re-examined, again with the goal of creating a dataset with all material analyzed by the same analyst.

A large portion of the avifaunal assemblage (86%) had been taxonomically identified by various scholars before this project (Table 4.4). Nearly half had been previously identified by Wetmore, Hargrave, or McKusick, Hargrave having re-examined the material Wetmore examined as well as new material, and McKusick having re-examined some of the material Hargrave had examined. For the Chaco Project, Akins and Emslie had previously identified 20% of the material in my dataset. Eight percent had been previously identified by Watson in the course of his dissertation (Watson 2012), and 3% by Watson and Megan Conger during a postdoctoral project at AMNH led by Watson to analyze worked bone from Bonito. My analysis added taxonomic identifications to nearly 1600 previously un-analyzed and un-identified specimens, comprising 14% of the overall assemblage.

Table 4.4. Number of fragments identified taxonomically by each analyst.

Analyst	# fragments	% overall assemblage
Bishop	1584	14%
Wetmore, Hargrave, McKusick	5558	47%
Akins	1117	10%
Emslie	1128	10%
Conger/Watson	304	3%
Watson	981	8%
unknown	1057	9%
	11729	100%

In making taxonomic identifications, a variety of comparative collections were used: collections of the Cotsen Institute of Archaeology Zooarchaeology Laboratory at UCLA; the

Donald R. Dickey Bird and Mammal Collection at UCLA; the Department of Ornithology at the AMNH; the Division of Birds at UNM's Museum of Southwestern Biology; and collections of the Smithsonian's Program in Human Ecology and Archaeobiology.

Specimens were identified to the most specific taxonomic level possible. As previously discussed in Chapter 3, identifications of avifaunal remains must be necessarily conservative given the high species richness of many different genera and families of birds and the class Aves overall, as well as often poorly-pronounced morphological variability between many species within the same genus. Therefore, taxonomic identifications were, and should be, carried out in a deductive fashion, by isolating the most likely genus, for example, and ruling out the various geographically-relevant species until a positive identification can be made. When two species are possible and one cannot be ruled out, for example, the specimen must be assigned to the level of genus instead. As is the case with any zooarchaeological analysis, the reliability of taxonomic identifications is related to the robustness of available comparative collections. Where specimens appeared, or were likely to be a given taxon, but not all relevant species could be ruled out due to lack of available comparative specimens, the term "c.f." (compares favorably) was affixed to the taxonomic designation (e.g. "c.f. *Callipepla squamata*"). Specimens not identifiable to order, family, genus, or species, were sorted by size class (Aves large, Aves medium, Aves small, Aves very small).

Without access to a modern skeletal collection of macaws, Hargrave's (1970) published identifications were relied upon. Additionally, Trail (2017) was used to assist in distinguishing between golden and bald eagle, as well as comparative specimens of both species. Furthermore, because many species of certain genera in the family Accipitridae are morphologically very similar to one another, a system was developed to deal with the identification to species of hawks and falcons. A morphometric study was conducted for the genera Accipiter, Buteo, and Falco. While these genera are relatively morphologically distinct *from one another,* the species within each are characterized by low morphological variability. Using the Donald R. Dickey Bird and Mammal Collection, the major bones of multiple individuals of each geographically-relevant species were visually compared and measured to construct metric range profiles for each species. Four measurements were taken on each major bone, length, width at mid-shaft, proximal breadth, and distal breadth. Since multiple individuals of each species were measured, the ranges of each measurement were graphically mapped to produce metric range profiles for each species, which were then used to assist in the identification of archaeological specimens. Therefore, in identifying archaeological hawk bones, once the specimen was visually determined to be *Accipiter, Buteo,* or *Falco*, the same four measurements were taken on the archaeological specimen, which were then compared to the range profiles for each species within that genera.

Methods for Determining Age, Sex, and Pathology:

Age: Ageing the remains of wild bird species is a complicated process because the sequence of bone development and ossification, indicative of age, are not well understood across a large range of species (Serjeantson 2009:36). Sequences of bone development in domesticated birds, such as turkey and chicken, have been better studied, but limited literature has defined the expected sequence in many wild species (see, however and for example, Maxwell 2008a). Contributing to confusion in ageing avian skeletal remains is the fact that the process of development and ossification of bird bones is slightly different than that which characterizes mammals, and has ramifications for what we find in the archaeological record. A brief overview of how avian bone ossification occurs is given here.

In mammals, most bones in the body (especially long bones) have multiple ossification centers. Before birth, a cartilaginous model or blueprint of each bone is developed, and within this model a primary ossification center in the center of the diaphysis (the shaft) begins to replace cartilage with bone (known as ossification). Once the diaphysis is nearly ossified, secondary ossification centers arise in the proximal and distal ends of the cartilaginous blueprint. These secondary centers ossify the proximal and distal epiphyses separately from the diaphysis, until eventually the epiphyses and the diaphysis are fully united after all cartilage between them has been ossified. Thus, a long bone from a juvenile mammal appears in the archaeological record as an unfused diaphysis and two unfused epiphyses, because the cartilage connecting them (that would have later been ossified had the animal lived) will have decayed.

The same model of endochondral ossification is not entirely replicated in birds. Most avian elements have only one primary ossification center for each long bone. In elements with only one ossification center, cartilaginous growth plates exist at each end of the diaphysis, as they do in mammalian bones with multiple ossification centers. But instead of secondary ossification centers creating epiphyses, the "ends" of the long bone are formed as the bone grows outwards, from the primary ossification center. To complicate matters further, several avian long bones *do* have secondary ossification centers. Most typically, the formation of the proximal and distal tibiotarsus and tarsometatarsus occurs through secondary ossification, meaning that they *do* have epiphyses in the true sense of the word, which are formed separately and unite with the diaphysis. This has been demonstrated for the chicken, turkey, and at least several species of duck (Church and Johnson 1964; Maxwell 2008a,b; Wise and Jennings 1973). Still other, irregularly shaped elements, such as the pelvis/synsacrum, have multiple ossification centers.

Technically, therefore, not all avian bones "fuse." Those that do undergo fusion include the tibiotarsus and tarsometatarsus (which fuse proximally and distally), the carpometacarpus (fusion of metacarpal II and III), the notarium in some birds (a series of fused thoracic vertebrae), and the pelvis and synsacrum (with the ilium, ischium, and pubis fusing together before fusing to the synsacrum (Serjeantson 2009:38-39)). In bones with only one ossification center, however, no actual fusion between multiple parts (for example diaphysis and epiphyses) occurs. Instead, these bones can be said simply to form. Thus, in describing the state of "fusion" for each specimen examined, the term fusion/formation was used instead, to encompass both styles of avian bone ossification. What the differential nature of ossification in avian elements means for the archaeologist is that, when juvenile avian remains are recovered from the archaeological record, depending on the element and species in question, some may occur as unfused diaphysis and epiphyses, while others will simply appear as not fully formed bones (that resemble unfused diaphyses).

My own confidence in the utility of ageing wild birds to specific age categories is low, and the application of the categories used to understand how humans interacted with wild birds. In assessing the age of a bird based on the maturation of skeletal elements, several categories of data need to be separated. To assess *skeletal maturity* based on the appearance of a bone using the primary indicators for birds—fusion/formation, size, and porosity—is a relatively straightforward task carried out in the course of visual analysis. First an assessment of the degree of formation or fusion must be made regarding, with long bones, the proximal and distal epiphyses. Are the epiphyses unformed/unfused, fully formed/fused, or somewhere between the two stages? Second, inferring from the degree of fusion/formation, can an age stage be assigned (for example, very young, immature, subadult, adult, or old). These categories of data can be assigned with relative ease if the analyst has predetermined the categories to be identified. However, greater problems arise when the age stages that are assigned (e.g. immature, subadult, adult) are translated uncritically to represent stages in a bird's life, such as fledging and leaving the nest, reaching reproductive age, etc.). Of course, it is this latter type of information that has the most relevance in archaeological interpretation, yet, especially in the case of wild birds, the relatedness between these stages and skeletal maturation are not always well understood.

In general, the avian skeleton becomes mature early in a bird's life, contrary to the case in mammals, typically before breeding plumage and sexual maturity are reached (Serjeantson 2009:35). However, as Serjeantson (2009:36) has pointed out, "not much is known about the sequence and timing of skeletal development in wild birds," and little literature weighs in on the relationship between skeletal maturation and life stages of the living bird (but see: deFrance 2005; von den Driesch et al 2005). The general pattern is probably one of skeletal maturation around the time that a species fledges, but this varies (Serjeantson 2009:36). For example, altricial birds, whose young spend a long time in the nest, tend to reach skeletal maturity before leaving the nest, while the bones of precocial birds, whose young leave the nest earlier, are generally not fully skeletally mature when they depart (Sereajntson 2009:38). To fully understand the relationship between visually-observed stages of skeletal maturity and life stages, the relationship between the two would have to be better known, with many targeted studies carried out on specimens of known, exact age.

Given these complications, a reasonably conservative approach was employed and every effort was made to assign stages of fusion/formation and age stages as objectively as possible. First, fusion/formation was observed, taking into account fusion and bone porosity, and elements were determined to be unfused/unformed, fully formed/fused, or between the two. Then, using these assessments along with bone size and observable characteristics (such as those related to agedness), a probable age stage was assigned. Age stages were chosen in advance as a slight elaboration on the series suggested by Serjeantson (2009:Table 3.6), and consisted of: Very Young (completely unformed, very small); Immature (unformed epiphyses but closer in size to the diaphysis of a fully fused bone); Subadult (just younger than adult, fused but maybe semi-porous, some growth marks may remain); Adult (fully fused, not porous, robust, no growth marks remain); Old (obvious evidence of osteophytic lipping related to agedness).

For the reasons described above, I did not attempt to link these stages of skeletal maturation to actual age in years or to stages of a bird's life. In developing and assigning age stages, terms such as "neonate," "nestling," "fledgling," etc. were intentionally avoided. Instead, the stages were meant to be generally applicable to all species. In reality, the actual ages in years of each of the stages varies by species. Hopefully, the classes devised will have both broad and specific significance in analysis. For example, it is significant to find juvenile or immature avian skeletal remains of wild taxa in the archaeological record, since this can indicate that they were taken from the nest. The same is true for old individuals, especially coupled with positive observations of pathology, which can indicate care given to live birds.

Sex: In birds, the most obvious distinction between the sexes—where it exists—is plumage, and across the class Aves there are few secondary sexual characteristics evident in the skeleton (Serjeantson 2009:35). Possible indicators of sex vary in reliability between different bird species, but include size, skeletal characteristics, and the presence of medullary bone. Both size dimorphism and medullary bone as indicators of sex are more amenable to studies dealing with *domesticated birds*, but are not particularly robust measures for wild birds, given the limited degree to which these characteristics have been studied in wild birds.

Medullary bone deposits are calcium-rich deposits that form in the medullary cavity of the long bones of female birds before and during egg-laying (Serjeantson 2009:36). Medullary bone has been found to develop in wild turkey, sage grouse, passenger pigeon, short-eared owl, and Canada goose (Serjeantson 2009:51; Driver 1982; Munzel 1987; Gotfredsen 2002; Lentacker and Van Neer 1996; Van Neer et al 2002), but has also been found to be absent in some species (Serjeantson 2009:51). Its absence in an archaeological assemblage does not necessarily indicate the absence of females, but rather the absence of females that died in lay, of species that are known to produce medullary bone at all. Additionally, medullary bone can only be seen by the naked eye in cross section, so in an assemblage where a high proportion of specimens were complete or nearly complete, recording of medullary bone would be uneven.

Size dimorphism related to sex in wild birds varies greatly: some species are highly sexually dimorphic, some are minimally so, and others not at all (Serjeantson 2009:53). Even among those species which are size dimorphic, there is often overlap between males and females. To use size to assign sex reliably in wild birds, given the range of species present in this assemblage, an extensive metric study of known-sex specimens from modern comparative collections would have to be conducted across many species. Given the limited contribution that knowing sex ratios for wild birds in the assemblage would make beyond considerations of plumage (and even so, many species represented are not sexually dichromatic), such an undertaking was foregone.

There are, however, relatively reliable characteristics for determining the sex of turkey skeletal remains. First, the most notable exception to the general lack of secondary sexual skeletal characteristics in birds is the presence of the well-known bony spur found on the tarsometatarsus of many birds in the order Galliformes, including turkeys. Generally, the tarsometatarsal spur is an indicator of maleness. It should be noted, however, that spurs have been documented on some female galliforms, including turkeys (Gilbert et al 1981:8). Nonetheless, it is overall still a reliable measure for sexing turkeys given the small percentage of females that exhibit spurs (Serjeantson 2009:48).

Additionally, osteometric analyses and DNA studies have found that using metrics to distinguish sex in wild and domestic turkeys is a reliable tool. Male turkeys, both domestic and wild, tend to be larger than female turkeys, a pattern that is reflected in skeletal remains. Two osteometric methods were used to determine sex in the turkeys represented in the Chaco avifaunal dataset. First, ranges of sample means of the measurement *greatest length* for humeri, tibiotarsi, and tarsometatarsi were published by McKucisk (1986) and have been widely used by other zooarchaeologists (e.g. Fothergill 2012; Munro 1994; Watson 2012). Second, patterns in osteometric data of the distal breadth of the tibiotarsus published by Badenhorst et al (2012) were used to expand the number of turkeys that could be sexed, and to provide corroboration for the results provided by using McKusick (1986). These are discussed in further detail below.

Pathology: Avian pathologies are not well-studied outside of domestic birds. Malformations of the skeleton can either be congenital or acquired during a bird's life. Many diseases and other traumas may affect living birds, but not all produce evidence on the skeleton. Several types of bone infection (osteomyelitis) can result in the production of periosteal new bone around the shafts of infected long bones, including tuberculosis and non-tuberculosis forms of osteomyelitis, though it is not likely that the two can be differentiated using skeletal remains (Waldron 2009:59). Osteopetrosis is a virus that in birds results in the production of layers of periosteal new bone that spreads into the marrow cavity. Long bones become denser and enlarged (Waldron 2009:60). A crooked sternal keel can result from nutritional deficiencies

(Waldron 2009:56; Warren 1937; Poulos et al 1978), though in an immature bird whose sternum is more porous and less rigid, the keel can become distorted in the ground after deposition (Serjeantson 2009:39-40; Waldron 2009:56).

Remodeled fractures and breaks result in the displacement of bone, angulation of the distal portion, and the production of callus bone to mend the break; these are usually readily visible. Fractures can be survived by wild birds depending on whether the bird can continue to fly, feed, and protect itself. Fractures of the coracoid, for example, are especially hard to survive, as the bird cannot fly during healing and may never be able to fly again (Waldron 2009:56). In domestic birds, females in lay are prone to osteoporosis, which increases their susceptibility to bone fractures (Waldron 2009:57). Healed fractures are more common in domestic flocks than wild birds, since food and care are provided. But in wild birds, seriously injured or diseased birds do not often survive (Serjeantson 2009:36). Thus, pathological trauma, especially healed breaks, are usually taken as a good indication that a wild species was kept in captivity and cared for.

While it is easy to recognize that a bone is abnormal, it is more challenging to pinpoint the cause of the abnormality. Healed fractures are the most readily identifiable, but even where these are slight they may not be wholly visible to the naked eye. Following the recommendations of Waldron (2009:60) best practice is simply to describe and photograph the pathology, and look for signs that are unique to a specific type of trauma. Therefore, in recording pathologies on the Chaco avifaunal assemblage, abnormalities were first described in detail and then photographed, and informed interpretations were made as to the possible cause and nature of the trauma.

Quantitative Analytical Measures and Measurements

Three quantification measures were relied upon in analysis: Number of Fragments, Number of Identified Specimens (NISP), and Minimum Number of Individuals (MNI). The number of fragments is straightforward, this is a simple count of all fragments counted, weighed, and recorded. NISP is the fundamental, basic measure relied upon here however, and took into consideration direct, observable refit of fragments (crossmending). Where, for example, a single specimen was recovered as two broken but still adjacent fragments that demonstrably fit (crossmend) together, the Number of Fragments was 2 while the NISP was 1. Different analysts do this differently; some do not count crossmendable fragments as one specimen and instead count them separately (for a NISP of 2) (see Chaplin 1971:65), while others count crossmendable fragments together (for a NISP of 1) (see Clason 1972). The latter approach, and that used here, appears to be the more generally useful (Reitz and Wing 2008:167-168).

Recording both number of fragments and NISP is simply the carrying out of a desirable goal to record as much information as possible. As long as it is done consistently, this approach helps to avoid counting specimens from the same element more than once, which would over-inflate NISP. It should be noted that simple crossmending of specimens in the course of analysis (a primary, observable quantification measure) is not the same as engaging any of the complicated methods for assemblage-wide refit to reconstruct the derived measure known as MNE, or Minimum Number of Elements. MNE is a derived measure that is calculated after analysis and represents the number of theoretical complete elements that would account for all fragments (Lyman 1994:290). Many different methods exist to systematically record bone portions in order to calculate MNE (e.g. Klein and Cruz-Uribe 1984; Watson 1979; Marean et al 2001). MNE was *not* calculated in this analysis. Additionally, a personal review of Southwest zooarchaeological literature revealed that remarkably few analysts calculate MNE (though see Watson 2012).

One of the benefits of MNE is to help mitigate the effects of density-mediated destruction by refitting fragments together. It can therefore be highly useful when working with assemblages affected by high degrees of fragmentation, whether caused by post-depositional taphonomic processes or human behavior. Neither of these seems likely to have heavily affected the Chaco avifaunal assemblage for several reasons. In places where preservation-inspired differences in specimen survival are mitigated by reasonably good preservation conditions, fragmentation due to density-mediated post-depositional destruction is relatively less severe. In his dissertation, Watson (2012:286-288) calculated NISP:MNE ratios for artiodactyl remains from four Chaco sites and found that fragmentation intensity was low for all sites examined. Additionally, by comparison to large mammals who were obvious food sources and whose remains might be expected to be more heavily fragmented due to human processing, the remains of an animal involved so heavily in ritual—such as birds—are expected to be even less heavily fragmented. This expectation is born out by the fact that more than 40% of the entire avifaunal assemblage is composed of complete or nearly complete specimens. Thus, MNE is of relatively limited utility here and was not calculated.

Number of Identified Specimens (NISP) is by far the most commonly used quantitative measure in zooarchaeology, it is reliably duplicated between analysts, and is consequently fundamental to comparing assemblages analyzed by different analysts (Reitz and Wing 2008:203). Like other measures, however, NISP is subject to its own set of complications. If NISP is used as a measure of relative taxonomic abundance, it assumes that fragmentation across an assemblage is uniform and that all taxa were equally likely to be collected (Reitz and Wing

2008:203). Smaller taxa and those with fewer bones are more likely to be underrepresented than larger taxa and those with a greater number of elements (Reitz and Wing 2008:203; Lyman 2008:30). NISP is also affected by cultural practices (Reitz and Wing 2008:203-204). For example, smaller animals are more likely to be returned from the kill site whole, while larger animals are likely to be butchered and only portions returned, resulting in an overrepresentation in NISP of smaller animals compared to larger. Conversely, butchering of the elements of larger animals will inflate NISP. However, because NISP is an observable measure that does not require further calculations, it is less complicated than derived measures like MNE and MNI, which are best calculated after the recording process has been completed (Lyman 2008:28).

Minimum Number of Individuals (MNI) is a derived unit of measurement because it is a manipulation of NISP rather than a direct observation (Marean et al 2001:334). MNI can be defined as the minimum number of individuals that are necessary to account for the number of specimens of a particular species in an assemblage (Reitz and Wing 2008:205). MNI was developed in part to deal with the problems that plague NISP, in particular to avoid over-counting taxonomic abundance due to fragmentation (Lyman 2008:44; Marshall and Pilgram 1993:262). MNI is much more complex than NISP and has to be calculated considering a variety of variables; consequently, it gets calculated in different ways by different analysts, leading to incomparability between assemblages analyzed by different zooarchaeologists (Lyman 2008:45). In general, MNI is typically an *underestimation* of the real number of animals represented in an assemblage; first, because it calculates only the *minimum* number of animals needed, and second, because it is rarely calculated by *visually* pairing elements together, which means that minor differences in, for example, size that would otherwise rule out pairings go unnoticed, leading to an underestimation of MNI (Reitz and Wing 2008:206).

MNI is calculated here by counting the greatest number of unique or paired elements of a given side (left or right) of a given taxon. But this can be done in a number of ways, by creating samples within which to count paired elements, and how parts of an assemblage are aggregated for the calculation of MNI can drastically affect the values that are produced (Lyman 2008:57-69). Some calculate MNI at the level of the entire site, while others separate spatial and temporal units in consideration of how animal parts may have moved within a site, especially larger sites with longer occupation histories. Other variables must also be considered, including age and sex.

Here, MNI was calculated in consideration of age and sex (the latter only in the case of turkeys, the only species that could be sexed), and at the level of the site (see Table 5.1). To calculate MNI at the level of the room would probably lead to an overestimation of the number of individuals, given the ease with which different parts of birds likely moved between rooms. In a few specific and unique cases, MNI was calculated within a given room for comparison.

Measurements. Von den Driesch (1976) provides the definitive and exhaustive guide to measuring every avian skeletal element; these guidelines are used extensively by those doing specific and targeted studies of avifaunal remains from archaeological sites. Given the scope of the data collection for this dissertation research, the sheer size of the avifaunal assemblage, and the questions being asked of the data, however, four measurements were chosen that were widely applicable to many different elements in many different taxa, and indeed these four are recommended by von den Driesch (1976) for nearly all long bones: greatest length (GL), mid-point width (slightly different that von den Driesch's SC=smallest breadth at corpus), greatest proximal breadth (Bp), and greatest distal breadth (Dp). All were taken in millimeters using Mitutoyo digital calipers. All specimens were weighed in grams.

Initially, a rather optimistic approach was employed in faithfully taking each of these four measurements on *all* elements which had that aspect complete, on *all* taxa. When it became clear just how much material had to be analyzed, the recording procedure was refined to specific taxa. The result is that measurements were consistently taken on the following, where the feature to be measured was intact: (1) all turkey long bones, (2) all eagle long bones, (3) objects of worked bone when possible. For turkey long bones, the immediate intended goal was to be able to determine sex, and to be able to evaluate size ranges. For eagle long bones, the hope is to eventually, after this dissertation research, conduct a morphometric study for golden and bald eagle that will allow for the distinguishing of elements that could not be distinguished using Trail (2017). For objects of worked bone, the intent was to document certain dimensions of each artifact, especially the length of bone tubes and beads. Occasionally measurements were also taken on unique features, such as the maximum width of pathological bone growth, and recorded in the comments field.

Context

One challenge with working with historically-collected archaeological materials, especially those collected by different projects and shuffled around the country, is reconstructing the contextual details of the material being analyzed. Though the recording procedures of the earliest projects in Chaco Canyon differed significantly from the expectations of modern archaeology, in general, a greater interest developed over time in canyon research in carefully recording the provenience of artifacts and ecofacts. To be levied against the criticism that contextual details for artifacts from Chaco are impossible to reconstruct (a critique I’ve heard many times), there are many, many, available archival and legacy documents that can assist in the reconstruction of context, many of which are available online through the Chaco Research Archive. This effort is time consuming, but represents an integral and necessary part of any collections-based research.

The largest physical repository for archival documents relating to Chaco Canyon is the Chaco Archive, located in the Hibben Center on the UNM campus. The Chaco Archive houses an abundance of original material generated by the archaeological projects described above (as well as others), including photographs, field notes, reports, and manuscripts. Notably, the Chaco Archive contains archival documents generated by the UNM/SAR field schools, the Chaco Project, and all NPS-related (stabilization, salvage, etc.) work conducted in the park.

Some of the material housed at the Chaco Archive, was digitized by the Chaco Digital Initiative, and is now available online at the Chaco Research Archive (CRA, chacoarchive.org). The Mellon, NSF, and NPS-funded Chaco Digital Initiative, spear-headed by Stephen Plog of the University of Virginia, spent nearly a decade digitizing legacy data and archival documents concerning Chaco Canyon into a relational digital database, resulting in the creation of the online Chaco Research Archive. Now, documents that were previously only accessible by visiting repositories across the country are available online and have been tediously combed and mined for information to construct interactive maps of Chaco sites and searchable relational databases (Heitman et al. 2017; Plog 2015). Types of digitized documents include field notes, artifact inventories, maps, drawings, photographs, correspondence, and unpublished reports, all of which are invaluable in reconstructing provenience.

In reconstructing contextual information for the collections examined in this dissertation research, as many sources of information as possible were marshaled. The first and most obvious pass at accessing these details were museum catalogues. Beyond this, both the Chaco Archive and the Chaco Research Archive proved to be invaluable resources in teasing out a greater level of contextual information for many of the specimens analyzed in this research. A separate trip just to mine archival documents at the Chaco Archive was made, where field specimen sheets and field notes proved valuable resources for increasing the quality of contextual information accompanying the avifaunal assemblage. Additionally, CRA was used to access many digitally available documents, such as field notes and specimen cards, that helped in these efforts. These efforts and past work with CRA (see Bishop and Fladd 2018; Bishop et al forthcoming), including my employment by the archive in 2011 and 2012, have repeatedly revealed that the situation is not as dire as we might have it. Even during the earliest projects in Chaco, Pepper and Judd almost always noted which rooms objects came from within Pueblo Bonito, and often made descriptions in their hand-written field notes of finer location detail. Judd in particular made hand-written notecards describing each room excavated (Judd 1921-1923), as well as hand-written specimen cards (Judd 1921-1927), and Pepper kept a diary (Pepper 1896) and hand-written notes on excavated rooms containing room measurements and drawings (e.g. Pepper 1897, among many). In the case of the Chaco Project, often, the vestiges of provenience information were in the form of hand-written FS numbers on individual bones, which, when not available in catalogue information, were marked in the dataset and then looked up at the Chaco Archive.

After exhausting possible sources to either reconstruct provenience information and contextual details or to enhance that provided by museums, the overwhelmingly majority of the avifaunal assemblage has some level of contextual detail, invaluable in interpretation. 99.6% of the assemblage can be attributed to the site level. 95.4% of the assemblage can be attributed to context within site, such as room, kiva, or plaza. 72.7% of the assemblage can be attributed to an even greater level of detail, such as feature within room, level, layer, etc. Thus, it is no longer admissible to assume that studies of Chaco must be characterized by poor provenience information. While the information may not always be readily available or easy to access, with dedication and effort, much greater detail can be marshaled to accompany the analysis of Chacoan material culture.

The analysis of historically-produced museum collections, coupled with the use of archival documents, holds great potential to develop and amend our understanding of Chaco Canyon. The results of this effort directed towards avifaunal remains are presented in the following chapters. First, in Chapter 5 I attempt to make headway in addressing the first research question, present details about the entire avifaunal dataset, and provide a discussion of the taxa represented. I also present evidence for and discuss the use of birds as food and of their bones as raw material for bone objects. Chapter 6 moves on to addressing the second and third research questions, assessing the more ritual aspects of the involvement of birds in canyon life.

Chapter 5: Avifaunal Use, Diet, and Bone Object Manufacture

In this chapter I explore the types of birds that were acquired and valued in Chaco Canyon, evidence of their role in diet, and evidence of the importance of their bones as raw material for manufacturing objects. This chapter presents a more traditional zooarchaeological analysis as well as first-level interpretations of the dataset itself. It is also my hope that the description that follows will be of value to other zooarchaeologists, especially those engaged in an avian zooarchaeology in the same or other geographical areas, and that it will be of comparative interest to zooarchaeologists studying other types of fauna in the Southwest.

The Avifaunal Assemblage

The Chaco avifaunal assemblage is comprised of 11,729 fragments of bird bone, representing 11,014 NISP. These remains were recovered from 38 different sites in Chaco Canyon (Figure 5.1). Forty-one discrete taxonomic units were identified, that is, 41 non-overlapping unique species, genera, or families that represent 41 discrete types of birds (Table 5.1). There are 37 species identified, as well as an additional 1 genus and 3 families that are types of birds not represented by other identified species.

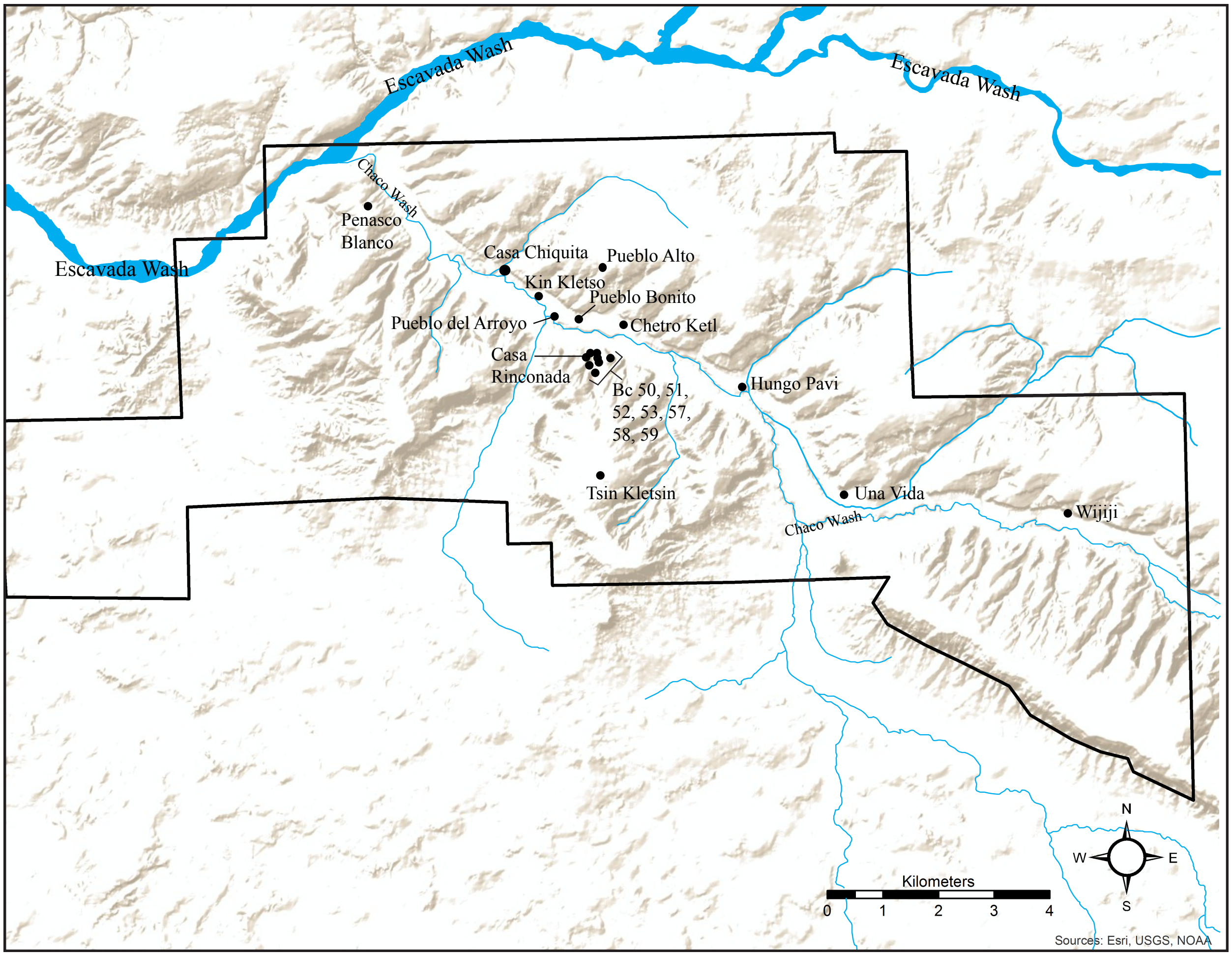

Figure 5.1. Chaco Canyon, showing some of the sites from which material was analyzed.

The Minimum Number of Individuals (MNI) represented in the assemblage is 654. MNI was calculated at the level of the site, since it might be expected that different parts of the same bird may have been distributed or moved across a site. While it is certainly possible that parts were shared across multiple sites, especially smaller sites and those in closer proximity to one another, calculating MNI at the level of the entire canyon is likely to vastly underestimate the minimum number individuals. It should also be remembered that MNI is a *minimum* number required to account for the elements in the assemblage, while in reality, the number of individuals of each taxon collected by the inhabitants of the canyon was certainly greater. MNI was calculated as the greatest number of paired left or right elements, or of an unpaired element, in consideration of articulated whole or part individuals (which were identified and segregated), and in consideration of sex (turkeys only) and skeletal maturity indicative of age (all birds). MNI was only calculated for specimens identified to species or genus.

Taxonomic Composition of the Assemblage

Overall the assemblage was highly identifiable, in part due to the low degree of fragmentation, and the previous efforts of other researchers to sort and identify the material. Considering NISP, 88% of the assemblage was identified to the family level or greater, 86.7% to the level of genus or greater, and 84.5% was identified to species. A total of 11.8% of the assemblage is comprised of remains that could only be identified as class Aves or c.f. Aves.

Many types of birds are represented in the assemblage, both local and nonlocal taxa, including raptors, galliforms, water birds, doves and pigeons, woodpeckers and flickers, exotic parrots, and many birds of the order Passeriformes (perching birds). The majority of species identified were likely locally available in or around the canyon, with some notable exceptions. Information on the local availability, distribution, seasonality, and habitat preferences of each species are briefly summarized below; this information was gathered using multiple sources and bird guides (Cartron 2010; Sibley 2014; Vuilleumier 2016; Sterry and Small 2009).

Table 5.1. Taxonomic composition of the Chaco avifaunal assemblage analyzed for this research.

Order	Family	Taxon	Common Name	NISP	MNI
Accipitriformes	Accipitridae	*Aquila chrysaetos*	golden eagle	489	65
		Haliaeetus leucocephalus	bald eagle	6	2
		Accipitridae (eagle-sized)	eagle	99	
		Accipiter cooperii	Cooper's hawk	3	3
		Accipiter gentilis	northern goshawk	3	3
		Buteo jamaicensis	red-tailed hawk	287	36
		Buteo lagopus	rough-legged hawk	7	5
		Buteo regalis	ferruginous hawk	84	20
		Buteo swainsoni	Swainson's hawk	78	18
		Buteo sp.	hawk	221	31
		Circus hudsonius	northern harrier	33	3
		Accipitridae *(Buteo* or *Accipiter)*	hawk	2	
		Accipitridae (hawk-sized)	hawk	12	
	Accipitridae/ Falconidae	Accipitridae or Falconidae (hawk- or falcon-sized)	hawk or falcon	4	
	Cathartidae	*Cathartes aura*	turkey vulture	1	1
Falconiformes	Falconidae	*Falco mexicanus*	prairie falcon	34	10
		Falco sparverius	American kestrel	58	7
		Falco sp.	falcon	1	1
Strigiformes	Strigidae	*Asio* c.f. *otus*	owl, c.f. long-eared	4	1
		Bubo virginianus	great horned owl	34	16
		Megascops kennicottii	western screech owl	7	4
	Tytonidae	*Tyto alba*	barn owl	1	1
Anseriformes	Anatidae	*Anas acuta*	northern pintail	2	1
		Anas platyrhynchos	mallard	3	1
		c.f. *Mareca americana*	c.f. American widgeon	1	1
		Anas sp.	dabbling duck	2	2
		Anatidae	duck	2	
Gruiformes	Gruidae	*Antigone canadensis*	sandhill crane	42	10
Galliformes	Odontophoridae	*Callipepla squamata*	scaled quail	35	12
		Callipepla sp.	quail	8	5
		Odontophoridae	quail	1	
	Phasianidae	*Meleagris gallopavo*	turkey	5319	276

Columbiformes	Columbidae	*Zenaida macroura*	mourning dove	11	4
		Ectopistes migratorius	passenger pigeon	2	1
Piciformes	Picidae	*Colaptes auratus cafer*	red-shafted flicker	5	3
		c.f. Picidae	c.f. woodpecker	1	
Psittaciformes	Psittacidae	*Ara* sp.	macaw	12	2
		Ara macao	scarlet macaw	2405	35
Passeriformes	Turdidae	*Turdus migratorius*	American robin	1	1
		Turdidae	thrushes	1	
		c.f. *Sialia currucoides*	c.f. mountain bluebird	1	1
		c.f. *Sialia mexicana*	c.f. western bluebird	1	1
		Sialia sp.	bluebird	3	2
		c.f. *Catharus* sp.	thrushes	4	1
	Corvidae	*Corvus corax*	common raven	122	25
		Pica hudsonia	black-billed magpie	30	15
		Gymnorhinus cyanocephalus	pinyon jay	9	3
		Corvidae, small	small corvid	1	
		Corvidae, jay	jay	2	
	Alaudidae	*Eremophila alpestris*	horned lark	135	15
	Bombycillidae	*Bombycilla cedrorum*	cedar waxwing	3	2
	Hirundinidae	Hirundinidae	swallow	1	
	Icteridae	Icteridae	icterids	6	
	Laniidae	*Lanius ludovicianus*	loggerhead shrike	35	1
	Mimidae	c.f. Mimidae, thrasher	c.f. trasher	3	
	Passerellidae	*Pipilo chlorurus*	green-tailed towhee	10	4
		Junco hyemalis	dark-eyed junco	1	1
		Passerellidae (junco or sparrow)	junco or sparrow	3	
		Passerellidae	American sparrows	4	
	unknown	Passeriformes	passerines	14	
unknown	unknown	Aves, very small	very small bird	2	
		Aves, sm	small bird	60	1*
		Aves, sm-md	small-medium bird	17	
		Aves, md	medium bird	138	
		Aves, md-lg	medium-large bird	155	
		Aves, lg	large bird	865	
		Aves	bird	12	
		c.f. Aves		56	
Totals				**11014**	**654**

[1]Partially articulated individual of a bird that could not be identified to species.

Turkey and other Galliforms. Turkey remains comprise nearly half of the assemblage NISP and over 40% (Table 5.1) of the MNI, in both cases far more than any other taxa. Other taxa in the order Galliformes included quail (*Callipepla* sp.*)* and scaled quail. Quail remains together account for less than 1% of the assemblage and are therefore unlikely to have been an important source of food.

An understanding of the history of turkey domestication and husbandry in the US Southwest is still developing, especially concerning the geographical origin of the domestic turkey used in the Southwest and independent domestication events (Lipe et al 2016; Spellet et al 2010). Domestic turkey may have been present in the Southwest as early as 200 CE, but even so, local wild turkey (Merriam's turkey) continued to be captured and even penned, and some degree of interbreeding between wild and domestic birds appears to have occurred (Grimstead et al 2016; Speller et al 2010). Multiple lines of evidence indicate that turkeys were bred or at least penned in Chaco Canyon, including the presence of eggshell, juvenile individuals, pathologies, and an isotopic analysis of strontium (Grimstead et al 2016; Watson 2012; Windes 1987). Analysis of aDNA from the bones of turkeys recovered in Chaco Canyon is needed to shed light on whether or not wild and domesticated birds were both present. However, if wild turkey was penned and raised inside the canyon, these birds would have been acquired from elsewhere, since wild turkey primarily occupies higher-elevation forested habitat and would not have been a natural occupant of the canyon. Scaled quail is likely to have been locally present if uncommon (Cully 1985b).

Raptors. Raptors are well represented in the Chaco avifaunal assemblage, and include eagles, hawks, falcons, owls, and vultures. Together, raptors comprise 13.3% of NISP, but 35%

of MNI. In both NISP and MNI, golden eagle is the most abundant species of raptor, followed by red-tailed hawk. Eagle remains also include several specimens of bald eagle and remains identifiable only as either golden or bald eagle (Accipitridae (eagle sized)). Many species of hawk were identified from the genera *Buteo*, *Accipiter*, and *Circus*, as well as several species of falcon, including prairie falcon and the American kestrel. Multiple species and genera of owl are also present, of which great-horned owl is the most abundant in both NISP and MNI. Many articulated parts of individual raptors, especially eagles and hawks, were recovered from Pueblo Alto, and are discussed in Chapter 6. Only one specimen was identified as turkey vulture.

Most species of raptor were likely available within the canyon, though the sheer number of individuals represented in the assemblage draws into question the possibility that all were procured locally. Raptors are predominantly solitary birds with large territory sizes, which means that the canyon was unlikely to have been home to more than several breeding pairs of a given species at any one time. Golden eagles have territorial home ranges from 20 to 200 square kilometers, or larger (Cartron 2010:374-375). Bald eagles would have been especially rare as they prefer to hunt and nest around water, and are only seasonally present in the winter. Golden and bald eagle, Cooper's hawk, red-tailed hawk, ferruginous hawk, northern harrier, prairie falcon, and American kestrel have been visually observed within the canyon (Cully 1985a,b). Northern goshawk, rough-legged hawk, and Swainson's hawk were not observed (Cully 1985a,b). The Northern goshawk prefers heavily wooded areas and thus may have only been a rare visitor to the canyon, if at all. Rough-legged hawk is only a winter resident in northwestern New Mexico, and Swainson's hawk only a summer resident.

All four species of owl are likely to have been locally present. Long-eared owl and great-horned owl have been observed (Cully 1985a,b). Western screech owl prefers more heavily wooded areas, though it may have still been an occasional visitor or resident in the canyon. Turkey vulture has been observed as a summer resident (Cully 1985a,b).

Water Birds. Both ducks and crane were identified in the Chaco avifaunal assemblage, though together they make up less than 1% of overall NISP and 2.3% of MNI. Of these, Sandhill Crane is the best represented, and several species of duck appear in low quantities. A lack of permanent standing water in Chaco Canyon would have made the canyon undesirable to ducks and cranes. It is conceivable that any of the species of duck or crane could have been taken during migration if their route took them over Chaco where they may have made use of seasonal washes, but otherwise could have been procured elsewhere. The mallard was reported as a "casual migrant" in Chaco Canyon, though only one sighting was noted (Cully 1985a,b). Sandhill crane is even less likely to have been locally present, as it appears in northwestern New Mexico only on migration.

Doves and Pigeons. Two species of pigeon or dove were identified, though they comprise less than 1% of either NISP or MNI. Mourning dove is a year-round resident of New Mexico and has been documented in the canyon (Cully 1985a,b). The identification of the remains of passenger pigeon was made by Hargrave and verified by Wetmore. This species went extinct in the early 20th century, and though there is limited understanding of its historic and prehistoric distribution, its remains have been documented from two other prehistoric sites in New Mexico (Brasso and Emslie 2006; Howard 1971). Its appearance in Chaco is somewhat unusual, given that the preferred habitat of the passenger pigeon in the eastern United States was known to be deciduous forests. However, changes in habitat preferences of species over time are not unheard of.

Woodpeckers and allies. The family Picidae is represented only by the red-shafted flicker (whose feathers have also been found in Chaco Canyon), and a possible woodpecker, which together comprise less than 1% of the assemblage NISP or MNI. The red-shafted flicker, which is the western subspecies of the northern flicker, has been observed in the canyon (Cully 1985a,b), though its appearance is unlikely to have been frequent given its preference for more heavily wooded areas. Though the woodpecker remains could not be identified beyond the level of family, several different species of woodpecker have been observed in the canyon (Cully 1985a,b).

Perching Birds. Eleven different families in the order Passeriformes are represented in the assemblage. Together birds of the order Passeriformes make up 3.5% of the assemblage NISP and nearly 11% of the MNI. Of the Passeriformes, 42.1% NISP and 59.7% MNI are corvids, including common raven, black-billed magpie, and pinyon jay. Ravens are the most abundant of these, and in fact have the highest MNI of all birds behind turkeys, raptors, or parrots. Behind raven, the horned lark is well represented, comprising 34.4% Passeriformes NISP and 20.8% Passeriformes MNI, representing a minimum of 15 individuals.

The remaining types of Passeriformes are few in number. Robins, bluebirds, and thrushes (Turdidae) are represented by several individuals but low NISP. The same is true of the family Bombycillidae, only represented by the Cedar Waxwing. Loggerhead shrike is represented by 35 NISP but only 1 individual. Several families are represented by specimens that could only be identified to the family level, including Hirundinidae (swallows), Icteridae (orioles and blackbirds), and Mimidae (mockingbirds, catbirds, and thrashers), each with less than 10 NISP.

Several species were identified in the family Passerellidae, including juncos, sparrows, and towhees. The green-tailed towhee is represented by a minimum of 4 individuals, and the dark-eyed junco by only one.

All of the passerine birds just described are likely to have been present in the canyon prehispanically. Both the mountain and western bluebird would have only been present in the winter, descending from higher elevations. All passerine species have been observed in the canyon with the exception of the cedar waxwing (Cully 1985 a,b). Though its congener, the bohemian waxwing, was observed, the cedar waxwing prefers generally more wooded areas.

Macaws and Parrots. Much has been written about the macaws recovered from Chaco Canyon (e.g. Bishop and Fladd 2018; Crown 2016b; George et al 2018; Hargrave 1970; Watson et al 2015). The most recent description of all macaws and parrots from Chaco (Crown 2016b:Table 1) reports 41 individuals: 38 macaws and 3 thick-billed parrots. Hargrave's (1970) account of macaws throughout the Southwest, which has been relied upon extensively by most scholars discussing macaws/parrots from Chaco, also reports 38 macaws. After physically examining all avifaunal collections and scouring all possible published sources, manuscripts, and archival information (such as field notes and specimen cards) in the course of this dissertation research, the count of parrots and macaws recovered from Chaco Canyon is 45:42 macaws and three thick-billed parrots (Plog et al forthcoming). In the course of this dissertation research, only 38 of the 42 macaws could be physically located for re-study, while the remaining 4 are known only from excavation notes and specimen cards (Hargrave 1970; Judd 1921-1927:52; Judd n.d.:16-17, 83; Judd 1954:264; 1959:127). Some of these were at one time analyzed by Hargrave, but have subsequently been lost, while others were described in excavation notes by Judd but never found by Hargrave. Not one of the three thick-billed parrots could be found by the author for re-study, though their existence was documented by Judd (Judd 1921-1927:136; Judd 1954:264) and Hargrave was able to locate all three (Hargrave n.d., Hargrave 1961a).

The status and whereabouts of the 7 parrots/macaws that could not be located is unknown; it is likely that their loss is due to the movement of collections between museums in the mid-20th century. These unfound 7 parrots/macaws are not included in Table 5.1, which reports only those remains that were physically located and analyzed during this research project. Table 5.2 presents the total number of macaws and parrots from sites in Chaco Canyon that could be found and/or reconstructed from archival documents. Remains in the avifaunal dataset presented here include those identified as scarlet macaw (*Ara macao*) and those identified only as macaw (*Ara* sp.). Crown (2016b:333) has rightly drawn into question the reliability of distinguishing osteologically between different species of macaws. Because macaws and parrots are not a central focus of this dissertation and because so much excellent research has recently been and is being conducted on macaws, identifications by Hargrave and Emslie (see Hargrave 1970) were relied upon in this analysis. Original identifications made first by Alexander Wetmore included specimens identified as military macaw (*Ara militaris*), which have been subsequently referenced by other scholars. Hargrave over-wrote these identifications, and all specimens reported by Hargrave (1970) are scarlet macaw (*Ara macao*) or *Ara* sp. The contextual, depositional, and skeletal details of the macaws and parrots from Chaco are discussed in greater detail in the next chapter.

Table 5.2. All macaw and parrot remains recovered from Chaco Canyon, including both those remains analyzed in this dissertation research and those described in literature and archival documents.

	Macaws (*Ara macao* and *Ara* sp.)	**Thick-billed parrot (*Rhynchopsitta pachyrhyncha*)**
Pueblo Bonito	35	2
Pueblo del Arroyo	5	0
Kin Kletso	1	0
Una Vida	0	1
29SJ1360	1	0

Summary of taxonomic representation and abundance. The taxa represented in this dataset span a variety of avian families, with many species that exhibit different behavioral characteristics, habitat preferences, and plumage variability. With the exception of the macaws and parrots, all species can be found today at some point during the year in northwest New Mexico. The majority of taxa have habitat preferences that make them likely to have been locally available within or near the canyon at some point during the year, with some species even likely to have been local nesters.

Some species, though local to New Mexico, may have rarely been found in the canyon and could have been obtained outside of Chaco. These include, for example, the northern goshawk, wild turkey, and cedar waxwing, all of which prefer heavier tree cover. Others including duck and crane would have been infrequent visitors to the canyon, favoring instead more permanent sources of water on their migratory routes. Still others would only have chosen the canyon as a habitat during the winter, descending from higher elevations, such as the mountain and western bluebirds. Even those species that may have occupied the canyon would have done so to varying degrees of abundance and availability dependent upon gregariousness and local population sizes of each species (see Bishop forthcoming).

Acknowledging that the majority of species may have been locally available within the canyon does not preclude the possibility that any could have been obtained from elsewhere, especially water birds and those that prefer more montane habitats. As previously mentioned, the sheer quantity (in both NISP and MNI) of some birds, especially raptors, draws into question the assumption that all birds were taken from within the canyon. Raptors should be some of the least abundantly available birds in the canyon, with their usually large territorial home ranges and solitary nature helping to maintain low local population densities. Yet they are abundantly represented in the assemblage. Golden eagles in particular maintain large territories, yet golden eagle has the third highest NISP and the second highest MNI in the assemblage. Of course, the proportion of birds of any taxon acquired within or external to the canyon can only be determined through future isotopic sampling and the establishment of local baselines.

Macaws and parrots are the only truly exotic taxa in the assemblage. Scarlet macaw specifically currently ranges no further north than central Mexico; as far as is known their ranges have never extended into the US Southwest. Thick-billed parrot may have been a sporadic visitor to southwestern New Mexico (Phillips et al 1964; Valdes-Peña et al 2011; Wetmore 1935).

The presence of regionally nonlocal species (such as parrots) and canyon-nonlocal species or rare visitors to the canyon demonstrates an investment in acquiring bird species beyond just those that may have been encountered on a regular basis. This fact and the sheer quantity of avian remains, especially of rare taxa, recovered from the canyon in the course of what has been sometimes extensive but often unsystematic excavation or collection (where bone was often ignored), defies any assertion that the collection of birds by the occupants of Chaco Canyon was ever only casual or opportunistic. This realization has also been supported by a more detailed quantitative analysis of the biological, physiological, and behavioral traits of many of the species identified in the assemblage (Bishop forthcoming). Elsewhere I have highlighted the fact that certain species, such as various types of raptors, have species-level behavioral and physical characteristics that would have rendered their capture by humans quite challenging relative to other species (Bishop forthcoming). And yet many of these challenging-to-procure species comprise considerable portions of many of the avifaunal assemblages from Chaco sites. The disproportionate contribution to Chacoan avifaunal assemblages of birds that are some of the most challenging to procure and some of the rarest on the landscape highlights the high level of investment by people in procuring species that held significance.

Preservation and Taphonomy

Overall the avifaunal assemblage was in good condition, not plagued by a high degree of prehistoric or recent breakage, and subjected to a minimum level of natural modifications. Of all specimens, 41.5% were either complete or nearly complete elements. Only 35.5% of specimens exhibited evidence of damage occurring before, at or around the time of deposition (prehistoric breakage), while 50.97% exhibited some type of recent (modern) damage, likely sustained in the course of excavation. Additionally, 4.5% of specimens were broken intentionally in the manufacture of tools or objects.

A very small portion (2.3%) of the assemblage exhibits any evidence of having been gnawed—carnivore, rodent, or otherwise. In terms of natural taphonomic processes that act on bones post-depositionally, 10.5% of specimens bear evidence of plant root etching, and only 7.8% are weathered. Here, weathering was recorded as the degree of bone deterioration as a result of being left on the ground surface and exposed to the elements (sensu Haglund 2001; see Blau 2017 for different approaches to weathering).

The high proportion of complete or nearly complete specimens, coupled with a relatively low proportion of prehistoric breakage, minimal gnawing, and minimal weathering, might suggest that much of the bone in the avifaunal assemblage may not have been discarded on ground surfaces that remained exposed to the elements for an extended period of time. Instead, avifaunal remains may have been predominantly interred in covered deposits (in the case of articulated individuals and parts), or even as “trash” deposited in spaces that were then covered by additional material.

It is important to note that smaller birds are likely to be very underrepresented in the assemblage. Both preservation concerns and excavation biases would limit their recovery. Even where screening is used in excavation, the remains of many types of birds are likely to slip through screens. In re-excavating the backfill of several rooms at Pueblo Bonito, left behind by excavations conducted by George Pepper in the 1890s, Patricia Crown and colleagues (Crown 2020) found the remains of several small birds, including Bullock’s oriole, thrushes, flicker, and black-headed grosbeak (Ainsworth et al 2018, 2020). It is clear from the ethnographic record of the Pueblo Southwest that small, colorful birds are valued for their feathers. Unfortunately, we cannot account for the many small birds that may have been important to and collected by the inhabitants of Chaco Canyon. It is quite possible, however, that they were a vibrant part of the human-bird relationship and of the picture of ceremonial life painted in this dissertation.

Site-level Variation

Thirty-eight sites are represented in the overall avifaunal dataset, and there is great variation in the size and composition of the assemblages from each site. Table 5.3 summarizes NISP, MNI, and Number of Taxa by site, and presents the extent of excavation, the number of rooms excavated, and avifaunal density (measured as NISP/# rooms) for each site in the avifaunal dataset. Assemblages range from containing no more than 1 NISP to containing over 3,000, and from having as few as one unique taxon to as many as 26. While variation is evident between different sites, it is challenging to assess the significance of this variation. Some of this variation is almost certainly attributable to differences in the extent to which different sites were excavated, and to the different collection methods used (related to screening, screen size, etc.). While many sites were completely or nearly completely excavated, some were only minimally so. Still others were not excavated at all, with material only collected on survey.

Table 5.3. NISP, MNI, and number of taxa by site, and extent of excavation, number rooms excavated, and avifaunal density by site.

Site	NISP	MNI	# Unique Taxa	Extent of Site Excavation	No. rooms excavated[1]	Avifaunal density (NISP/# rooms)	Refer-ence[3]
Bc 50, Tseh So	67	8	5	nearly complete	25	2.68	3, 9
Bc 51	186	21	11	nearly complete	50[2]	3.72	3, 4, 8, 9
Bc 53	22	5	3	complete or nearly complete	25	0.88	1, 3, 9
Bc 55	3	1	1	nearly complete	4	0.75	1, 8
Bc 57	866	45	11	complete or nearly complete	14	61.86	3, 8, 9
Bc 58	42	5	5	nearly complete	13	3.23	1, 3, 4, 8, 9
Bc 59	1	1	1	~75%	26	0.04	1, 3, 8, 9
Casa Chiquita	2	2	2	unexcavated	0	n/a	7
Chetro Ketl	71	17	11	~50%	142	0.50	8
Eleventh Hour site	167	14	8	less than 10% (~8%)	1.5	111.33	9
Gallo Cliff Dwelling	36	9	6	complete or nearly complete	5	7.20	8

Half House	3	1	1	unknown	1	3.00	2, 8, 9
Kin Bineola	1	1	1	unexcavated	0	n/a	1
Kin Kletso	249	23	9	complete or nearly complete	56[2]	4.45	8
Leyit Kin	137	20	10	nearly complete	18	7.61	2, 8, 9
Peñasco Blanco	15	4	2	very limited	0	n/a	7, 11
Pueblo Alto	2320	112	26	10%	15	154.67	4, 8
Pueblo Bonito	3394	169	16	nearly complete	350	9.70	3, 5, 10
Pueblo del Arroyo	303	13	3	about half	94[2]	3.22	6, 8
Pueblo Pintado	18	7	5	unexcavated	0	n/a	1
Pumphouse Site	24	3	3	partial	5	4.8	14
Rabbit Ruin	3	2	1	unexcavated	0	n/a	none
Rich's Site	235	7	2	probably the majority	18.5	12.70	8, 9
Shabik'eshchee	4	3	3	~40%	21	0.19	8, 9, 13
Spadefoot Toad Site	579	16	5	mostly excavated	11	52.64	9, 12
Talus Unit No.1	181	25	11	complete or nearly complete	34	5.32	8
Three-C Site	1	1	1	complete or nearly complete	11	0.09	8, 9
Turkey House	12	3	2	complete or nearly complete	9	1.33	8, 9
Una Vida	1403	39	13	5-15%[2]	16	87.69	8
Voll's Site	76	14	7	nearly complete	21	3.62	8, 9
Zorro Bradley's Site	57	10	6	complete or nearly complete	12	4.75	8, 9
29SJ 1360	30	8	5	probably the majority	16	1.88	8, 9
29SJ 329	1	1	1	unknown	unknown	n/a	none
29SJ 423	7	5	4	30-50%[2]	4	1.75	8, 9
29SJ 626	9	5	4	unknown	5	1.80	8, 9, 12
29SJ 627	387	9	6	mostly	31	12.48	8, 9

				excavated			
29SJ 628	22	5	2	unknown	6	3.67	8, 9
29SJ 724	32	7	5	nearly complete houseblock 1	11	2.91	8, 9
unknown	48	12	9	n/a	n/a	n/a	

[1]calculated as the number of rooms, kivas, and/or pithouses.
[2]exact number or percent not known but approximated as best as possible based on available information.
[3]Information for extent of excavation and number of rooms gathered from the following sources: (1) Chaco Research Archive site pages; (2) Adams 1951:273-293; (3) Heitman 2011:145-148; (4) Heitman 2015:Table 8.1; (5) Judd 1954; (6) Judd 1959; (7) Lekson 1984:246; (8) Mathien 2005:Table A.1, A.2, A.3, A.4, A.5, p.143; (9) McKenna and Truell 1986:Table 2.1, p.88-89; (10) Pepper 1920; (11) Roberts 1927; (12) Windes 1993; (13) Wills et al 2012; (14) National Park Service 2019

Assessing inter-site differences is not without hope, however. Some variation may be indicative of patterns in past behavior rather than biases introduced by different excavation practices, and certainly there was variation in both the degree to which and the ways in which the occupants of different sites used and interacted with birds. For example, both Bc 57 and Bc 58 were excavated by UNM/SAR field schools in 1942 and 1947 respectively, presumably using similar methods, are of similar sizes, and yet there are obvious differences in their avifaunal assemblages, even simply in size and taxonomic representation (Table 5.3).

Though we cannot easily account for the differences in avifaunal assemblages produced by different excavation methods, we can partially account for variation imposed by the extent of excavation. While specimen density (Table 5.3) is by no means a perfect measure, it allows for a more even comparison between sites of the size of each assemblage. The example of Bc 57 and Bc 58 again serves to illustrate that there are real differences in the quantity of avifauna between sites. Despite their relative comparability in excavation extent and methods employed, the quantity of avifaunal remains at Bc 57 far exceeds that at Bc 58. The average specimen density across all sites is 18.9 specimens per excavated room. Six sites have very low specimen densities (less than 1.00 specimen per room), five sites have very high densities (above 50 specimens per room), and the remainder have intermediate densities that fall between 1.0 and 12.7. It is important to consider assemblage size and density together. Pueblo Bonito, for example, has the greatest quantity of avifaunal remains, yet a density below the average. Still, much of these patterns may be influenced by or attributed to excavation and collection methods. Pueblo Alto was excavated in the 1970s by the Chaco Project, and all material was screened through 1/4", 1/8", or 1/16" mesh (Heitman 2015:Table 8.1). Unsurprisingly, it has the highest specimen density by far. Specific components of site-level variation in the avifaunal dataset will be discussed in greater detail in the next chapter.

Birds as a Dietary Resource

From the perspective of optimal foraging, it is hard to see how wild birds would be an optimal choice for food when other resources, especially large mammals, are available. Factors such as body weight and nutritional value, aggregation (group size), and mobility are important considerations in prey take (Jochim 1976). Birds have greater mobility than many mammals that may be taken for food, since they can fly away (Serjeantson 209:230-231). While many bird species do aggregate in large numbers, many are exclusively solitary, and this behavior depends on both the species and the season (Serjeantson 2009:231). Available meat and nutritional value is highly variable among birds. While large birds (such as turkey) can provide enough meat for more than just a nuclear family, birds that weigh less than approximately 200 grams have to be caught in numbers in order to provide any measurable amount of food (Serjeantson 2009:231). Furthermore, the desirable fat sources which may be abundant in mammalian bone marrow are limited in birds (Serjeantson 2009:233). Additionally, a different kind of effort is needed to process birds for consumption compared to mammals. Since birds have to be plucked before consumption, it is more efficient to process one large bird than it is to process multiple small birds that might provide a comparable amount of meat (Serjeantson 2009:233).

Overall, this means that some large birds may be efficient parts of a dietary strategy, but medium and small birds are quite uneconomical as a food resource, unless they are caught, processed, and consumed in large numbers (Serjeantson 2009:235). Chapter 2 should have made apparent the fact that bird consumption in the present and historic Pueblo world is a rarity, with examples indicating that consumption was largely incidental, supplementary, or symbolic. In fact, much prior zooarchaeological research in the Southwest has, based on the ethnographic record, equated the presence of wild birds in the archaeological record with ritual rather than consumption. Nonetheless, the expectations of this assumption—that the majority of birds were brought to Chaco Canyon for ritual or ritual-related activities and not dietary consumption—must be tested against the assemblage itself.

Consideration of the Species Present

The majority of species in the overall Chaco assemblage were unlikely to have been important or frequent food resources. Table 5.4 presents MNI, body weight, and aggregation tendencies for the different species identified in the assemblage. Forty-two percent of all species in the assemblage weigh less than 200 grams; these are listed below the dotted line. Under the expectation that small birds would have to be captured in numbers to provide sufficient quantities of meat beyond an occasional snack, the lighter birds in the assemblage do not seem to fit this bill. All of the species that typically weigh less than 200 grams and which are social never occur in large numbers above 15 individuals. Recall from Chapter 2 that the horned lark was taken in numbers and roasted at Zuni (Ladd 1963:13, 106). While 15 MNI of horned larks are in the overall assemblage, these are spread between 8 sites. Furthermore, there are only very low frequencies of water birds, which are known to provide more fat than other birds. While Sandhill crane has an MNI of 10, these individuals are distributed between at least 5 sites.

Some of the larger-bodied birds do occur in great numbers. Of the 21species that typically weigh above 200 grams, 16 occur as NISP of 17 or below. The remaining 5 species are red-tailed hawk, ferruginous hawk, golden eagle, common raven, and turkey. Based on the ethnographic record, it seems unlikely that the raptors were valued for their meat. In the case of red-tailed hawk, ten out of 36 of these individuals are represented by wings and feet deposited in a ceremonial pit filled with other raptor parts at Pueblo Alto (discussed in Chapter 6; see also Akins 1987:599).

Based on both the ethnographic and archaeological record, turkey remains the best candidate for the species most likely to have contributed to Chacoan diet. Turkey is by far the most numerous in both NISP and MNI. Additionally, it is the heaviest-bodied species, and wild turkeys are social birds that roost and travel in groups. The capture and processing of turkeys for food is of course made even more efficient if domestic birds are kept, since they do not have to be hunted.

Based on the evidence just described, most species occur in such frequencies that they are unlikely to have been routine contributions to diet. However, consideration of species characteristics (such as body size and aggregation behavior) alone does not constitute evidence for or against the consumption of specific species. The burden of proof requires that other zooarchaeological variables be scrutinized.

Table 5.4. Body weight and gregariousness of species identified in the assemblage.

Taxon	MNI	Weight (grams)	Aggregation/Gregariousness
Turkey	276	5800	social
Sandhill crane	10	4850	social
Golden eagle	65	4575	solitary
Bald eagle	2	4325	solitary
Turkey vulture	1	1830	social
Ferruginous hawk	21	1600	solitary
Great horned owl	16	1400	solitary
Common raven	25	1200	solitary
Mallard	1	1100	social
Red tailed hawk	36	1080	solitary
Rough-legged hawk	5	990	sometimes in small groups
Northern goshawk	3	950	solitary
Swainson's hawk	18	855	sometimes in small groups
Northern pintail	1	800	social
Prairie falcon	10	720	solitary
American widgeon (c.f.)	1	720	social
Barn owl	1	460	solitary
Cooper's hawk	3	450	solitary
Northern harrier	3	420	sometimes in small groups
Passenger pigeon	1	300	social
Owl, c.f. long-eared	1	260	sometimes in small groups
Scaled quail	12	180	social
Black-billed magpie	15	175	social
Western screech owl	4	150	solitary
Red-shafted flicker	3	130	sometimes in small groups
Mourning dove	4	120	social
Pinyon jay	3	100	social
American kestrel	7	117	solitary
American robin	1	77	social
Loggerhead shrike	1	48	solitary
Horned lark	15	32	social
Cedar waxwing	2	32	social
Green-tailed towhee	4	29	sometimes in small groups
c.f. mountain bluebird	1	29	social
c.f. western bluebird	1	29	social

Dark-eyed junco	1	19	social

Heat Treatment

Evidence of burning or heat treatment on bone is almost always an indicator of human activity, since it is rarely that bone becomes burned through natural means (Serjeantson 2009:149-150). Through direct contact with or close proximity to a heat source such as fire or heated coals, bones become discolored. They may be calcined or partially calcined through contact with very high temperatures or at lower temperatures for an extended amount of time, resulting in a white, gray, or bluish-gray color. Briefer contact with fire can result in partially burned areas of the bone limited to the area that had contact with a heat source, usually ranging from shades of brown to black (Serjeantson 2009:150; Stiner et al 1995). Burning localized to an articular end or broken distal or proximal shaft usually suggests that that portion of the bone came into direct contact with a heat source (such as embers), but that the rest of the bone was spared from the same discoloration because it was still covered with meat (Laroulandie 2001; Serjeantson 2009:151). This type of charring at the articular ends of a bird bone provide good evidence of cooking. Various other cooking methods tend to leave no traces on bones, including boiling, stewing, or roasting in enclosed or earthen ovens (Steadman et al 2002; Serjeantson 2009:153).

In the analysis conducted here, heat-treatment was recorded as the presence of carbonization/charring (again indicated by shades of brown to black), calcination (shades of white, gray, bluish-gray), and what appeared to be discoloration produced by extended low-temperature indirect heat treatment where bone was discolored slightly but not carbonized. A thorough analysis of the degrees of heat treatment and speculation of the means through which these bones were burnt is outside the scope of this current research, and provides an interesting avenue for future research. For now, however, all indications of heat treatment will be taken to proxy possible cooking for consumption. In reality of course, bones can become burned for reasons not related to food consumption, including for example if they are swept into a fire as trash or are part of a sacrificial fire (in which case they typically become calcined). And because many methods of cooking animals can leave little to no trace on bones, certainly part of the picture may be missing.

It should also be noted that plucking a bird for its feathers and consuming its meat are not mutually exclusive practices. It is reasonable to assume that a bird can be first plucked (a necessary step in the cooking process), its feathers retained for the manufacture of ceremonial paraphernalia, and its carcass subsequently consumed. The best example of this is likely the turkey, who would have provided a good amount of meat after the plucking of its feathers. Recall that at Cochiti, wild and domestic turkey are both valued for their feathers and are consumed, while the same is true of wild turkey at Taos. However, taboos could have prohibited such dual use, relegating a bird to one use to the exclusion of another, as was reportedly the case with eating turkey at Hopi and among the Tewa (Lange 1950:207; Parsons 1939:22; Tyler 1979:75).

The percentage of any heat treatment in the overall Chaco avifaunal assemblage is low, with just 2.5% of all specimens bearing any evidence of coming into contact with heat. Table 5.5 lists the taxa with specimens that were heat treated. For most of these taxa, the percentage of NISP that was heat treated is also low, under 6%, and often under the assemblage-wide average of 2.5%. Where percentages exceed this, it is almost always attributable to sample size (for example northern goshawk, where one of only 3 NISP identified to this species was burnt). Considering this, none of the species with any evidence of heat treatment have such in proportions that are high or indicate routine cooking of the species. While many of the species with evidence of heat treatment are raptorial, this can be attributed at least in part to the fact that raptors are generally well represented in terms of taxonomic richness in the overall assemblage. Only 2.65% of all raptor NISP in the assemblage were heat-treated, largely replicating the assemblage average.

Even the remains of birds that might be the most obvious food choices given their body weight and/or fat content—such as ducks, larger water birds, and quail—exhibit no or limited proportions of heat treatment. Even turkey remains that are heat treated comprise only 2.3% of all turkey NISP, again roughly the assemblage average. Based on this evidence, no species seem to have undergone routine cooking with methods that would char, carbonize, or calcine bone.

Table 5.5. NISP and percent heat-treatment by taxa.

Taxon	**NISP Heat-Treated**	**%NISP Heat-Treated**
Golden Eagle	11	2.2%
Accipitridae (eagle-sized)	4	4.0%
Northern goshawk	1	33.3%
Red-tailed hawk	12	4.2%
Rough-legged hawk	1	14.3%
Ferruginous hawk	1	1.2%
Swainson's hawk	3	3.8%
Hawk (*Buteo* sp.)	1	0.5%
Accipitridae (hawk-sized)	1	8.3%
Prairie Falcon	2	5.9%
Great-horned owl	2	5.9%
Turkey	123	2.3%
Scaled quail	1	2.9%
Common raven	2	1.6%
Horned Lark	1	0.7%
Passeriformes	1	7.1%
Aves	108	8.3%

Butchery and Disarticulation

Birds can be disarticulated, butchered, and skinned for many reasons, not all of which are dietary. They may be disarticulated in order to produce smaller portions for cooking and consumption, or they may be disarticulated simply to separate valuable parts of the body for other purposes—removing wings as ceremonial objects or as units of feathers, isolating parts of the body for the use of bone in tool or ornament manufacture, etc. In the case of birds (as opposed to mammals) evidence of skinning is usually not a good indicator of bird consumption, since birds are usually plucked rather than skinned in order to preserve the desirable layer of fat for cooking that lies just below the skin (Serjeantson 2009:138). Skinning is therefore not evidence to be marshalled in assessing the consumption of birds, and is considered further below. Because the carcasses of birds may be broken up for different reasons, not all of them dietary, cut marks and evidence of disarticulation are potentially a weak indicator of definitive consumption, especially in a case where there is so far little evidence for the routine or large-scale consumption of birds.

Evidence of butchery and disarticulation can often be found in the form of cut and chop marks on bones. These marks are made primarily in order to dismember a bird or fillet its meat. Because disarticulation using tools requires cutting through the ligaments that hold limb bones together, marks are left usually at the articular ends, while filleting results more frequently in the presence of cut marks on the body of the element (Laroulandie 2001; Serjeantson 2009:132-133). A robust and detailed study of the placement and nature of cut marks is outside the scope and focus of this dissertation. For now, evidence will be considered generally to make the case for or against consumption of birds.

Just as with heat-treatment, the overall percentage of cutting and chopping in the assemblage is low at only 2.74%. Because instances of chopping were minimal (only 16 NISP), cutting and chopping are considered together here; table 5.6 lists taxa whose remains had any indication of either. Percentages for most species fall below 10%, with many falling below 6%. Where percentages exceed this, it is usually because total NISP for a given species is low (for example northern goshawk, where only one of 3 NISP had cut marks). Raptors appear to disproportionately show evidence of cutting or chopping compared to other species, though again, there are a great number of raptor species in the assemblage overall, and only 8.4% of overall raptor NISP exhibited cut or chop marks.

Table 5.6. NISP and percent cutting/chopping by taxa.

Taxon	**NISP Cutting and Chopping**	**%NISP cutting and chopping**
Golden Eagle	60	12.3%
Accipitridae (eagle-sized)	15	15.2%
Northern goshawk	1	33.3%
Red-tailed hawk	25	8.7%
Rough-legged hawk	1	14.3%
Ferruginous hawk	6	7.1%
Swainson's hawk	6	7.7%
Hawk (*Buteo* sp.)	1	0.5%
Northern harrier	1	3.0%
Accipitridae (hawk-sized)	2	16.7%
Prairie falcon	4	11.8%
Great horned owl	2	5.9%
Sandhill crane	1	2.4%
Common raven	5	4.1%
Turkey	113	2.1%
Aves	60	4.6%

Both turkey and golden eagle are large birds whose dismemberment would have been easiest with the use of tools. Thus, if their carcasses were frequently broken apart, a high proportion of cutting would be expected. Contrary however to what might be expected with widespread and frequent consumption of turkeys, cut marks are present on only 2.1% of turkey NISP, below the assemblage average. Instead, considering species with NISP greater than 5, eagle remains (both golden eagle and those identified only as eagle-sized Accipitridae) exhibited the highest proportion of cutting. Combined, 12.8% of eagle remains had cut marks. While this proportion is still considerably lower than might be expected if eagles were routinely being dismembered, it is noteworthy that they appear to have been subjected to cutting more frequently than other types of birds. However, 23 of these cut eagle specimens only have cut marks because such cuts were made to enable scoring and snapping of the bone in the manufacture of bone objects. When these are removed only 8.8% of eagle remains feature cut marks that may be evidence of dismemberment or the processing of the body.

When the distribution of cut marks on eagle remains is examined by element, the majority were located on wing elements, as opposed to non-wing elements (mostly of the leg) (Table 5.7). Furthermore, when cut mark location is examined (proximal end, proximal shaft, shaft, distal shaft, or distal end), cut marks are concentrated in locations that suggest they were made in the act of dismemberment. In an experimental study, Laroulandie (2001) recorded cut marks left by disarticulation and filleting partridges, and found that generally, those on the articular ends of long bones were left in the process of disarticulation, while those on the coracoid, furculum, scapula, sternum, and limb bone shafts were made in filleting. Table 5.8 reveals that a very low proportion of cut marks on eagle remains were located in areas identified by Laroulandie as probably resulting from filleting, while a far higher proportion were in locations meeting the description for disarticulation. Some elements, such as the ulna and radius, exhibited cut marks on their proximal and distal shafts. These were likely made in attempts to remove epiphyses from the shaft, for the manufacture of cylindrical bone objects, since neither the ulna nor the radius carry a particularly large quantity of meat and because cylindrical bone objects were frequently manufactured from these elements (discussed below). They may also have been made in attempts to remove remaining skin and tissue from the element to prepare bone for working.

Given the preponderance of cut marks on eagle wing elements as opposed to leg elements, and their distribution throughout the body, cut marks on eagle remains are likely to be mostly the result of the following activities: disarticulation of the carcass (especially the wings), the removal of epiphyses for the manufacture of objects, or the removal of skin for the manufacture of objects or the preservation of feathers. Eagle was likely disarticulated not for consumption, but for preservation of wings, or for the acquisition of raw material for ornament and tool manufacture.

Table 5.7. Proportion of cut marks on wing and non-wing elements for golden eagle and turkey.

	Wing Elements	**Non-Wing elements**
Golden Eagle	72.5%	27.5%
Turkey	36.0%	64.0%

Surprisingly, turkey remains exhibit a low frequency of cut marks. This is in contrast to the expectation that they were an important food bird. In the case of both heat-treatment and cut marks % turkey NISP is below the overall assemblage averages (Tables 5.5, 5.7). Additionally, 24 of the turkey specimens exhibited cut marks that were the result of attempts to score bone for the manufacture of bone objects. When these are removed, the percentage drops to only 1.7%

NISP turkey remains with cut marks. Despite the low proportion of NISP with cut marks, interesting patterns emerge when we examine element distribution and placement of cuts. Contrary to the case with eagles, a greater proportion of turkey specimens with evidence of cutting are non-wing elements (Table 5.7). Additionally, cut marks are present on several types of elements in turkeys that did not exhibit cutting in eagles, including notably the scapula and coracoid. In general, cut marks are distributed throughout the body. While those meeting Laroulandie's (2001) description for disarticulation predominate, marks indicating filleting account for a greater proportion of cut marks than was the case with eagles (Table 5.8). As was the case with eagles, other cut marks appear also on the proximal and distal shafts of some elements, just below the epiphyses, and might represent attempts to remove the ends of long bones for the use of the diaphysis in the manufacture of bone objects.

Table 5.8. Proportion of cut marks suggestive of filleting and disarticulation for golden eagle and turkey.

	% Filleting Cut Marks	**% Disarticulation Cut Marks**	**% Other Cut marks**
Golden Eagle	5.8%	55.8%	38.5%
Turkey	29.2%	44.9%	25.9%

Clear evidence of the removal of meat from turkey carcasses exists in the presence of 5 sterna with long, shallow scrape marks on the ventral surface of the sternum, especially along the keel. These marks would not have been made in the act of disarticulation, but in removing breast meat from the bird. Multiple different human behaviors, however, both relating to dietary consumption and the use of other products (feathers, bone) produced the cut marks that are evident on turkey remains. These included disarticulation for consumption, the preservation of feathers, or both, and removing the skin for the preservation of feathers or in order to acquire bone for the manufacture of bone objects.

Because birds are overall much smaller than large mammals that may be acquired for food, birds can frequently be dismembered by hand, requiring no tools and leaving no cut marks (Serjeantson 2009:144). Additionally, smaller birds can be cooked whole after plucking, requiring no dismemberment at all. Where birds may be disarticulated without tools, damage to the bone can result and can be observed in an archaeological assemblage. Disarticulation in this fashion usually requires repeatedly bending and over-extending a joint by hand. In the case of the elbow, this can result in damage to the olecranon fossa of the distal humerus made by the olecranon process of the ulna. Additionally, minor "peeling" of the bone surface can result when two bones are pulled apart, and strongly-attached ligaments take with them some of the bone surface, even damaging or removing portions of the articular end in the process (Serjeantson 2009:144). If a bird is cooked first, however, it can be easily dismembered by hand with minimal damage to the bones.

Overall, only 1.4% of all specimens in the assemblage bore evidence of disarticulation in the form of crushing or peeling. This is not all that surprising, given that birds can be dismembered with the use of tools as well, and because disarticulation by hand does not always result in crushing or peeling. Nonetheless, many raptor species dot the list of taxa that displayed such evidence (Table 5.9). Again, small sample size is an issue with some taxa (for example Turdidae, to which only one specimen was identified). Intriguingly, however, 10% of each golden eagle and red-tailed hawk bore evidence of disarticulation by hand, and both species are well represented in the assemblage. Such evidence is, by contrast, limited on turkey remains.

Table 5.9. NISP and percent crushing and peeling by species.

Taxon	**NISP Crushing, Peeling**	**%NISP Crushing, Peeling**
Golden eagle	49	10.0%
Bald eagle	1	16.7%
Red-tailed hawk	29	10.1%
Ferruginous hawk	4	4.7%
Swainson's hawk	1	1.3%
Hawk (*Buteo* sp.)	3	1.4%
Prairie falcon	3	8.8%
Great horned owl	3	8.8%
Sandhill crane	2	4.8%
Common raven	5	4.1%
Passenger pigeon	1	50.0%
Bluebird	1	33.3%
Turdidae (thrushes)	1	100.0%
Turkey	46	0.9%

Perhaps the most important instance of crushing in the entire assemblage is the singular example on one ulna of a specimen taxonomically identified by Hargrave as passenger pigeon. Where there may have been some question as to the origin of its presence, either anthropogenic or as a later, natural intrusive, the obvious crushing of the olecranon process of the proximal end confirms that it was disarticulated from the body of a passenger pigeon by human hand.

Summary of Evidence

Overall, evidence of heat treatment and disarticulation by hand or using tools is rare in the Chaco avifaunal assemblage. Only 2.5% of all specimens had evidence of coming into contact with a heat source, only 2.74% bore evidence of being processed with tools, and only 1.4% were disarticulated by hand. Certainly, these values are not high enough to suggest that processing birds for food was a routinely undertaken endeavor. Even where there is evidence for disarticulation, it was not necessarily for consumption, but could easily have been to procure raw material for bone objects, or to preserve parts of the body. Nonetheless, the presence of such indicators of human processing does provide irrefutable evidence that birds were sometimes dismembered by hand and sometimes using tools, and that some parts did come into contact with heat.

Interesting patterns emerge when all three lines of evidence just discussed—dismemberment by hand, disarticulation using tools, and heat treatment—are considered together. First, three species identified in the assemblage appear to have been more frequently disarticulated (using tools or by hand) than others. Turkey accounts for the highest proportion of all specimens bearing evidence of disarticulation or of being heat-treated (Table 5.10), suggesting that they were involved in consumption more frequently than other birds.

Table 5.10. Distribution of all disarticulated and heat-treated remains between taxa.

Taxon	**% of disarticulated remains**	**% of heat-treated remains**
Golden Eagle	24.1%	4.0%
Bald eagle	0.2%	0%
Accipitridae (eagle-sized)	3.3%	1.5%
Northern goshawk	0.2%	0.4%
Red-tailed hawk	11.9%	4.4%
Rough-legged hawk	0.2%	0.4%
Swainson's hawk	1.5%	1.1%
Ferruginous hawk	2.2%	0.4%
Hawk (*Buteo* sp.)	0.9%	0.4%
Northern harrier	0.2%	0%
Accipitridae (hawk-sized)	0.4%	0.4%
Prairie Falcon	1.5%	0.7%
Great-horned owl	1.1%	1%
Common raven	2.2%	0.7%
Sandhill crane	0.7%	0%
Horned Lark	0.0%	0.4%
Bluebird	0.2%	0%
Turdidae (thrushes)	0.2%	0%
Passenger pigeon	0.2%	0%
Passeriformes	0.0%	0.4%
Scaled quail	0.0%	0.4%
Turkey	35.2%	44.7%
Aves	13.3%	39.3%

When evidence for disarticulation and heat-treatment are examined side-by-side, the same three taxa—turkey, eagle, and red-tailed hawk—are of note (Table 5.11). Two different patterns can be seen between turkeys and raptors. The remains of eagles and red-tailed hawks indicate high incidences of disarticulation relative to other taxa but low subsequent burning, supporting the hypothesis that their remains were disarticulated for non-dietary reasons. This is corroborated by the discussion of bone objects below, and the likelihood that their feathers were valued and that the birds themselves may have been sacred.

Turkey remains, on the other hand, exhibit low but more comparable percentages of disarticulation and heat-treatment, suggesting that as frequently as they were dismembered, they also came into contact with a source of heat. The location of some cut marks on elements and portions that indicate the removal of meat (especially on the sternum) provides positive evidence that some turkeys were eaten. The overall low percentages of heat-treatment and disarticulation do not provide resounding or strong evidence for an exclusively dietary interest in turkeys. Evidence suggests instead that turkeys likely served multiple purposes to the inhabitants of Chaco Canyon.

Table 5.11. Percent NISP of several taxa exhibiting evidence of disarticulation or heat-treatment.

Taxon	NISP Disarticulated	%NISP Disarticulated	NISP Heat-Treated	%NISP Heat-Treated
Eagles (golden, bald, unidentified)	116	19.5%	15	2.5%
Red-tailed hawk	48	16.7%	12	4.2%
Turkey	158	3.0%	123	2.3%

Of course, multiple cooking methods leave no trace on bones, and especially small birds can be cooked whole without requiring disarticulation. And yet small birds do not occur in any large quantities in the assemblage, and thus could not have been frequent contributions to the diet. As far as can be assessed zooarchaeologically, there is no evidence in the Chaco avifaunal assemblage for routine or even moderate-scale consumption of birds. Overall minimal evidence of processing for meat and of subsequent heat treatment is consistent with the idea that the primary purpose of bird procurement was for non-dietary reasons, to obtain feathers, participants in ritual, or raw material for bone objects. Where birds may have been eaten, consumption was likely occasional, opportunistic, or for symbolic purposes.

An inter-site analysis of evidence for disarticulation and heat-treatment is not presented here for several reasons. Firstly, counts of each type of modification are already fairly low, such that to parse out evidence of modification by the 38 sites represented in the assemblage would result in sample sizes too small for reasonable analysis. Second, only 12 sites had avifaunal assemblages with no evidence of cutting, chopping, crushing, peeling, or heat-treatment. Of these 12, all but one site have assemblages sizes lower than 25, suggesting that the absence of modification is not a true absence, but one influenced by the limited excavation or recovery. The only exception is 29SJ 633, with an assemblage of 167 NISP. Less than 10% of this site was excavated (McKenna and Truell 1986:88-89), however, and this is likely the reason for the apparent absence of these forms of modification.

A Closer Look at Turkeys

Though there is no overwhelming evidence that turkeys were a major contribution to the diet, they were likely more frequently and consistently eaten than other types of birds. While an in-depth analysis of turkey husbandry is outside the scope of this dissertation, sex ratios were calculated in the Chaco avifaunal assemblage and provide interesting insight into decisions regarding turkey management, as well as data for future studies of turkey husbandry. In general, analyses of age profiles and sex ratios in domesticated turkey populations can inform studies concerning management practices, decisions regarding breeding, size variation in the birds, and living conditions (Badenhorst et al 2012:63-64).

In her comparative osteological study of turkey remains throughout the Southwest, McKusick (1986) found no overlap in the ranges of sample means of the greatest length of three skeletal elements between male and female turkeys, regardless of subspecies and whether the bird was domestic or wild. Her metrics for distinguishing adult male and female turkeys continue to be used by zooarchaeologists (e.g. Fothergill 2012; Munro 1994; Watson 2012). In an analysis of proximal and distal breadth of the tarsometatarsus, Badenhorst et al (2012) found that these measures exhibited overlap in ranges between males and females, but statistically significant mean values between sexes, demonstrating the value of using fragmentary specimens. Furthermore, Speller and Yang (2016) compared genetically determined sex to sex determined by morphological size in an archaeological sample, in order to evaluate the efficacy of both methods. They compared sex determinations based on the metric analysis of turkey humeri (measuring greatest length, proximal breadth, and distal breadth) to genetic sex obtained using aDNA, and found a 100% match in the 31 specimens tested. In other words, sex predicted using element size was found to be a reliable method for determining sex.

In determining sex in the Chaco avifaunal assemblage, three methods were used. First, the presence of the tarsometatarsal spur was taken as an indicator of maleness. Because the absence of a spur can be due to separation during post-depositional processes, and because it may not form until 7-8 months (McKusick 1986; Munro 1994:21), the absence of a spur was not taken as an indicator of femaleness. Furthermore, two separate methods for determining sex based on metrics of different elements were used. First, using the ranges published by McKusick (1986:Table 12) and following Fothergill (2012:Table 3.3) and Munro (1994:Table 4.1), the humerus, tibiotarsus, and tarsometatarsus of adult turkeys were sexed using greatest length measurements.

Second, the distal breadth of tibiotarsi were used to sex both the complete specimens also sexed using McKusick (1986), as well as fragmentary bones that had complete distal epiphyses. Badenhorst et al (2012:Figure 3) found that when distal breadth and distal depth of their archaeological tibiotarsi (from Sand Canyon Pueblo and Albert Porter Pueblo) were plotted, specimens fell into one of two discrete clusters of smaller and larger birds, representing theoretically female and male. As an exploratory way to increase the sample size of Chaco turkeys that could be sexed, distal breadths of Chaco specimens were compared to Badenhorst et al's (2012:Figure 3) archaeological clusters. Distal breadth measurements of all Chaco tibiotarsii (both complete and fragmentary bones) fit neatly into one of the two clusters, with a clear gap in the range, with no specimens measuring between 17.98 and 19.33mm, a gap that corresponds well with the edges of Badenhorst and colleagues clusters. For complete tibiotarsii that were sexed first using McKusick's (1986) ranges, sex assignments based on distal breadth following Badenhorst et al (2012) corroborated those made using McKusick 100% of the time (n=22).

When all three methods for assessing turkey sex are used together, fairly even ratios of male to female are found across the canyon (Table 5.12). When sex distribution is broken down by site, similarly close ratios are observed at sites where more than 20 turkey elements could be assigned sex. At Pueblo Bonito and Bc 57, patterns match those observed for the canyon overall, while at Kin Kletso the pattern is reversed—more females are represented than males, though the ratio is still fairly close. At Una Vida, which has more turkey remains than any other site in Chaco Canyon, the proportion of males to females is more disparate, with almost two-thirds male and one-third female. All assemblages for which at least 8 specimens could be assigned sex had both males and females present.

Table 5.12. Percentages of male versus female turkeys.

	Total NISP Turkey Remains	**NISP sexed elements**	**%NISP Female**	**%NISP Male**
Sample sizes above 20				
Pueblo Bonito	274	81	44.3%	58.0%
Bc 57	486	36	44.4%	55.6%
Una Vida	1333	34	35.3%	64.7%
Kin Kletso	211	28	53.6%	46.4%
Sample sizes below 20				
Pueblo Alto	1311	20	75.0%	25.0%
Talus Unit No. 1	148	15	33.3%	66.7%
Pueblo del Arroyo	186	10	80.0%	20.0%
29SJ 589	49	8	25.0%	75.0%
29SJ 299	226	7	0.0%	100.0%
29SJ 633	135	4	25.0%	75.0%
Chetro Ketl	41	4	50.0%	50.0%
Leyit Kin	116	4	50.0%	50.0%
29SJ 827	62	3	100.0%	0.0%
Bc 51	30	4	25.0%	75.0%
Gallo Cliff Dwelling	22	2	50.0%	50.0%
Bc 58	19	1	0.0%	100.0%
Bc 59	1	1	100.0%	0.0%
29SJ 1360	20	1	0.0%	100.0%
29SJ 629	504	1	0.0%	100.0%
Bc 50	35	1	0.0%	100.0%
Entire Assemblage	*5319*	*265*	*44.5%*	*55.5%*

In combining all three methods to determine turkey sex, it should be noted that the use of the spur in this instance acts disproportionately on males and females, because it is taken as an indicator of maleness with no equivalent for measuring femaleness. Its observance therefore inflates the numbers of males present. Metrics, on the other hand, act more evenly on the sexes, since they can be used to identify both males and females. When results are compared using only metric analysis (Badenhorst et al 2012; McKusick 1986) to results including tarsometatarsal spurs, the overall percentages of males and females become more even when spurs are excluded (Table 5.13). In either case, male and female turkeys appear to have been present in fairly even proportions in Chaco Canyon. Using metrics of the tarsometatarsus, Watson (2012:147-150) found the same pattern in his prior analysis of turkeys from Bc 57 and Bc 58, with 50% female and 50% male birds.

Table 5.13. Percentage male versus female turkeys using different methods of sexing.

	%NISP Female	%NISP Male
Using metrics and spurs	45%	55%
Using metrics only (no spurs)	49%	51%

Worked Bird Bone Objects

Bird bone in Chaco Canyon was used to manufacture multiple types of objects, both those of practical use and those of obvious ceremonial or ornamental value. Bird bone is characterized by thin cortical bone and is often internally pneumatized. It is therefore usually less dense than most mammalian remains, rendering it easier to work with, especially when manufacturing hollow objects. Many skeletal elements, especially those of larger birds, are suitably sized for making a variety of handheld objects, as well as much smaller objects. Besides the practicality and ease of using bird bone in manufacturing certain types of objects, the potential symbolic referents that may be made by using bone from a specific species were likely important motives in choosing bird bone as a raw material.

In his analysis of manufactured bone objects from the vertebrate faunal assemblages of 14 different sites in Chaco Canyon, Watson (2012:Table 8.1) found 13 different object types:

awls, needles, pins, antler flakers, end scrapers, weaving tools, tinklers, gaming pieces, ornaments, punches, spatulate forms, rubbing tools, and sounding rasps/whistles. Considering the entire avifaunal assemblage from Chaco Canyon analyzed in this dissertation, only 5 types of objects were manufactured from bird bone (Table 5.14). Bird bone was not chosen as material for many of the more utilitarian objects and tools otherwise manufactured from animal bone (Watson 2012). The category of production waste denotes parts of bones that were clearly discarded during the manufacturing process, but which were not themselves the desired end form. These include mostly discarded epiphyses that were scored and removed from long bones in the manufacture of other objects, especially tube beads. A total of 538 specimens of bird bone were worked into finished forms or were discarded in the process.

Table 5.14. Worked bird bone from Chaco Canyon.

Form	**NISP**	**% of worked bird bone**
Awl	116	21.6%
Tube bead and bead blanks	343	63.8%
Production waste	58	10.8%
Needle	1	0.2%
Whistle	3	0.6%
Worked Talon	3	0.6%
Worked, form unknown	14	2.6%

Tube Beads

Tube beads and bead blanks are by far the most numerous form of worked bird bone in the assemblage. Because of the tendency of the manufacturing process of a bone tube to destroy or remove the parts of the bone that are typically the most useful in making taxonomic identifications, nearly half of all bird bone tubes could only be assigned to class Aves. It should be noted, however, that tubes made from bird bone sometimes *are* readily identifiable with the appropriate amount of time and effort, and with a reasonable comparative collection. Gracility, robusticity, curvature, cross-section profile, and identifying landmarks are all often readily visible on bird bone tubes and can be used reliably to make identifications in the absence of epiphyses. This is especially true in the case of large birds, such as eagle, turkey, and sandhill crane, whose remains though often similar in size and superficially in appearance, prove to be distinguishable upon further examination, especially with experience identifying bird bone tubes.

Of tubes that could be identified beyond class Aves, the majority are manufactured from the remains of turkey. Second most frequent, the remains of golden and bald eagle comprise 37% of tube beads and bead blanks that were identified beyond class Aves. Remaining taxa contribute much lower proportions, and include red-tailed hawk, Cooper's hawk, northern goshawk, and Sandhill crane. Overall, the most frequently chosen element was the ulna, followed in decreasing order by the tibiotarsus, the radius, the femur, and the humerus. Among remains of turkey, the tibiotarsus was by far the most frequent choice, accounting for 62% of all tubes manufactured from turkey bone. For eagle bone, there is also a clear preference in choice of element for bone tube manufacture, but it was the ulna, which accounts for 58% of all tube beads or blanks made from eagle remains. These two elements, eagle ulna and turkey tibiotarsus, each provide the straightest, most circular diaphysis (shaft) in the skeletons of each taxon. This indicates that a straight bead with circular cross-section was the most desirable. If this is true, the second most commonly chosen elements should be the humerus or ulna in the case of turkey, and the femur or humerus of eagle. Indeed, this is true, with turkey ulnae and eagle femora being second most frequently chosen from each species.

Insight can be gained into the manufacturing process for tube beads when we examine more closely whether or not each bead was polished, and whether or not each of the two cut edges of the bead were ground smooth. The probable sequence of events for manufacturing tube beads based on these lines of evidence is the following: first, both ends of a long bone were scored and snapped off, leaving the diaphysis. The resulting shaft was sectioned into smaller pieces to create one or multiple tubes. After these were split, the two edges of each bead blank were ground down to smooth the jagged ends that resulted from scoring (Figure 5.2). The final step would have been to polish the bead, to create shine and to obfuscate any marks from scoring or scrape marks from cleaning the long bone (Figure 5.3).

Figure 5.2. Examples of bone tube beads or bead blanks. Top: CHCU 2323, tube bead from tibiotarsus of Aves (large), displaying jagged, unsmoothed edge (left); Talus Unit No.1. Bottom: CHCU 38, tube bead

blank from turkey tibiotarsus, note root-etching covering surface of bone, as well as smoothed ends; 29SJ 589.

An alternative scenario is that, once the epiphyses were removed, the entire long bone shaft (still un-sectioned) was polished, and then was sectioned into multiple beads, whose ends were then ground. If this were the case, however, we would expect nearly all beads and bead blanks to be polished, which was not the case. Instead, two patterns corroborate the first hypothesized chain of events. First, the majority of beads or bead blanks that are not polished have both ends smoothed (63%), indicating that polishing more frequently occurred *after* both ends were smoothed. Second, the majority of specimens that are polished (85%) have both ends ground, while very few (3.5%) have neither end ground, suggesting again that polishing likely came after ends were smoothed as the last step in the manufacturing process. Realistically, these two steps likely alternated in when they occurred, but were the last two steps of the manufacturing process. When the presence of polishing on a tube bead is taken to indicate the completion of the manufacture process, slightly more than half of all tube beads and bead blanks were polished (53%), while the remainder were not polished, indicating that many tube beads or blanks in the assemblage were never finished. Additionally, only 28% were polished *and* had both ends ground.

Figure 5.3. CHCU 50705, tube bead of turkey tibiotarsus (showing front and back), highly polished with both ends smoothed; Gallo Cliff Dwelling.

Of beads that had reached their final length (both ends ground), average length was 38.9mm, ranging from 4.8mm to 85.9mm. Very short or very long beads were not common however; 87.2% fell between 10 and 60mm in length. Most frequently beads were between 30 and 40mm in length, 20 and 30mm in length, or 50 and 60mm in length.

Further insight into the manufacturing process is gained from several noteworthy cases. Three individual elements that appear to be from one golden eagle were used to produce multiple beads. Three beads were manufactured from the left ulna, three from the right ulna (Figure 5.4), and two from the left radius. These were recovered together, refit together, and are the appropriate size to confirm that they came from the same bones, and likely from the same individual. Notes made by Lyndon Hargrave and subsequently captured in museum catalogue records were the first to make this observation. All 8 beads were polished and had all of their ends ground smooth, indicating that they were finished. These specimens confirm that in bird bone tube manufacture, multiple beads could be and were produced from the same single diaphysis.

Figure 5.4. Three tube beads manufactured from the same golden eagle ulna (CHCU 1205, 1162, 1156); all ends smoothed, all beads polished; Bc 51.

Additionally, these eight specimens come from a remarkable room that, when examined in greater detail, suggests evidence of extensive mineral, stone, bone, and shell working and object manufacture. Room 34 at Bc 51 was excavated in the course of ruins stabilization from 1949-1950 by Gordon Vivian. The second story of this room, having collapsed into the story of that below it, appears to have been a workshop (Vivian n.d.), and had an incredibly rich material artifact inventory.

Over 1,220 objects were recovered from the second story debris, and included 542 shale and gilsonite beads; 7 fragments of shale or gilsonite inlay; 2 gilsonite pendants; 393 pieces of worked, unworked, and raw turquoise; 5 fragments *Olivella* and *Glycymeris* shell; 90 bone tubes, 78 of which were made from bird bone; 13 talons of long-eared owl, great-horned owl, and prairie falcon; and 2 raven beaks (Chaco Research Archive 2019, Specimen List 1; Vivian n.d.; see also Mathien 1984).

The 78 bird bone tube beads were manufactured from the femora, radii, ulnae and humeri of golden eagle, sandhill crane, turkey, unidentified hawk, and unidentified Aves. Of these, 40% are polished and 66% have both ends smoothed, indicating that many were finished or nearly finished, including the eight golden eagle specimens described above.

Awls

Awls are the second-most numerous object manufactured from bird bone (Table 5.14). Species whose elements were used to manufacture awls include golden eagle, ferruginous hawk, sandhill crane, and turkey. Nearly 60% of awls were manufactured from the limb bones of turkey, with golden eagle bones a distant second (only 6% of awls). Awls, regardless of species, were made from the humerus, radius, ulna, tibiotarsus, tarsometatarsus, and even the carpometacarpus, but the most frequently chosen was the tibiotarsus, usually one of the longest and most substantial bones in the avian skeleton (Figure 5.5).

Figure 5.5. Bone awl manufactured from turkey tibiotarsus (CHCU 607); Kin Kletso.

Whistles

Only three possible whistles were identified in the assemblage. One of these was made from the ulna of a golden eagle, another from the ulna of an unidentified eagle, and a third from the tibiotarsus of a turkey. Each of these are broken, and the only indications that they are whistles is the presence of a portion of a beveled hole that likely formed a finger hole at the broken edge of each specimen. All three of these are from Pueblo Bonito. The eagle and turkey specimens are from Room 226, located in the southeast corner of Pueblo Bonito, adjacent to Kiva D. This room had a walled-up T-shaped door, and excavations produced several shell pendants, a turquoise pendant, several *Olivella* beads, painted wood, fragments of shell and turquoise, 2 shell bracelets, a duck effigy vessel, and many other objects (Chaco Research Archive 2019, Specimen List 2). The golden eagle whistle fragment was recovered from Room 288, also in the southeast corner of the pueblo, but located closer to the plaza and adjacent to Kiva 162. This room had far fewer objects of the nature of those found in Room 226, but included several *Olivella* beads (Chaco Research Archive 2019, Specimen List 3).

Needles

A single fragment of a needle manufactured from a bone of an unknown medium-sized bird was recovered from 29SJ 1360, House 1, Kiva B, on the kiva bench. Not much more can be said about this object other than that it has a hole drilled at one end, as expected of a needle.

Worked Talons

All three worked talons were manufactured from golden eagle distal phalanges, and all were recovered from Room 334 in Pueblo Bonito. On each of these talons, an incision was made just below the proximal articular surface, and in two cases the cranial/ventral articular protuberance was removed. On one of these specimens, the scoring attempt was abandoned before completion, and deep score marks are still visible around the circumference of the proximal neck. It is not clear what function these talons may have served. Perhaps they were intended to be decorative additions to a ceremonial object or to ceremonial attire. But if they were tied to another object or worn as a pendant, it is not clear what purpose the removal of the proximal process would have served, since if it were left in place the talon could be tied even more efficiently and securely (Figure 5.6). An alternative scenario involves affixing them to another object by slotting them into a receiving space, where the removal of the protuberance was intended to make the talon fit more securely. Room 334 is a unique space with many remains of other raptors, and will be discussed further in Chapter 6.

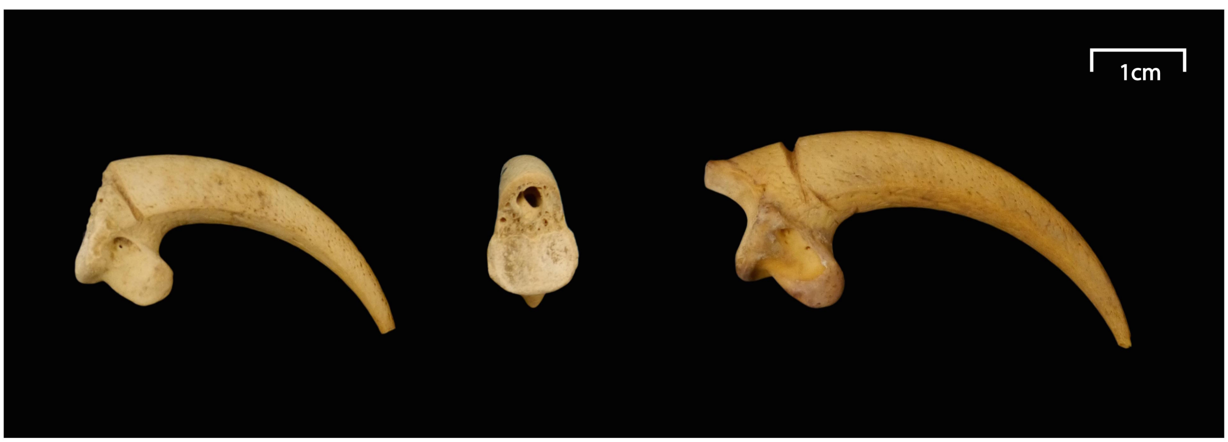

Figure 5.6. Worked talons. From left to right: 343548(a), 343548(a), 343548(b) (NMNH).

Patterns

Of the wide range of objects manufactured from animal bone in Chaco Canyon (Watson 2012), it is noteworthy that bird bone was chosen more often for ornamental and ceremonial forms (beads, whistles, worked talons) than for more utilitarian objects (awls, needles). The former categories of objects comprise 65% of all worked bird bone from Chaco, while the latter comprise only 22%. By contrast, considering data presented by Watson (2012:Table 8.1), 81% of worked bone objects made from all types of animal bone are forms utilitarian in nature, while only 16% are ornamental or ceremonial. These differences make clear that bird bone was put to different uses than was animal bone in general. Given the evident ceremonial importance of birds both past and present, it is fitting that even in bone object production, these same concerns were paramount.

Scrape marks

Scrape marks can be characterized as long shallow striations, usually occurring in multiples, which may appear on bone surface for several reasons. These striations are usually made either in the process of removing the skin to preserve feathers, or in the act of cleaning a bone to prepare it as raw material for object manufacture (Serjeantson 2009:138). Because birds are rarely skinned before consumption, the presence of these striations should not be considered evidence for consumption. Where their presence is related to skinning birds, they are often accompanied by several short, repeated, parallel cuts on the same element, used to first detach skin at a point of articulation with the bone, followed by longer striations that indicate scraping to remove the skin from the bone after the initial cuts.

Scrape marks also frequently appear as sets of many long, shallow striations occurring over extensive portions of a bone’s surface, made in the process of scraping to clean the bone’s surface free of ligaments and tissue in order to prepare it for manufacturing bone objects. These can be positioned longitudinally, transversely, or obliquely to the bone as viewed with the proximal end positioned upwards. Such marks can be seen, for example, on many tube beads that have not yet been polished. Where scrape marks are made in the process of cleaning bone, they provide further evidence of bone working and preparation for the manufacture of objects.

Overall, 185 specimens in the assemblage displayed scrape marks. Considering directionality, long, longitudinal marks were the most common, followed by oblique marks, then transverse. Forty-two specimens had striations in multiple directions. Of all 185 specimens, 130 of these were worked bone objects of forms discussed above. Considering the remaining 55 specimens, 12 of these also had cut marks that suggest the striations were made in the act of skinning, and were found on the radii and ulnae of golden eagle and a ferruginous hawk. Since little muscle is found on these elements these cuts and striations likely relate to the recovery of feathers (Laroulandie 2004; Serjeantson 2009:203).

The remaining 33 specimens with scrape marks had no additional cut marks, potentially denoting that the scrape marks resulted from cleaning bone. These were of golden eagle, bald eagle, unidentified eagle, Sandhill crane, red-tailed hawk, and turkey, and appear on radii, humeri, carpometacarpi, tibiotarsi, ulnae, a single coracoid and a single tarsometatarsus. Realistically, it is difficult to draw a hard line between whether scrape marks are resultant from either cleaning of bone, from skinning, or both. Experimental studies in both processes are needed. Additionally, any potential absence of evidence for skinning does not at all diminish the potential significance or scale of feather use, since the same bird can be plucked *and* its bones used as raw material. Due to these limitations, scraping in the Chaco avifaunal assemblage indicates only that both activities—cleaning of bone for raw material and skinning for the removal of feathers—occurred, and that these activities were concentrated on the remains of eagles, hawks, sandhill cranes, and turkeys.

Conclusion

So far, the picture of human-bird relationships in Chaco Canyon has unfolded to involve a range of wild birds of varying sizes, behaviors, and habitat preferences. At least 36 wild species were procured, domesticated turkey was probably husbanded within the canyon (Grimstead et al 2016), and macaws and parrots were imported from an unknown breeding center (George et al 2018).

Minimal evidence exists to support the hypothesis that the primary motivation behind the acquisition of birds was an interest in consuming them. In addition to low overall percentages of indicators of consumption such as heat-treatment and butchery in the assemblage, no evidence points to the frequent consumption of any type of bird. Even though turkey appears to have been the most likely contributor to diet, the frequency of heat-treatment and cutting in turkey remains suggests that their primary purpose was not as a food resource, though they were clearly eaten on occasion. Any consumption of birds in Chaco Canyon was likely only occasional, an interpretation that fits well with the ethnographic record.

Similarly, while bird bone was used to manufacture a small range of objects both utilitarian and ornamental, there is no evidence for a robust industry of bird bone object manufacture, nor was this the primary purpose for which birds were acquired. Specimens that were the result of or involved in the process of manufacturing bird bone objects comprise less than 5% of the entire avifaunal assemblage.

If their proportionate representation in the assemblage is any indication, turkeys and raptorial species piqued the interest of the inhabitants of Chaco more frequently than any other birds. Even though turkey remains comprise 48% of the entire assemblage, their abundance does not appear to be because they were an important food resource nor as a result of an extensive worked bone industry. As will be explored in the next chapter, this suggests that their primary importance was for the use of their feathers, in the manufacture of ceremonial paraphernalia and as participants themselves in ritual.

Of the wild birds acquired by Chaco people, raptorial species held great significance, a pattern that has also been noted among the historic and modern Pueblos (see Chapter 2). Not only are raptors as a group numerous in the assemblage, individual raptorial species—especially golden eagle and red-tailed hawk—predominate among the raptors and comprise sizeable proportions of the overall assemblage. Clearly these birds were valued. It is unlikely that their significance was dietary, for all of the reasons discussed above. Even where birds like golden eagle may have been desirable for the manufacture of bone objects, other suitably sized species could have provided comparable raw material, such as turkey, goose, or crane. Additionally, raptors are some of the most challenging birds to procure, especially in large quantities, given their scarcity on the landscape. These realizations make their abundance in the assemblage all the more surprising if the expectation is that the inhabitants of Chaco acquired birds in only an opportunistic and efficient way.

The above discussion moves us partway along towards addressing the first research objective of this dissertation, which seeks to understand the nature of bird use and human-bird relationships, and the different ways that birds were important in Chaco life. In the next chapter, the second and third research objectives will be addressed in attempting to understand the nature of ritual practice and ceremonial organization in Chaco Canyon.

Chapter 6: Ritual Avifaunal Use, Ritual Practice, and Ceremonial Organization

Birds can be involved in ritual in a variety of direct and indirect ways. Whole birds may be incorporated in ritual practice as participants, ultimately ending up in dedicatory deposits. The same is true of parts of birds, such as wings, legs, and feet, which can be used in ritual practice and also end up ultimately in dedicatory deposits. But birds, their parts, and their primary and secondary products are also used in ritual and the preparation of objects for ritual. This includes most significantly their feathers, collected for use in ritual and in the manufacture of ceremonial objects such as prayer sticks, prayer feathers and bundles, and ceremonial dress and paraphernalia. The ritual use of birds therefore encompasses many types of activities, both ritual practice itself and those related to the preparation for ritual practice. Many of the avifaunal remains in Chaco Canyon appear to have resulted either from ritual practice itself, or as a byproduct of ritual-adjacent and preparatory activities.

The analyses presented in this chapter rely on a subset of the overall avifaunal dataset that contains remains likely to be the byproducts of ritual or ritual-related activities. Based on the results discussed in the last chapter, the overall dataset was pruned to remove specimens that were obviously or very likely to have been discarded as the result of dietary or bone-working practices. These include primarily specimens that were heat-treated, all worked bird bone objects, and several cases where remains were clearly the result of processing for the removal of meat. Of course, even individual specimens which provide evidence of consumption or object manufacture could have come from individual birds whose feathers could have been plucked for use in ceremonial attire or paraphernalia, such that some of the specimens removed to construct the *ritual avifaunal dataset* may have been related to ritual activities as well. Likewise, some of the remains remaining in this sub-dataset may be from birds that were cooked and consumed using methods that leave no traces on bones. There is no perfect way to separate remains into such constructed categories, since these behaviors are not mutually exclusive.

The resulting dataset is a best-estimation of a set of remains that do not appear to have been deposited in the Chacoan archaeological record as a result of dietary or object manufacturing activities, but instead of a range of activities either directly ritual in nature (ritual practices), or ritual-related (preparation of materials and objects to be involved in ritual). It is true that such a method for constructing a ritual dataset would *not* work everywhere, and in fact likely would not work in most places, as in other regions and time periods birds have been important components of diet, and remains bearing absence of evidence of consumption may still be more likely to be the products of such activities. For the Southwest, however, this is already a more quantitative method than that which is usually employed, which is to assume that all remains of wild birds occur in human contexts as a result of ritual activities. Given the limited evidence for consumption in the overall assemblage, the minimal degree of bone working, and a local ethnographic record that demonstrates an extensively ceremonial use of birds in the present and historic past, the sub-dataset which forms the basis of this chapter is perhaps as close as we may get to a quantitative foundation for the analysis of ritual practice.

The Ritual Avifaunal Dataset

The overall avifaunal assemblage discussed in the last chapter was only diminished by 7.1% of NISP and 10.5% of MNI after the removal of specimens clearly the byproduct of dietary or manufacturing behaviors. This pruned ritual dataset is presented in Table 6.1, and consists of 10,231 NISP and a minimum of 585 individuals. Overall, similar general patterns are evident in taxonomic representation as are in the overall dataset. Turkey remains continue to comprise the majority of the assemblage in both NISP and MNI, followed by golden eagle, red-tailed hawk, and hawks in general. Macaws of course are quite numerous in NISP since instances of macaws are primarily comprised of articulated individuals. Most taxa are represented by fewer than a minimum of 15 individuals, with the exceptions of the aforementioned taxa and several others (Table 6.1). Raptors continue to be robustly represented in general.

Table 6.1. The "ritual avifaunal dataset": subset of the overall avifaunal dataset having removed remains resulting from dietary or manufacturing activities.

Order	Family	Taxon	Common Name	NISP	MNI
Accipitriformes	Accipitridae	*Aquila chrysaetos*	golden eagle	426	55
		Haliaeetus leucocephalus	bald eagle	3	1
		Accipitridae (eagle-sized)	eagle	35	
		Accipiter cooperii	Cooper's hawk	2	2
		Accipiter gentilis	northern goshawk	2	2
		Buteo jamaicensis	red tailed hawk	284	36
		Buteo lagopus	rough-legged hawk	6	5
		Buteo regalis	ferruginous hawk	82	20
		Buteo swainsoni	Swainson's hawk	77	18
		Buteo sp.	hawk	217	32
		Circus hudsonius	northern harrier	33	3
		Accipitridae *(Buteo* or *Accipiter)*	hawk	2	
		Accipitridae (hawk-sized)	hawk	4	
	Accipitridae/ Falconidae	Accipitridae or Falconidae (hawk- or falcon-sized)	hawk or falcon	2	
	Cathartidae	*Cathartes aura*	turkey vulture	1	1
Falconiformes	Falconidae	*Falco mexicanus*	prairie falcon	33	9
		Falco sparverius	American kestrel	58	7
		Falco sp.	falcon	1	1
Strigiformes	Strigidae	*Asio* c.f. *otus*	owl, c.f. long-eared	4	1
		Bubo virginianus	great horned owl	32	15
		Megascops kennicottii	western screech owl	7	4
	Tytonidae	*Tyto alba*	barn owl	1	1
Anseriformes	Anatidae	*Anas acuta*	northern pintail	2	1
		Anas platyrhynchos	mallard	3	1
		c.f. *Mareca americana*	c.f. American widgeon	1	1
		Anas sp.	dabbling duck	2	2

		Anatidae	duck	2	
Gruiformes	Gruidae	*Antigone canadensis*	sandhill crane	37	8
Galliformes	Odontophoridae	*Callipepla squamata*	scaled quail	34	11
		Callipepla sp.	quail	8	5
		Odontophoridae	quail	1	
	Phasianidae	*Meleagris gallopavo*	turkey	5011	227
Columbiformes	Columbidae	*Zenaida macroura*	mourning dove	11	4
		Ectopistes migratorius	passenger pigeon	2	1
Piciformes	Picidae	*Colaptes auratus cafer*	red-shafted flicker	5	3
		c.f. Picidae	c.f. woodpecker	1	
Psittaciformes	Psittacidae	*Ara* sp.	macaw	12	2
		Ara macao	scarlet macaw	2405	35
Passeriformes	Turdidae	*Turdus migratorius*	American robin	1	1
		Turdidae	thrushes	1	
		c.f. *Sialia currucoides*	c.f. mountain bluebird	1	1
		c.f. *Sialia mexicana*	c.f. western bluebird	1	1
		Sialia sp.	bluebird	3	2
		c.f. *Catharus* sp.	thrushes	4	1
	Corvidae	*Corvus corax*	common raven	120	23
		Pica hudsonia	black-billed magpie	30	15
		Gymnorhinus cyanocephalus	pinyon jay	9	3
		Corvidae, small	small corvid	1	
		Corvidae, jay	jay	2	
	Alaudidae	*Eremophila alpestris*	horned lark	135	15
	Bombycillidae	*Bombycilla cedrorum*	cedar waxwing	3	2
	Hirundinidae	Hirundinidae	swallow	1	
	Icteridae	Icteridae	icterids	6	
	Laniidae	*Lanius ludovicianus*	loggerhead shrike	35	1
	Mimidae	c.f. Mimidae, thrasher	c.f. trasher	3	
	Passerellidae	*Pipilo chlorurus*	green-tailed towhee	10	4
		Junco hyemalis	dark-eyed junco	1	1
		Passerellidae (junco or sparrow)	junco or sparrow	3	
		Passerellidae	American sparrows	4	
	unknown	Passeriformes	passerines	13	
unknown	unknown	Aves, very small	very small bird	2	
		Aves, sm	small bird	59	1*
		Aves, sm-md	small-medium bird	12	
		Aves, md	medium bird	97	

		Aves, md-lg	medium-large bird	116	
		Aves, lg	large bird	697	
		Aves	bird	12	
		c.f. Aves			
Totals				**10231**	**585**

[1]Articulated individuals for a taxonomic category that otherwise did not have MNI computed, where an articulated individual was present that could not be identified to species.

Similar patterns in the distribution of NISP and MNI by site in the overall assemblage are also reflected in the ritual assemblage. The average density of faunal remains (NISP/number of rooms) is 18.0 specimens (Table 6.1). Seven sites have very low densities, under 1.00 specimen per room, including some sites that had avifaunal remains but which have no "ritual" avifaunal remains (Bc 59, Three-C Site, Turkey House), while five sites have specimen densities greater than 50. The remaining sites have specimen densities that fall between 1.3 and 12.6.

Table 6.2. NISP, MNI, number of taxa, and avifaunal specimen density by site for the ritual avifaunal dataset.

Site	**NISP**	**MNI**	**No. Unique Taxa**	**Avifaunal density (NISP/# rooms)**
Bc 50, Tseh So	33	6	4	1.32
Bc 51	82	15	10	1.64
Bc 53	15	3	2	0.60
Bc 55	3	1	1	0.75
Bc 57	837	44	11	59.79
Bc 58	37	5	4	2.85
Bc 59	0	0	0	0.00
Casa Chiquita	2	2	2	n/a
Chetro Ketl	56	14	11	0.39
Eleventh Hour site	167	14	8	111.33
Gallo Cliff Dwelling	35	8	6	7.00
Half House	3	1	1	3.00
Kin Bineola	1	1	1	n/a

Kin Kletso	238	20	9	4.25
Leyit Kin	125	18	9	6.94
Peñasco Blanco	0	0	0	n/a
Pueblo Alto	2166	110	25	144.40
Pueblo Bonito	3156	147	16	9.02
Pueblo del Arroyo	271	5	2	2.88
Pueblo Pintado	17	6	4	n/a
Pumphouse Site	23	3	3	
Rabbit Ruin	3	2	1	n/a
Rich's Site	233	7	2	12.59
Shabik'eshchee	3	3	3	0.14
Spadefoot Toad Site	571	15	5	51.91
Talus Unit No.1	169	25	11	4.97
Three-C Site	0	0	0	0.00
Turkey House	0	0	0	0.00
Una Vida	1386	39	13	86.63
Voll's Site	72	12	6	3.43
Zorro Bradley's Site	48	9	5	4.00
29SJ 1360	28	8	5	1.75
29SJ 329	1	1	1	n/a
29SJ 423	6	4	4	1.50
29SJ 626	9	5	4	n/a
29SJ 627	343	9	6	11.06
29SJ 628	21	5	2	3.50
29SJ 724	32	7	5	2.91
unknown	39	11	9	n/a

Bird Burials, Intentional Placements, Articulated Birds, and Articulated Bird Parts

Deposition of whole, articulated birds or articulated bird parts (such as wings or feet) in formal, intentional deposits (often burials), and the deposition of whole or partial birds in contexts that appear to have been deliberate (even when not burials) was common in Chaco Canyon. At least 85 instances of articulated birds or bird parts having been intentionally deposited were evident or could be surmised in the Chaco avifaunal assemblage, in addition to two other unique deposits containing many parts (approximately 187) of birds. Confusion easily arises in describing and distinguishing between individuals or parts of individuals that were articulated, buried, or intentionally deposited. To clarify the terminology and approach used here, articulated individuals or portions represent remains that appear to have been deposited still contiguous and attached by flesh. Articulations can be whole (complete birds deposited in the flesh), or partial (an individual body part, e.g. wing, leg, foot, head). It is important to note however that articulated birds or portions do not necessarily imply ritual dedicatory deposition (often called offerings). Some partial articulations may represent portions that are discarded as trash resultant from some other activity such as processing a bird for meat (e.g. discard of feet). It would be unusual however, to have a complete articulated individual that was not dedicatory.

Additionally, intentional, dedicatory deposits (offerings) can take many forms. While the term "burial" is often used to describe such deposits, ritual dedicatory depositions are not always burials in that they are not always placed in excavated pits, subfloor or subterranean deposits, or covered with other materials. Ritual dedicatory deposits also occur as intentional placements that were not burials, such as on floors and even in fill, especially in acts of closure.

In the Chaco avifaunal assemblage, all articulations were recorded in the process of analysis or determined conservatively after data collection. Theoretically, there are several steps in recognizing articulated individuals. The first and most important is during excavation; we are reliant upon the excavator to have recognized that they were uncovering the remains of an entire or partial individual. Such reliability was highly dependent upon excavation methods and the excavator. Even where multiple individuals were found together in the same context, care was not always taken to preserve the association between remains, and individuals were sometimes bagged together. Especially in early excavations where detailed drawings at every level of excavation were not made, it is challenging to reconstruct the exact locus and associations of different specimens. During the course of analysis for this dissertation, care was taken to identify articulated individuals using catalogue descriptions and contextual clues such as the ways in which the materials were boxed, and using hand-written notes that accompanied the material as well as excavation notes available for many sites on the Chaco Research Archive and in the CCNHP Archives.

After data collection, the entire dataset was scrutinized to try to identify remains that appeared, based on context, taxa, elements present (completeness or contiguity in the body), age, gender, and modification to have been from the same individual. After cases of articulation were identified, each instance was further assessed for other evidence, to determine if it was likely that the articulation was placed in an intentional, dedicatory way. Archival records were combed and field notes, specimen lists, catalogue records, and every other piece of possibly useful archival documentation was examined. Often, original excavators designated instances of burials or placements, sometimes in publications or site reports, and other times this had to be constructed from detailed field notes, maps, drawings, or other documents. Where excavators or previous analysts had not made such determinations, multiple lines of evidence (context, details of the remains, etc.) were needed to support the interpretation of intentionally deposited articulated bird or part.

There are 85 instances of ritually deposited birds or bird parts in the Chaco avifaunal assemblage. These are what others might call “burials” (though they are not all strictly *buried*).

Of these, 54 were determined to be deposited in dedicatory fashion (as burials or placements), and 31 were determined to very *probably* be dedicatory deposits. Beyond these 85 instances, there are even more instances (34) of articulated portions that are not discussed here and which were determined to not have sufficient supporting evidence to identify them as dedicatory. These are simply reflected in the overall dataset and were considered in calculating MNI. Two unique cases are known where multiple bird parts were interred *en masse* together; these are discussed separately as unique cases rather than presented as individual cases of articulated birds or parts. Additionally, 901 NISP come from contexts where remains appeared to be associated with other remains of the same taxon in the same context, but where articulation was not clear (such as a jumbled collection of remains of the same species).

Seventy-one of the individuals or parts described below were found or recorded in the course of data collection and analysis for this dissertation. An additional 14 individuals were reconstructed from existing literature and manuscripts.

Articulated Dedicatory Depositions at Great House Sites

Pueblo Bonito. Reviews of all types of fauna recovered from Pueblo Bonito have revealed that no articulated, complete individuals of any animals other than birds were ever interred at the pueblo (Bishop and Fladd 2018; Hill 2000). A total of 19 birds or parts were found in intentional dedicatory deposits, and an additional 6 in situations that were almost certainly intentional (Table 6.3). Taxa selected for such deposition include macaws (both Scarlet and *Ara* sp.), thick-billed parrot, sandhill crane, golden eagle, red-tailed hawk, Swainson's hawk, and black-billed magpie. Many of these birds were deposited whole, while others were represented by particular parts of the body, such as legs, feet, heads, or even most of the body missing specific parts that had been removed and taken elsewhere. Only parts of golden eagles were deposited (head, feet), while the two hawks were complete individuals. One sandhill crane missing distal extremities and its head was interred beneath a floor. In addition to these 19 individuals, an additional estimated 53 wings and 78 legs were recovered from one unique room, Room 334; these are discussed separately below.

Articulated deposits at Bonito are much more frequently found in rectangular rooms than they are in kivas. The only taxon left in kivas was golden eagle. Contexts for articulated individuals or portions thereof include resting on floors (sometimes covered with other objects), interred in prepared pits, deliberately placed in fill, buried beneath floors, and with infant burials. Several rooms received multiple individuals, especially rooms 38, 71, 78, and 306, and it is almost always macaws that were placed in multiples in the same room. In one instance, Room 306, the commingled remains of three macaws were interred in the same pit, while a fourth was buried in its own pit.

Several individuals deserve further, brief description. The beaks (premaxilla and mandibles) of four black-billed magpies appear to have been removed from their bodies and were deposited in Room 38, accompanying the macaws in this room. It is unclear if these were found in the subfloor pits containing two macaws, or if they were recovered with the many articulated but non-intentionally deposited individuals also found in this room (discussed below). Regardless, Hargrave noted that the beaks appeared to have been cut off and bound, resulting in lateral compression of the elements (Hargrave n.d).

Of the 25 deposited individuals at Bonito (Table 6.3), 13 had at least one skeletal pathology. One golden eagle pedal phalange had small pathological bone growth on the plantar surface. The remainder of pathologies occurred on the remains of macaws and thick-billed parrots, the former known to have been kept in captivity at Bonito (Judd 1954:264; Pepper 1920:195). These included roughened ulnae with bone trauma indicative of repeated plucking of the remiges (wing feathers) (noted also by Hargrave 1970), bent and deformed sternal keels that may indicate nutrient deficiency, bowed long bones, healed fractures, and pathological bony growth and spurs likely resultant from localized trauma or infection.

The majority of articulated deposited birds at Bonito are macaws (either Scarlet or *Ara* sp.). Each of these I have discussed in greater detail elsewhere (Plog et al forthcoming). Many macaws recovered from Pueblo Bonito (see Table 5.2) were not included in Table 6.3 because it could not be demonstrated conclusively that they were interred as articulated and/or intentional dedicatory deposits. These include 12 complete macaws that were found on the floor of Room 38, in a layer of bird droppings (Pepper 1920:195), having evidently died either in the collapse of the room or as a result of some other accident. The remains of five macaws (four complete and a fifth skull) were found in similar circumstances in Room 249 (Judd 1954:264). The partial remains of two other macaws were also recovered from Kiva J, one consisting of a head and a sternum, and a second of just a sternum. In Room 251, two partial macaws were found, consisting of one beak and random elements from another individual. Yet another partial macaw was found in Room 255, but consisted of only non-contiguous portions of the axial skeleton.

Pueblo del Arroyo. Five instances of articulated intentional deposits and one probable were identified at Pueblo del Arroyo (Table 6.3). Four of these are macaws, and two turkey. All are complete individuals deposited in the flesh, excepting one macaw whose remains could not be located and analyzed in the course of data collection. Where depositional details were known, all were deposited on or very near to floors, and always in rectangular rooms.

In Room 63, three macaws were deposited on a shallow accumulation of sand (Judd 1959:127). Each of these had multiple pathologies, including roughened ulnae, pathological bone growth or spurs, and an abscess. In Room 50, two adult female turkeys and a single scarlet macaw, all complete individuals, were deposited. One of these turkeys had a slightly bent sternal keel, though pathologies were absent on the other birds. Hargrave thought that there was definite evidence that the cap of the other turkey's skull had been cut off (Hargrave n.d).

One additional macaw was recovered from Pueblo del Arroyo, but is not included in Table 6.3 because there was not sufficient evidence to support its deposition in formal fashion. This incomplete skeleton was described by Judd (1959:127) as having two fractured and healed coracoids (Judd n.d.:83), but could not be located in museum collections.

Pueblo Alto. Twelve articulated birds or bird parts were intentionally deposited at Pueblo Alto. Most of these are either turkeys or raptors. These were recovered in the roomblock itself, the Alto trash mound, and in the primary plaza. In addition to these twelve, a reconstructed number of 40 wings and 16 legs, primarily of raptorial species, were deposited in a feature referred to as the "Bird Pit" by the original excavators (discussed in greater detail below). The large number of articulated individuals recovered even though only 10% of Alto was excavated is a direct reflection of the more modern excavation methods used.

Deposition of whole individuals, especially turkeys, was frequent in the trash mound. In one test pit, six very young complete turkeys appear to have been deposited either at once or in close temporal sequence, spanning a vertical range of 80cm. One of these individuals had a possible healed fracture of the wing. Also deposited in the trash mound was the right foot of a red-tailed hawk, and the left wing of an aged sandhill crane.

Several individuals were found in rectangular room contexts, including another foot of a red-tailed hawk in a firepit in Room 146. In the same context, the distal wing of a golden eagle was found. In Room 3, a complete horned lark with a healed wing fracture was left on the floor. In the northeast portion of the plaza, the right wing of a golden eagle treated with red ochre was deposited. Less than 10 meters to the east, in the northeast corner of the plaza, is the Bird Pit, discussed below.

Kin Kletso. Unfortunately, the loci and depositional details of all three individuals from Kin Kletso are unknown, despite efforts to reconstruct this information. Therefore, all three are only probable intentional depositions. The first is only the head (skull and premaxilla) of a macaw. The second, a great-horned owl also consisted of only the head (skull, premaxilla, and the left and right quadrates). Additionally, the right wing of a northern harrier was recovered, which had pathological bone growth on the distal shaft of both the radius and the ulna.

Una Vida. A single, complete, very young turkey was found in a thin layer of refuse on the floor of Room 63. Additionally, a single left ulna identified as thick-billed parrot was recovered from Room 65 (Hargrave 1961a), though this is not listed as an intentional deposition in Table 6.3.

Chetro Ketl. A single possible intentional deposition was recovered from Chetro Ketl, consisting of just the head (skull and premaxilla) of a Swainson’s hawk. Contextual details are unknown for this specimen since excavations conducted at the site have been poorly documented.

Table 6.3. Intentionally deposited articulated individuals or parts at great house sites (excluding parts from the Pueblo Alto Bird Pit and Pueblo Bonito Room 334, discussed in the text).

Taxa	Portion	Ritual deposition[1]	Provenience	Context	Identifier
Pueblo Bonito					
Swainson's hawk	complete individual	Y	Room 226	unknown	NMNH 343564
Red-tailed hawk	complete individual	Y	Room 264	on floor in SW corner of room	NMNH 343558
Scarlet macaw	complete individual	Y	Room 38	subfloor pit	AMNH H/5238
Scarlet macaw	complete individual	Y	Room 38	subfloor pit	AMNH H/5239
Black-billed magpie	beak only	Y	Room 38	on floor, with macaws	AMNH: no cat#
Black-billed magpie	beak only	Y	Room 38	on floor, with macaws	AMNH: no cat#
Black-billed magpie	beak only	Y	Room 38	on floor, with macaws	AMNH: no cat#
Black-billed magpie	beak only	Y	Room 38	on floor, with macaws	AMNH: no cat#
Scarlet macaw	complete individual	Y	Room 71	on floor	AMNH H/6452
Macaw (*Ara* sp.)	unknown	Y	Room 71	on floor	AMNH H/6451
Scarlet macaw	complete individual	Y	Room 78	on floor	AMNH H/6708
Scarlet macaw	complete individual	Y	Room 78	9" above floor	AMNH H/6709
Scarlet macaw	unknown	Y	Room 306	subfloor pit	NMNH 343580
Scarlet macaw	unknown	Y	Room 306	subfloor pit	NMNH 343580
Scarlet macaw	unknown	Y	Room 306	subfloor pit	NMNH 343580
Scarlet macaw	complete individual	Y	Room 306	subfloor pit	NMNH 343581
Thick-billed parrot	complete?	Y	Room 308	on floor, under masonry pillar	FS 1256
Scarlet macaw	complete individual	Y	Room 309	on floor, with infant burial	NMNH 343579

Scarlet macaw	complete individual	Y	E. refuse mound	unknown	NMNH 343574
Scarlet macaw	nearly complete; missing left wing and left leg	P	E. refuse mound	unknown	NMNH 343575
Thick-billed parrot	head only	P	E. refuse mound	unknown	NMNH 343584
Golden eagle	left and right feet	P	Room 328	unknown	NMNH 343544
Golden eagle	left and right feet	P	Kiva 67	debris	AMNH H/6248
Golden eagle	head only	P	Kiva I	unknown	NMNH 343552
Sandhill crane	nearly complete; but missing skull, pedal phalanges, and wing tips	P	Room 85	below floor	AMNH H/7264
Pueblo del Arroyo					
Scarlet macaw	complete individual	Y	Room 63	found on a shallow accumulation of sand	NMNH 344359
Scarlet macaw	complete individual	Y	Room 63	found on a shallow accumulation of sand	NMNH 344360
Macaw (*Ara* sp.)	unknown	Y	Room 63	found on a shallow accumulation of sand	#550
Turkey	complete individual	Y	Room 50	on/near floor	CHCU 107536
Turkey	complete individual	Y	Room 50	unknown	CHCU 63752
Scarlet macaw	complete individual	P	Room 50	unknown	C5
Pueblo Alto					
Turkey	complete individual	Y	Trash mound	within an 80cm vertical range in test	CHCU 90725, 90726, 90728, 90732

				pit	
Turkey	complete individual	Y	Trash mound	within an 80cm vertical range in test pit	CHCU 90725, 90726, 90728, 90732
Turkey	complete individual	Y	Trash mound	within an 80cm vertical range in test pit	CHCU 90725, 90726, 90728, 90732
Turkey	complete individual	Y	Trash mound	within an 80cm vertical range in test pit	CHCU 90725, 90726, 90728, 90732
Turkey	complete individual	Y	Trash mound	within an 80cm vertical range in test pit	CHCU 90725, 90726, 90728, 90732
Turkey	complete individual	Y	Trash mound	within an 80cm vertical range in test pit	CHCU 90725, 90726, 90728, 90732
Golden eagle	right wing	Y	Plaza 1	unknown	CHCU 74660
Golden eagle	right distal wing	Y	Room 146	in firepit	CHCU 74905
Red-tailed hawk	left foot	P	Room 146	in firepit	CHCU 80124
Horned lark	complete individual	P	Room 3	on floor	CHCU 88331
Red-tailed hawk	right foot	P	Trash mound	unknown	CHCU 80117
Sandhill crane	left wing	P	Trash mound	unknown	CHCU 90677
Kin Kletso					
Scarlet macaw	head only	P	unknown	unknown	CHCU 93706
Great-horned owl	head only	P	unknown	unknown	CHCU 95613
Northern harrier	right wing	P	unknown	unknown	CHCU 35798
Una Vida					
Turkey	complete individual	P	Room 63	thin layer of refuse on	CHCU 95039

				floor	
Chetro Ketl					
Swainson's hawk	head	P	unknown	unknown	CHCU 95622

[1]Y=yes, P=probable

Articulated Dedicatory Depositions at Small Houses

Bc 51. While only one individual was recovered from Bc 51, this single bird has unique implications for our understanding of human-avian relationships in Chaco Canyon. In Room 50, a rectangular room on the southwest side of this small house site, a complete American kestrel was buried beneath a floor. This bird appears to have sustained an injury to or infection of its jaw. Remodeled bone is visible on the left lateral side of the mandible, ventral to the dorsal condyle. Such an injury to the lower jaw of a raptor, which procures prey with the aid of its beak, would have required not only that food be procured for this bird, but that it be hand-fed. This American kestrel must have therefore been kept in captivity before its death, and was clearly disposed of with care.

Bc 57. Both common raven and turkey were found as articulated individuals intentionally deposited at Bc 57. In the fill of Room 7 a complete very young turkey was placed. An adult female turkey, nearly complete but missing below the knee and the distal wing, was found under a floor in Room 3. From Room 4, the left and right legs of a subadult common raven were found underneath a floor. A second articulated raven was found in an unknown context in Room 3. This individual was comprised of articulated elements making up most of the skeleton, but missing feet and part of the left wing. Multiple elements of this individual exhibit cut marks and indications of crushing from disarticulation, suggesting that either portions of this bird were removed before deposition, or that this bird was dismembered before its remains were deposited together (Watson 2012:138:Figure 5.2). As the left wing is missing from the elbow down, this wing may have been preserved elsewhere as a unit of feathers.

Bc 50. No articulated intentionally deposited birds or parts thereof were found or recorded from Bc 50 in this analysis. However, four individuals were reported elsewhere from "Feature 5", which Senter speculates was a kiva (Senter 1939:15, 34). These were found 6 inches above the floor in a layer of overlying laminated and windblown sand, indicating that they were placed there after the structure was no longer in use (Senter 1939:34-35).

Leyit Kin. Two articulated turkeys were deposited at Leyit Kin. One of these, a very young, complete individual, was recovered from Kiva B in a firepit that was no-longer used and had been partitioned in two using a broken metate. Fragments of eggshell showing yolk coloring were also found in the same half of this partitioned firepit (Dutton 1938:49). It is not clear, based on the size and immaturity of this individual if the bird had not yet hatched, just hatched, or was a few days old when it died, so it cannot be said if the individual was offered still in-egg, or having died at hatching, or if the bird had already hatched and the eggshell was unassociated with the individual. Size of the remains is slightly larger than those presented by McKusick (1986:21) as a "small Indian domestic" of 4 days old. However, given this individual could be a larger domestic or a wild bird precludes a definitive answer as to its association with the eggshell and its life stage at death and deposition.

Regardless of the bird's age at offering, this individual suffered deformation of both of its legs. The right tibiotarsus showed partial remodeling of an unknown nature, and the proximal articular surface of the left tarsometatarsus was malformed, with one side abnormally enlarged relative to the other, and the whole proximal end curved downwards. This latter pathology would have caused the left leg of this young turkey to bow outwards at the ankle. Again, the age of this bird at deposition complicates matters. It is unclear if these pathologies were developed before hatching, or injury was sustained after birth but before death.

The partial skeleton of an adult turkey, consisting of just the turkey from the "waist up," (having no legs) was found beneath the floor of Room 16, having been intentionally placed near the feet of an infant burial (Dutton 1938:55).

Talus Unit No.1. Two birds or parts were deposited in Kiva J. A complete sub adult turkey was found in unknown vertical context, with a slightly crooked sternal keel and two cervical vertebrae with pathologically enlarged interior facets. Additionally, just the left and right wings of a northern harrier were also placed in Kiva J. A nick on the proximal end of one of the humerii indicates these wings may have been removed from the bird using tools.

Gallo Cliff Dwelling. The articulated left wing of an adult turkey was recovered from this site. That it was deposited articulated is not debatable, since preservation is so good (protected by an overhang) that these specimens, consisting of the coracoid, scapula, humerus, radius, and ulna, were still held together by tendonal material. Feather quills and feather fragments also still adhered to and were in place of articulation with the feather-bearing elements. Further, fracture indicates that this entire wing was pulled or ripped away from the body and snapped off at the mid-coracoid and mid-scapula. Its recovery from an area designated as "trash" draws into question the intentionality in its placement, though it seems unlikely that an entire unit of feathers valuable for many purposes would be simply discarded.

29SJ 299. A complete adult male turkey was deposited on the floor of the southern half of Pithouse E. Another turkey burial was evidently recovered from Pithouse E, though it was not found or analyzed in the course of this dissertation (Windes 1976:16).

29SJ 627. Three individuals were interred or placed at this site. In Kiva E, a very young turkey was left on the “basal deposit” layer resting on the floor (Truell 1992:95-97). Pit Structure (or Kiva) F was intentionally filled in order to construct Kiva D (Truell 1992:61-62). This intentional fill contained the major limb bones and portions of the axial skeleton of two hawks of unknown but different species. Eight very young turkeys were found in “roughly the same level of fill” and “probably represent a single hatch” (Akins 1992:362), but these were not found or analyzed during the course of this dissertation.

29SJ 629 (Spadefoot Toad Site). Four articulated examples, all turkey, were recovered from this site. From Pithouse 3, the left and right wings of an adult turkey were found on the floor. Additionally, three complete immature turkeys were found in an intentionally filled pit in the plaza of this site.

29SJ 724. Two intentionally deposited parts were found at this site, recovered from Pithouse A in Roomblock 1, near the floor. These consist of a portion of the right wing of a red-tailed hawk, and the left foot of a ferruginous hawk. On the latter, one of the two calcaneal ridges on the dorsal surface of the tarsometatarsus was broken off, likely in disarticulation from the rest of the leg. The other calcaneal ridge appears to have been ground down. The removal of these ridges may have enabled the use of this raptor foot as paraphernalia or in some other way.

29SJ 1360. This site contained the only macaw to be recovered from a small house site. This individual was found in House 1, Pithouse B, in the fill from the structure’s bench to ground surface (no further vertical location is specified). In collections, this scarlet macaw is represented only by five elements from both the left and right side. Because material was not systematically recovered from this context, however, the remainder of this individual is likely in the backfill of the structure (McKenna 1984:321). Considering the dramatic way in which Pithouse B was abandoned following the apparent deaths of multiple individuals (see McKenna 1984:352-326), and the recovery of the macaw from the fill of the structure, this individual may represent a later post-occupational offering into accumulated fill. This interpretation is supported by the presence of weathering and root-etching on the remains, which suggest they were not protected by an intact roof.

The macaw from 29SJ 1360 appears to be one of the oldest in biological age of the macaws recovered from Chaco Canyon. The individual exhibits advanced osteophytic lipping on the proximal and distal ulna. This observation during data collection was corroborated by the same observation made by Emslie and reported by McKenna (1984:321). An additional aged macaw was recovered from Room 38 at Pueblo Bonito.

29SJ 628. This site is not a small house site but a Basketmaker III-Pueblo I pithouse site consisting of 6 pithouses, storage cists, and exterior hearths (Mathien 2005:Table A; McKenna and Truell 1986:49-54). One very young turkey was found in the fill of Pithouse E. Another very young turkey was recovered from Pithouse C but was not found or analyzed in the course of this dissertation research (Akins 1981f:6).

Unknown Provenience. One interesting individual is unfortunately completely unprovenienced. The left and right wings and feet of a northern harrier appear to have been found together, with a healed fracture on the left radius. These portions appear to have been snapped off at the distal humerus and the mid-tarsometatarsus, and the wings and feet deposited as articulated. The lack of gnawing and root-etching may indicate that these were deposited with flesh on and in a sealed or protected way.

Table 6.4. Intentionally deposited articulated individuals or parts at small house sites.

Taxa	Portion	Ritual deposition	Provenience	Context	Identifier
Bc 51					
American kestrel	complete individual	Y	Room 50	fill below floor	CHCU 35957
Bc 57					
Turkey	complete individual	P	Room 7	fill	Maxwell C91525
Turkey	nearly complete; missing below the knee and distal wing tips	P	Room 3	under floor	Maxwell C91508
Common raven	left and right legs	P	Room 3	under floor	Maxwell C91508
Common raven	nearly complete; missing feet and part of left wing	P	Room 4	fill?	Maxwell C91510, 91518, 91517, 91511
Bc 50					
Turkey[1]	complete individual	Y	Kiva/Pit structure 5	in fill just above floor	unknown
Turkey[1]	complete individual	Y	Kiva/Pit structure 5	in fill just above floor	unknown
Turkey[1]	complete individual	Y	Kiva/Pit structure 5	in fill just above floor	unknown
Turkey[1]	complete individual	Y	Kiva/Pit structure 5	in fill just above floor	unknown
Leyit Kin					
Turkey	complete individual	Y	Kiva B	in a no-longer-used firepit, partitioned using a broken metate	CHCU 94605
Turkey	half of turkey from the waist up	Y	Room 16	below floor, with infant skeleton	MIAC 26969

Talus Unit No.1					
Turkey	complete individual	P	Kiva J	unknown	CHCU 94789
Northern harrier	left and right wings	P	Kiva J	unknown	CHCU 35794
Gallo Cliff Dwelling					
Turkey	left wing	P	Trash area outside E wall	above floor fill	CHCU 50704
29SJ 299 (Rich's Site)					
Turkey	complete individual	Y	Pithouse E	on floor	CHCU 9972, 9871
Turkey[2]	complete?	Y	Pithouse E	on floor	unknown
29SJ 627					
Turkey	complete individual	Y	Kiva E	on floor	CHCU 28412
Hawk (*Buteo* sp.)	complete?	P	Kiva/Pit structure F	intentional fill	CHCU 80038
Hawk (*Buteo* sp.)	complete?	P	Kiva/Pit structure F	intentional fill	CHCU 80038
Turkey[3]	complete individual	Y	Kiva/Pit structure F	intentional fill	unknown
Turkey[3]	complete individual	Y	Kiva/Pit structure F	intentional fill	unknown
Turkey[3]	complete individual	Y	Kiva/Pit structure F	intentional fill	unknown
Turkey[3]	complete individual	Y	Kiva/Pit structure F	intentional fill	unknown
Turkey[3]	complete individual	Y	Kiva/Pit structure F	intentional fill	unknown
Turkey[3]	complete individual	Y	Kiva/Pit structure F	intentional fill	unknown
Turkey[3]	complete individual	Y	Kiva/Pit structure F	intentional fill	unknown
Turkey[3]	complete individual	Y	Kiva/Pit structure F	intentional fill	unknown
29SJ 629					
Turkey	left and right wings	Y	Pithouse 3	on floor	CHCU 60808

Turkey	complete individual	Y	Plaza	intentional fill of Pit 1	CHCU 60836
Turkey	complete individual	P	Plaza	Pit 1	CHCU 60917
Turkey	complete individual	P	Plaza	Pit 1	CHCU 60917
29SJ 724					
Red-tailed hawk	right wing	P	Roomblock 1, Pithouse A	near floor	CHCU 80024
Ferruginous hawk	left foot	P	Roomblock 1, Pithouse A	near floor	CHCU 93551
29SJ 1360					
Scarlet macaw	left and right wing elements	Y	Pithouse B	overburden 0-1m	CHCU 33549
29SJ 628					
Turkey	complete individual	P	Pithouse E	fill	CHCU 15364
Turkey[4]	complete?	Y	Pithouse C	unknown	unknown
Unknown site					
Northern harrier	left and right wings, left and right feet	P	Unknown	unknown	CHCU 35955

[1]Y=yes, P=probable
[2]Not analyzed by Bishop. Reconstructed from Senter 1939:15, 34.
[3]Not analyzed by Bishop. Reconstructed from Windes 1976:16.
[4]Not analyzed by Bishop. Reconstructed from Akins 1992:362; see also Truell 1992:61-62.
[5]Not analyzed by Bishop. Reconstructed from Akins 1981f:6.

At both great houses and small houses, birds or their parts were buried or placed in dedicatory fashion. At great houses, these included eagles, hawks, Sandhill crane, macaws and parrots, black-billed magpies, turkeys, ravens, owl, and horned lark, while at small houses ritual involving the deposition of birds was more narrowly focused on turkeys, hawks, falcons, and ravens. At both great houses and small houses, the practice of interring groups of immature turkeys in multiples is evident. Macaws were also often interred as multiples within the same room. Parts of birds such as wings and feet were more frequently used at great houses, while small house ritual focused on complete birds. Patterns in articulated bird deposition are discussed in greater detail below.

Unique Contexts

There are many unique contexts in which bird bone was found across the canyon, some of which are described above. But two in particular deserve separate discussion, Room 334 in Pueblo Bonito and the Bird Pit at Pueblo Alto. These two contexts are unique for the quantity of avifaunal remains they contain, the species present, and evidence that supports that many bird parts (wings and legs) were deposited in these spaces.

Pueblo Alto Bird Pit

The Bird Pit was excavated and so-named by the Chaco Project as they tested for buried kivas in the northeastern portion of the plaza at Pueblo Alto (Windes 1987:452). In Grid Square #30, they found an irregularly shaped pit that had been excavated into sterile red clay. The pit was 112 cm deep and approximately 114 cm wide, and only 65% of it (the portion in the grid square) was dug (Windes 1987:452). The material in this remarkable pit appears, based on ceramic content to have been deposited in a short span of time, perhaps a single event, in the early 1000s. Aside from high frequencies of jackrabbit and cottontail remains, the pit contained an unusual quantity of avifaunal remains (Akins 1987:599).

The Bird Pit appears to have been filled as a single event or over a short time span with many wings and legs of a variety of species. Analysis of the avifaunal contents of the pit reveals 256 NISP from at least seven different species—predominantly raptorial—and a minimum of 25 individuals (Table 6.5). The minimum number of body parts (wings, legs) necessary to account for all of the elements present was also calculated for remains identified to species. A minimum of 40 wings and 16 legs appear to have been deposited in this pit (Table 6.6). In every case, wings were broken off below the elbow, either at the elbow or at the wrist. Three of the 16 legs were broken off at the knee, and 13 were broken off at the ankle. All legs broken at the knee were from the left side. A small number of axial elements are also present in the pit, from 2 golden eagles, and one unidentified hawk. All remains were skeletally mature, indicating that no juveniles were involved.

Table 6.5. NISP and MNI of taxa found in the Pueblo Alto Bird Pit.

	NISP	**MNI**
Golden eagle	46	4
Red-tailed hawk	101	10
Rough-legged hawk	1	1
Ferruginous hawk	2	1
Swainson's hawk	3	1
Hawk (*Buteo* sp.)	92	6
Common raven	3	1
Bluebird (*Sialia* sp.)	1	1
Accipitridae (eagle-sized)	1	n/a
Accipitridae or Falconidae (hawk- or falcon-sized)	1	n/a
Passeriformes	1	n/a
Aves	4	n/a
	256	**25**

The location of evidence for disarticulation by hand or dismemberment by cutting supports the interpretation that articulated parts were deposited. Crushing, peeling, and chopping are found on the proximal ulnae and radii, proximal carpometacarpi, distal tibiotarsi, and proximal tarsometarsi, all joints of the knee, ankle, elbow, and wrist, consistent with the interpretation that portions were disarticulated at these joints from the rest of the bird. Additionally, cut marks are concentrated on eagle remains, while crushing and peeling occur more frequently on the remains of hawks. This distribution is likely related to the size of each bird and consequently ease of dismemberment.

Table 6.6. Minimum number of wings and legs in the Pueblo Alto Bird Pit.

	Wings		**Legs**	
	Left	**Right**	**Left**	**Right**
Golden eagle	4	2	1	1
Red-tailed hawk	10	8	4	4
Rough-legged hawk				1
Ferruginous hawk	1			
Swainson's hawk		1		
Hawk (*Buteo* sp.)	6	6	2	3
Common raven		1		
Bluebird (*Sialia* sp.)	1			
	22	**18**	**7**	**9**

That the elements in the Bird Pit were deposited as parts of articulated portions, and that the pit was filled and then sealed or covered is supported by multiple lines of evidence, such as the total lack of observed gnawing and minimal weathering (1.1% of NISP). Akins hypothesizes that, based on weathering ("checking") the pit was probably filled fairly rapidly rather than left open and filled gradually (Akins 1987:602).

The Bird Pit in the plaza of Pueblo Alto appears to be the result of a ceremonial activity that deposited multiple raptor wings and feet. These portions could have been sacred in and of themselves and served in an act of dedication. They may have also been retired components of ceremonial paraphernalia taken out of circulation and disposed of as sacred "trash."

Pueblo Bonito Room 334

Room 334 in the western half of Pueblo Bonito is an intriguing but challenging to interpret room that in many ways appears similar to the Pueblo Alto Bird Pit. Challenges that arise in the interpretation of this room stem from the limited notes that were taken during excavation by Judd, and the absence of photographs or drawings of this deposit. Regardless, its contents are remarkable. Whatever the behaviors and activities that resulted in the contents of this room, it contained elements of the wing, leg, and to a lesser degree axial skeleton elements of 56 individual birds (418 NISP). Though there are multiple possibilities for what activities produced this deposit, it appears that articulated parts (predominantly wings and legs), primarily of raptors, were deposited here. Evidence also suggests that whatever these activities, they were ritual or ritual-adjacent in nature.

Room 334 was built between 1071 and 1073 CE, and appears to have remained in use until at least 1150 (Windes 2003). The remains of Room 334 are predominantly raptors, including golden eagle, various hawks, and great-horned owl (Table 6.7). Many elements that would be expected to be present with the deposition of whole skeletons are absent, such as vertebrae and many of the elements of the skull. Second, while elements from the axial portion of the body are present for some species, they are not present for all, and in general they are underrepresented relative to elements of the limbs (discussed below). Additionally, even though excavation strategies were sub-par by today’s standards and systematic notetaking was not the norm, both the Hyde Expedition (Pepper) and especially the National Geographic Society Expedition (Judd) demonstrated a tendency to recognize and record complete individuals (such as the many articulated burials and placements from Bonito just discussed). When found, such deposits were usually recognized and then excavated carefully by hand and documented with drawings and sometimes photographs, and often written up. Had the specimens in Room 334 been recovered as 56 articulated complete individuals in a mass burial, surely Judd would have noticed and described them as such.

Table 6.7. NISP and MNI of taxa found in Pueblo Bonito Room 334.

	NISP	MNI
Golden eagle	184	14
Red-tailed hawk	93	11
Ferruginous hawk	35	6
Swainson's hawk	37	13
Great-horned owl	5	2
Common raven	21	4
Prairie falcon	24	3
Turkey	17	3
Aves, lg	2	n/a
	418	**56**

The uneven representation of different parts of the bird skeleton also suggests that they were not whole, but indicates instead that they likely comprise many articulated portions (especially wings and legs) of birds. Of the remains in this room, 74% of the NISP are from the limbs (wings and legs). Some birds are represented only by limb elements, while some have elements of the axial skeleton as well. The minimum number of body parts necessary to account for all of the elements present is presented in Table 6.8, where it can be seen that for most taxa wings and legs predominate, but for golden eagle and red-tailed hawk, axial portions are well-represented.

Table 6.8. Minimum number of body parts in Pueblo Bonito Room 334.

	Wings		Legs		Axial	
	Left	**Right**	**Left**	**Right**	**Head**	**Trunk**[1]
Golden eagle	11	8	10	4	13	14
Red-tailed hawk	6	6	7	10	1	12
Ferruginous hawk	2	3	6	5		
Swainson's hawk	1		8	12		
Great horned owl			2	1	1	1
Common Raven	4	4	1	2	1	1
Praire falcon	3	1	3	3	1	1
Turkey	1	3	2	2		1
	28	**25**	**39**	**39**	**17**	**30**

1. from below skull to pelvis.

Following Akins (1987:478, Table 8.7), percentages of elements from different parts of the body (skull, axial, wing, leg, foot) were compared to expected percentages in a complete bird skeleton (Table 6.9). Wing and leg elements are over represented, while axial elements are underrepresented. While some axial elements (such as ribs) may be more susceptible to density-mediated attrition or to being missed by excavators, other small elements (e.g. pedal phalanges) were recovered from this room, suggesting that preservation is not to blame for their absence.

Table 6.9. Percentages of body part elements compared to expected percentages in a complete bird skeleton.

	Expected percentage of the body	**Room 334**
Skull	6.4%	7.9%
Axial	44.1%	10.8%
Wing	22.1%	33.7%
Leg	7.8%	43.0%
Foot	19.5%	4.6%

Considering evidence of dismemberment (cutting) and of disarticulation by hand (crushing or peeling) on all remains in Room 334, these marks were present at all of the major joints, supporting the interpretation that parts of birds were removed and deposited in this room. These joints include the shoulder (proximal coracoid and scapula), at the elbow (distal humerus, proximal radius and ulna), at the wrist (distal radius and ulna, proximal carpometacarpus), near the wing tip (distal carpometacarpus), hip socket (proximal femur), knee (distal femur, proximal tibiotarsus), ankle (distal tibiotarsus, proximal tarsometatarsus), and foot (distal tarsometatarsus). By species, dismemberment only occurred at the elbow of common raven, at the elbow and wrist of ferruginous hawk, at the ankle of Swainson's hawk, at the elbow and ankle of prairie falcon, at the knee and ankle of great horned owl, at the wrist, elbow, knee, and ankle of red-tailed hawk, and at every joint of golden eagle, including even the hip joint with cut marks in and around the acetabulum of the pelvis.

Other indicators lend additional assistance in the interpretation of Room 334. Nearly 90% of the elements in this room were complete or nearly complete, indicating that these remains were not broken up for consumption; they were also not heat-treated. The absence of other domestic refuse in Room 334 (Chaco Research Archive, Square Room Query 1) indicates that these remains were not deposited in the course of normal trash disposal, but as the result of a more specific activity. Nor do the contents of this room appear to reflect a stockpile of raw material for bone tube manufacture. Evidence of scraping to prepare bone for manufacture is almost entirely absent (3 specimens). Overall a small number of specimens had any evidence of having been gnawed by animals. The presence of rodent gnawing on some bones (4.8% of specimens), but the near absence (only 0.5% of specimens) of carnivore gnawing suggest that while these specimens were likely deposited still articulated by flesh, the room was protected from and sealed off to access by carnivores. The limited degree of weathering present on these remains (3.8%) is consistent with being protected by the roof.

The location of Room 334 and details of its features and contents are similarly informative. This room is located adjacent to Kiva T, a large kiva. It is also cattycorner to Kiva 59. In the western wall of Room 334 was a t-shaped door of "unusual size," supposedly the largest that Judd found at Bonito (Judd 1921-1927:188; 1964:28). This door led directly onto the roof of Kiva T (Judd 1964:28). The avifaunal remains from Room 334 were found in 30 inches of material resting on the floor (Judd 1921-1927:189). Other materials in this deposit include the remains of bobcat, red fox, gray fox, mule deer, rabbit, pronghorn, and coyote (Chaco Research Archive 2019, Specimen List 4), as well as worked shell, greenstone, and jet, a shell bracelet, and a turquoise bead. Both doors to this room appear to have eventually been sealed.

Akins described the Pueblo Alto Bird Pit in the following way: "both the species distribution and butchering suggest that something unusual resulted in the contents of this pit" (Akins 1987:602). The same can be said of Room 334. While there are multiple possibilities for how the contents of Room 334 were deposited, evidence indicates that articulated portions (especially wings and legs) were removed from many raptors and, either right away or eventually, made their way into this room. This deposit may have been created, as was the Pueblo Alto Bird Pit, as a place for the dedicatory discard and decommissioning of objects of ceremonial importance that may have been used in ritual performance taking place in the adjacent Kiva T. If so, whether this deposit was created in a single event or short span as one large dedication of many raptor parts, or whether it was left open and accumulated parts over time as materials were retired is unclear. Another possibility is that this room served as a storage location for many raptor wings and legs in between their ceremonial use, from which these objects were retrieved when needed and to which they were returned after use. If so, the end-life of this room is unknown. The room may have been intentionally sealed and converted into a final dedication through the filling-in of both doors. Alternatively, if a roof access was present, this room may have simply been abandoned and left as-is when the occupants of Pueblo Bonito departed.

Regardless of whether the Room 334 deposit was a single act of dedication or provided a place to store the sacred materials used in Kiva T, these objects were either abandoned in place or intentionally sealed into a dedicatory space.

Floor contexts

Many of the articulated individuals described above were recovered in association with floor contexts: resting on them, buried beneath them, or placed in pits excavated into them. This type of deliberate placement occurs with the disarticulated remains of birds as well. As is the case with the articulated individuals described above, determining which remains were found in association with floors is again highly dependent upon the level of contextual and provenience data accompanying the material collections or that could be reconstructed from archival documents. Therefore, the short discussion that follows and the remains that are known to have been found in association with floors represent evidence of presence but certainly not evidence of absence.

Of those articulated individuals described above, multiple taxa occur on floors. These include most commonly turkey (n=4), macaws (4), thick-billed parrot (1), golden eagle (in firepit, 1), red-tailed hawk (1 on floor, 1 in firepit), and horned lark (1). Individuals interred below floors include turkey (3), American kestrel (1), and common raven (1). Additionally, 6 macaws were interred in pits excavated in floors. One turkey and one macaw were each associated with infant burials.

In addition to these, the remains of many more birds (435 NISP) that did not obviously form articulated individuals also occurred in such contexts. Disarticulated turkey, red-tailed hawk, and prairie falcon remains were found associated with burials in small numbers, together comprising only 66 NISP and 4 MNI. While 101 NISP were found deposited below floors, most of these occur in instances of under 5 NISP together, and often only as a single specimen in a given subfloor-context. One exception is a quantity of avifaunal remains, from both turkey and unidentified large Aves found beneath the floor of Room 3 at Bc 57; the nature of this deposit is unclear. Disarticulated taxa found below floors included turkey, golden eagle, ferruginous hawk, mourning dove, and black-billed magpie.

A greater number of disarticulated remains, 267 NISP, were found in contact with floors. Taxa recovered from floor-contact contexts included turkey, scaled quail, great-horned owl, golden eagle, bald eagle, red-tailed hawk, Swainson's hawk, unidentified eagle, and unidentified hawk. Again, in many cases these were single specimens or groups of under 5 NISP. Exceptions to this include random remains of 3 (MNI) turkeys (64 NISP) from Pithouse E at 29SJ 299.

On the floor of Room 19 at Una Vida, 78 NISP (5 MNI) of turkey were found, and 14 NISP of turkey were found on the floor of Room 103 at Pueblo Alto. Additionally, the floor of Room 159 at Pueblo Bonito appeared to support the remains of a variety of hawks and eagles, including red-tailed hawk, Swainson's hawk, unidentified hawk, bald eagle, golden eagle, and unidentified eagle (58 NISP, 33 MNI).

Of course, single bones on a floor are not compelling evidence of deposition related to ritual activities. Similarly, the interpretive potential of random disarticulated remains from contexts beneath floors is also ambiguous; these could arguably represent trash used as fill, or the consecration of certain remains. In most cases, a lack of excavation notes or detailed contextual information is prohibitive to interpretation. On the other hand, where remains appeared to have been intentionally placed with burials, the ritual association is clearer.

In Chaco Canyon, a variety of taxa appear to have been placed in depositional contexts intentionally created or used to receive their remains, articulated in whole or part. Birds occur as complete articulated individuals or articulated portions interred below floors, in prepared floor-level pits, and left to rest on floors; articulated portions were deposited *en masse* in special, designated spaces or rooms (e.g. Pueblo Bonito Room 334, Pueblo Alto Bird Pit), whole individuals or even individual bones were placed in accompaniment with human burials, especially those of infants; and more ambiguously, disarticulated remains or portions of birds were left on floors or found beneath floors. The significance of these types of deposits is further explored in the next section.

Ritual Practice and the Mechanisms of Ritualization

A theory of ritual practice and the mechanisms of ritualization as put forth by Bell (2009a,b) were described in Chapter 3. In Table 3.1, I provided archaeological expectations for each of Bell's mechanisms and relevant examples for this dissertation. Testing these expectations against the Chaco avifaunal assemblage and the record of ritual deposits involving birds achieves several things. First, while a bird burial is certainly recognizable as a ritual act, identifying the mechanisms that were used to set the act which produced it apart confirms its speculated ritual origin. Moreover, this process reveals the many ways in which ritualized activities were made distinct and marked as different, separate, and sacred, shedding light on the components and nature of the ritual experience.

Articulated Dedicatory Bird Depositions

All of the mechanisms put forth by Bell (2009b) and described in Table 3.1 are relevant for interpreting remains in primary contexts, especially intentionally deposited articulated individuals, since the interpretive leap from material remains to the behavior that produced them is the narrowest. While many deposits in Chaco Canyon may in fact be primary, due to the complications of interpreting some deposits from excavation notes, the focus here is on deposits that are unequivocally primary.

It is important to remember, as discussed in Chapter 3, that all that is visible in assessing the archaeological record is the ultimate location of deposition for objects that in some cases had long use-lives before ending up in their final resting places. In the following text and interpretation concerning the deposition of articulated birds, for example, the patterns that are visible concern only the ultimate disposal and placement of these birds, not necessarily how they, their parts, or their feathers were involved in ceremony before they were finally laid to rest. Concerning disarticulated remains, again we see the very end of their individual histories. This is not to say that patterns in the deposition of all bird remains, articulated or disarticulated, are not informative. As argued in Chapter 3, the locations of ultimate disposal can reflect structuring principles and commonly held beliefs that determined where such objects were finally discarded or placed. Therefore, while the full picture of ritual life may never be developed, patterns in the final depositions of the material record of ritual are still highly informative.

Formalism as a mechanism to ritualize practice may be reflected in the use of formal architecture or formal spaces and embellishments to elevate the status of ritual practice where it physically occurs. For example, in Early Formative period southern Mexico, ritual was often carried out on constructed platforms that literally elevated and formalized the experience of ritual (Bishop et al 2018; Lesure 2011). In some cases, the mechanism of *performance* may also be closely related to formalism. The degree to which ritual practice was performative may be implied by the degree to which it was formalized, and the size and nature of the space in which ritual occurred. Performance and formalism may also be closely tied to the size of the audience witnessing a specific event. For example, highly public ritual (viewed by a large audience) is probably highly performative (to captivate and draw in the audience), and is also probably highly formalized (increasing the air of importance of the experience). Whereas smaller more private ritual experiences, viewed by a limited and restricted number of people, are likely to have been less performative in nature. However, private ritual with a restricted audience could conceivably still be formal in nature, especially if private ritual was esoteric and carried out by ritual leaders with specialized knowledge.

The latter appears to have been the case with Chacoan great house ritual that involved bird offerings. Considering the layout of Chaco sites and the types of rooms constructed, plazas may be considered the most performative of spaces, capable of accommodating the largest amount of people, and unrestricted in view. Great kivas, average-sized kivas, and smaller kivas follow in decreasing size (see Lekson 1984:51-61), capable still of accommodating a number of people, though each of these may still have limited audiences depending on the nature of ceremony that occurs in them. Lastly, although some rectangular rooms at some sites rival kivas in size (e.g. at Pueblo Bonito), overall they may be smaller and serve a greater range of functions including habitation and storage. With each of these types of spaces, formalism may have also decreased. For example, especially at great houses, kivas and great kivas are more formal than rectangular rooms, considering their function, the specialized features they contained, and the ways in which they are prepared and decorated before and during ceremonies. Some rectangular rooms, however, do appear specially and formally prepared compared to others, containing specific features (hearths, niches) and preparations (wall plastering, whitewashing).

At Chaco great houses, intentionally deposited articulated individual birds or parts are concentrated more heavily in rectangular rooms than in kivas, great kivas, or plazas. Sixty percent of individuals were placed in rectangular rooms, while only 4% were recovered from kivas. Twenty-three percent were interred in trash mounds, while 2% were interred in plazas (these values do not include the Pueblo Alto Bird Pit or Pueblo Bonito Room 334, both of which represent unique events or deposits and which would obscure all other patterns). Using Pueblo Bonito as a specific example, considering just the individuals deposited in intramural contexts (excluding the trash mounds), 91% of individuals were in rectangular rooms and only 9% in kivas. Many of these are rectangular rooms in the interior of the roomblock, set back and not fronting the plaza. Instead of the deposition of whole birds or bird parts occurring frequently in large, formalized spaces (such as kivas or great kivas) or in spaces amenable to more performative acts (such as plazas), deposition more frequently took place in smaller, closed-off spaces that would have accommodated much smaller groups, creating restricted ritual experiences witnessed only by a few. Such acts may have been intentionally confined to private spaces to limit who could be present.

While many rectangular rooms at great houses might be considered informal spaces, by contrast, those from which bird offerings were recovered appear to have been formalized through certain features and wall treatments. For example, at Pueblo Bonito, of the 10 rectangular rooms with these deposits, 80% have walls that had been plastered, and 20% had walls that had also been whitewashed. Considering all first and upper story rectangular rooms in the overall pueblo, only 35% had plastered walls, and only 4% had whitewashed walls (Chaco Research Archive 2019, Square Room Query 2, Round Room Query 2). Furthermore, articulated birds and parts in rectangular rooms at Pueblo Bonito appear to occur frequently in rooms with hearths. Seven of 10 rectangular rooms with these deposits had hearths. Of those just in the northern arc of Bonito, six out of seven had hearths. Thus, two of the three rooms to not contain hearths occurred outside of the northern arc and happen to be the only two rooms that contain complete hawks (Figure 6.1). Considering all ground-floor rectangular rooms at Pueblo Bonito (approximately 300), only 20% contain hearths. Thus, rooms containing dedicatory articulated birds or parts of birds were arguably more formal spaces than other rectangular rooms, specially prepared to play host to the types of ritual acts that were meant to take place in them. This suggests that these rooms may have been specialized ceremonial rooms, discussed further below.

Ritual involving the deposition of birds and bird parts does not appear to have been largely performative at great houses. It was evidently not practiced for the eyes of larger groups or the entire pueblo. The absence of bird offerings from plazas and kivas may be an issue of excavation bias at some great houses, where plazas were rarely trenched (excepting Pueblo Alto). One exception to the generally secretive ritual involving the deposition of birds at great houses is the Pueblo Alto Bird Pit, which was created in the northeastern portion of the central plaza, and its use may have been witnessed by a larger group of people. By contrast, the creation of a similar deposit in Room 334 at Pueblo Bonito occurred in a rectangular room, whose walls were plastered.

Ritual involving the offering of birds at small house sites appears to have also been somewhat formalized and not largely performative, but contrasted to great house ritual in several important ways. At small house sites, kivas (which generally are small) represent slightly more formal spaces than rectangular rooms, though in general they are not as formalized in their construction and features as great house kivas. Plazas, where present at small house sites, or even neighboring great kivas (such as Casa Rinconada, the isolated great kiva located in the cluster of Bc sites on the south side of the canyon), would have provided spaces more amenable to performance than typical rooms or kivas at small houses. Seventy percent of articulated cases at small house sites occurred in kivas or pitstructures, while 16% occurred in rectangular rooms. Eight percent occurred in plazas, and 3% in middens. Data for plastering and whitewashing were too inconsistently available for the small houses, but where this information could be found, rectangular rooms containing these deposits frequently had plastered walls. Thus, ritual involving the offering of birds at small house sites appears to have occurred either in kivas or in relatively formal rectangular rooms, marking ritual as somewhat formalized, though likely less so than at great houses.

Sacral symbolism, establishes a connection between the components of ritual (people, objects, spaces) and a "sacred power." The most obvious indicator that sacral symbolism was a component of Chacoan ritual is the presence of macaws and parrots. Like other types of exotic materials procured from far outside the canyon (e.g. shells and copper bells), macaws likely represented something distant, and therefore powerful (sensu Helms 1998). Today, they are associated predominantly with the south and the sun (Tyler 1979). With only one known exception (at 29SJ 1360), all of the parrots or macaws found in Chaco Canyon were recovered from great houses. At Pueblo Bonito specifically, where the largest quantity of macaws and parrots has been recovered, deposition of articulated individuals in intramural contexts (excluding three in the east refuse mound) is concentrated exclusively in the northern foundational arc of the pueblo, the first to be constructed (Bishop and Fladd 2018).

Disarticulated remains were found elsewhere in the pueblo, but only on the eastern half. The northern foundational arc of Bonito contains the two Bonito burial clusters with some of the richest artifact concentrations in the entire Southwest (Plog and Heitman 2010). The concentration of dedicatory deposits of exotic birds in this section of the pueblo suggests that their use was attached to the demonstration of ritual knowledge and power, related to the procurement of exotic birds. The concentration of articulated macaws exclusively in rectangular rooms suggests that these rituals may have been secretive.

While "distant" birds were obviously important, so too were several local species. Raptors, both hawks and eagles, figure prominently in instances of articulated deposition. Elsewhere I have argued that, based on characteristics of their behavior and biology, these birds are some of the hardest to procure local species (Bishop forthcoming). While the acquisition of macaws from a breeding center in the Southwest/Mexican Northwest would have required social connections and capital, acquiring the great many raptors represented in the overall Chaco avifaunal assemblage would have also required tremendous effort. In fact, of all articulated depositions, raptors (hawks, eagles, owls) are nearly equally numerous as macaws/parrots. These values exclude the Alto Bird Pit and Room 334 in Pueblo Bonito, which both provide unique instances of the deposition of multiple parts of many raptors, strengthening the interpretation that these birds were, in their own way, just as significant as macaws. Today, raptors are obvious participants in ritual (as outlined in Chapter 2), and have associations with the sky, the zenith, and hunting. Unlike macaws and parrots, the deposition of raptors as articulated individuals or parts was not restricted to great houses, though they are more concentrated at the latter.

Turkeys, which clearly had utilitarian value (potentially as food, definitely as a source of bone for raw material), comprise 41% of all articulated individual birds or parts. These appear at both great and small houses, and are more numerous at the latter. Perhaps turkeys and raptors were deposited as articulated individuals at small house sites in lieu of macaws, which may have only been available to the inhabitants of great houses who had the resources or connections to procure them. Interestingly, formal articulated deposits containing turkeys are completely absent at Bonito despite the abundance of intentionally deposited articulated individuals at this site. According to Tyler (1979:55), turkeys are companions to people in both life and death. And indeed, they are one of the birds with whom Ancestral Puebloan peoples had the most direct and intimate contact. In at least one instance, an articulated portion of a turkey was found with an infant burial at Leyit Kin.

Invariance is a challenging mechanism to see in the archaeological record, since as a characteristic it describes behaviors that do not as frequently leave material traces. For an act to be ritualized through invariance means that repetition and control in the act create the feeling for the audience of being subordinated to “a sense of the encompassing and enduring” (Bell 2009b:153). Unfortunately, many invariant characteristics and practices that might characterize ritual, such as repetition of words, gestures, and bodily movements, are invisible to the archaeologist. Invariance may be evident archaeologically however in primary context deposits that result from single events where some consistent behavior occurred repeatedly. For example, where the same materials are used over and over in the same way, indicating some repetitive, invariant behavior.

Potential examples of ritual acts characterized in part by invariance include those that resulted in the creation of the Pueblo Alto Bird Pit, and in the contents of Room 334 at Pueblo Bonito. If the Bird Pit was created in a single instance, as evidence seems to suggest, many wings and feet were placed in the same space in sequence in the same way. For Room 334, it is less clear over what time span this deposit was formed. Even if the Room 334 deposit was not created in the same way as the Bird Pit, even if it accumulated over time as the repository for items used in the adjacent kiva, then parts of the same types of birds (raptors) were repeatedly used nearby over time, serving as evidence of traditionalism, discussed below. While there are few examples of material evidence for what might be characterized as invariance in ritual practice in Chaco, it is not necessarily that invariance did not characterize ritual behavior, but that we cannot determine to what degree it did because invariant behaviors may not leave clear material traces.

The principle of *rule governance* in ritual practice describes the use of rules that dictate how to act in a ritual experience and the types of behaviors that are or are not appropriate. Such rules can amount to simply a shared idea of what is and what is not acceptable behavior, or to formal, prescribed rules about who can do what, when, where, and how. In the archaeological record, rule governance may appear as standardized ritual practice through deposits that appear to have been created according to an idea of what is and is not suitable. The patterns described above for formalism and performance are relevant here. If no rules governed how birds were involved in ritual as articulated depositions, then we might expect them to occur in many different types of spaces involving many different types of birds and in many different contexts, these details having been determined by individual whim rather than in accordance with accepted practices and ideas of how ritual should be done. And yet, considering the great range of ways that an articulated individual or part could theoretically be deposited, and the great many taxa that are locally available that could be involved, there were clearly shared ideas or rules concerning how things should be done.

First, practices differed between great house and small house ritual concerning where articulated individuals or parts were to be deposited. There is some consistency at great houses in the placement of articulated individuals or parts in rectangular rooms, while at small houses these occurred more commonly in round rooms (kivas and pithouses). Considering the species that were chosen for practices that resulted in these deposits, a finite range of taxa were appropriate. While 41 discrete taxa are represented in the overall avifaunal assemblage, only 14 were deposited as articulated individuals or parts in intentional placement. Specifically, turkeys, macaws or parrots, and raptors comprise 89% of all instances.

While there may have been shared ideas about what birds were suitable for such ritual practices, there is greater variability, indicating more flexible rules, concerning the finer details of deposition. Birds or parts were placed in multiple situations, including on floors, below floors, in prepared pits below floors, in firepits, in room fill, in pits in plazas, in trash mounds, and with burials. It does not appear to be the case that specific taxa were always prepared in a certain way, nor that they were prepared differently in great houses compared to small houses. The only patterns evident are the following: (1) at both great and small houses, only macaws were placed in prepared subfloor pits and this practice appears to have been exclusive to macaws and great houses; (2) birds were placed on floors, below floors, in firepits, and (rarely) with burials at both great and small houses; (3) the majority of instances of birds placed in fill occurred at small houses, while only several instances were noted at great houses. Turkeys received the greatest variability in treatment, being deposited in all of the ways listed (except in subfloor pits).

The last mechanism, *traditionalism*, infuses ritual with a sense of legitimacy and authenticity by establishing a connection between current practices and antecedent ones. Establishing this connection grounds ritual in time-honored tradition and qualifies it as legitimate and powerful. For ritual to be traditional does not imply that ritual practices themselves remain unchanged over time, but that certain elements can be maintained or referents to past practices made in order to make the entire experience, however different from before, still seem traditional. In the archaeological record, traditionalism is manifested in evidence of continuity over time in the same types of ritual acts and behaviors (i.e., the deposition of articulated animals), and/or in continuity of the details of these practices (such as where and how they occurred). Continuity can be seen at many scales, including at the level of the site, between sites that were primarily occupied at different times, and at the regional level, where practices may have antecedents in preceding periods at other sites within the region but outside the study area.

Examining evidence for traditionalism as an important component of ritual practice requires some level of chronological control. For the articulated intentional deposits addressed here, temporal assignments were made for specific rooms within sites wherever possible (using primarily McKenna and Truell 1986; Windes 2003; Windes and Ford 1996). Where such information was not available, phases were assigned based on the overall dating of the site. Cases were then assigned to the Basketmaker III (500-750 CE), Pueblo I (750-900 CE), Pueblo II (900-1150 CE), or Pueblo III (1150-1350 CE) periods. Evidence indicates that, while the practice of depositing or burying birds was a long-lived tradition, the specifics of how that was accomplished appear to have become more flexible over time.

Broadening our geographical scope, the earliest known burials, interments, or intentional depositions of articulated birds were not in Chaco Canyon. This tradition appears to have emerged at least by late Basketmaker II times (50-500 CE), with the earliest known example from Canyon del Muerto in northeastern Arizona, dating to approximately 250 CE (McKusick 1986:4), and was relatively common by the Basketmaker III period (500-750 CE) (Badenhorst and Driver 2009:1838; Munro 1994:102-103). This tradition is reflected throughout the sequence in Chaco Canyon, from sites established as early as the 6th century CE (29SJ 628) (McKenna and Truell 1986:138). Nine of the intentionally deposited articulated individuals or parts date to Basketmaker III (500-750 CE) or Pueblo I (750-900 CE) period sites or components of sites in Chaco Canyon, including 29SJ 724, 29SJ 628, 29SJ 299, and Bc 50. All but two of these individuals are turkeys. All of the turkeys were complete individuals, all deposited in kivas or pitstructures, and 6 of the 8 were found on or near the floor, one in fill, and one of unknown depositional details. The remaining individuals, a red-tailed hawk and ferruginous hawk, consisted of the right wing and left foot respectively, near the floor of a pithouse at 29SJ 724. Thus, bird deposition in Basketmaker III/Pueblo I period Chaco Canyon appears to have primarily involved the placement of complete turkeys in association with the floors of pitstructures or kivas.

The majority of articulated individuals or parts date to contexts or sites from the Pueblo II period (900-1150 CE), a fact that is unsurprising since this period saw the peak of occupation in the canyon and the construction of most great houses and has drawn the most attention from archaeologists. Nonetheless, the nature of practices that resulted in the deposition of birds appear to have diversified compared to preceding periods. A greater range of taxa became acceptable for and important in the ritual deposition of birds. The very end of the Pueblo I period saw the introduction of macaws into Chaco Canyon (Watson et al 2015), and their involvement in ritual dedication increased in the Pueblo II period. Additionally, while birds continued to be placed on the floors of kivas and pit structures, the loci and details of deposition also became more variable. Rectangular rooms, round rooms, and plazas received these types of offerings, and the treatment of the remains—interred below floors, in prepared pits, left on floors, in fill, etc.—was more diverse than before. Both the Pueblo Alto Bird Pit and Room 334 at Pueblo Bonito date to the Pueblo II period (Windes 1987:452; Windes 2003:24) but represent new and seemingly novel ways of depositing bird parts in large quantities.

These above described elaborations on earlier Basketmaker III/Pueblo I practices to include more taxa and more ways of depositing birds in the Pueblo II period demonstrate continuity in the practice of bird offerings, but change or elaboration in how this practice was enacted. The act itself of depositing a bird, regardless of how it was carried out, may have lent a sense of traditionalism and authenticity to such ritual practices, creating ties to practices that began as early as the Basketmaker II period.

Traditionalism at Pueblo Bonito

Pueblo Bonito provides an opportunity for a more detailed look at traditionalism and elaboration in the offering of birds over time, but at a great house where the specifics of these behaviors appear to have been somewhat unique. Figure 6.1 shows Pueblo Bonito construction stages proposed by Windes (2003) and Windes and Ford (1996). On top of these stages are mapped the 25 articulated bird depositions at Pueblo Bonito. It is immediately apparent that the majority of instances (18) of complete or partial birds are located in the foundational northern arc, and that many of these (12) are macaws or parrots, and were placed on or beneath floors. This arc of rooms, outlined in red, was the first-constructed portion of Pueblo Bonito, built in the 800s and early 900s (Windes 2003; Windes and Ford 1996). Articulated birds or parts deposited outside of this arc are, by contrast, all raptors, two of which are partial.

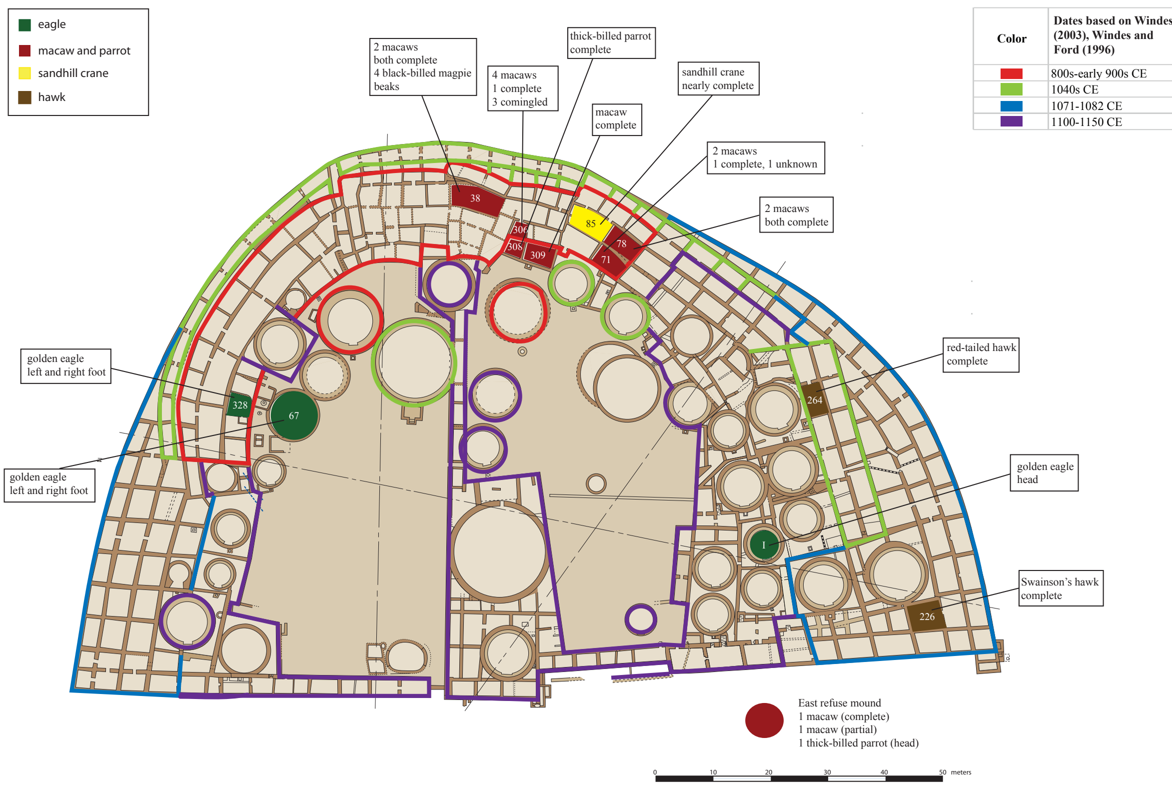

Figure 6.1. Pueblo Bonito showing formally deposited articulated birds or parts, as well as construction stages proposed by Windes and Ford (1996) and Windes (2003). Pueblo Bonito base map provided by the Chaco Research Archive and designed by Edward Triplett.

Of course, the presence of these birds in certain rooms does not mean that their deposition dates to the phase in which each room was constructed. As Pueblo Bonito was expanded over the next 300 years, rooms fell in and out of use. Certainly people could also have returned to an earlier-constructed room at a later time to deposit a bird. To assess in finer detail patterns in the deposition of these birds at Pueblo Bonito, each instance was assigned a probable phase of deposition based on available information concerning the room's construction phase and length of occupation (Windes 2003; Windes and Ford 1996), the contextual details of the deposition if known (e.g. sub floor, on floor, etc.), and direct radiocarbon dating of the remains wherever available (Watson et al 2015). If these assessments are roughly correct, the following patterns emerge: first, the earliest birds to be deposited at Bonito are macaws. Eight macaws were likely deposited at or around the time of the construction of the rooms in which they were placed (rooms 38, 306, and 78), in the mid-late 800s or early 900s. The only sandhill crane, in room 85, may have also been placed early, in the early 900s. In the 1000s, an additional two macaws likely were deposited, in room 71, and the Swainson's hawk may have been placed in the late 1000s to mid 1100s, almost certainly the first complete bird to be placed outside of the northern arc. The thick-billed parrot in room 208 may have been placed in the early to mid 1100s. Deposits after 1150 CE include the macaw from room 309, and the golden eagle feet placed in both Room 328 and Kiva I. The red-tailed hawk placed on the floor of room 264 was probably deposited after 1150 CE, and potentially in the 1200s. If these latter cases were indeed deposited after 1150 CE, it is notable that they may post-date the cessation of construction at Pueblo Bonito.

If this reconstruction is even roughly accurate, it is clear that the predominant pattern in the Early Bonito phase (900-1040 CE) was for people to offer macaws beneath or on room floors. In the Classic Bonito phase (1040-1100 CE), macaws were still deposited in this way, but so was a Swainson's hawk outside of the northern arc. In the Late Bonito phase (1100-1150 CE) and later (post-1150), macaws continue to be deposited, as was a thick-billed parrot, partial articulations of golden eagle, and an additional hawk (also outside of the northern arc). Therefore, the earliest bird offerings at Pueblo Bonito appear to have been made using predominantly macaws, and offerings focused on a limited range of taxa. As the pueblo was expanded, the types of birds involved in offerings proliferated, including most notably raptors. Similarly, offerings were made (though infrequently) in other parts of the pueblo outside of the northern arc.

Even if the practice of offering birds was elaborated to include other types of birds, macaws appear to have been a mainstay of Bonito ritual. Based on the above, these birds received burial or placement throughout the construction of the pueblo. This is corroborated by direct radiocarbon dating of some of the Bonito macaws. Watson et al (2015:Table 1) AMS dated the remains of 14 macaws from the northern arc, including some of the articulated individuals described here but also some individuals who appear to have died in room collapse or an accident, and which were not deposited as interments. Of these 14, slightly fewer than half have calibrated ranges that overlap with Windes' (2003) dating of the construction of this portion of the pueblo (800s to early 900s CE). The two articulated and intentionally deposited macaws in Room 78 have calibrated ranges that indicate they could have been deposited during the construction of the northern arc. One of the intentionally deposited individuals in Room 71, however, as well as 11 macaws (non-burials) that appear to have died in an accident in Room 38 have calibrated ranges that suggest these birds died after the construction of the northern arc. This indicates that this portion of the pueblo continued to be used, and continued to receive offerings of macaws after its construction. The late dates of some of the individuals in Room 38, which was hypothesized by Pepper (1920:195) to be an aviary, supports the conclusion that this segment of the pueblo remained in use for several centuries. This practice of repeated return has also been demonstrated by the analysis of the northern burial crypt, a series of four rooms in the northern arc that contained many human burials deposited over a span of 300+ years (Kennett et al 2017; Plog and Heitman 2010).

To summarize, the northern foundational arc of Pueblo Bonito saw the deposition of multiple articulated individuals or parts, some of which appear (based on radiocarbon dates) to have been placed during initial construction. Others, however, were placed after the construction of this portion was completed, indicating that the northern arc continued to be used for similar practices to those that were already important at its founding. The presence of articulated individuals also in portions of Pueblo Bonito not constructed until later, coupled with the wide span of radiocarbon dates on macaw remains (Watson et al 2015), reveal that the ritual practices involving the offering of articulated birds or articulated parts were long-standing traditions maintained throughout the occupation of Bonito, likely from the late ninth century to the mid-twelfth century. Considering the number of birds or parts deposited articulated at Bonito (25), and the length of time over which they were placed (potentially 300 or more years), such ritual acts do not appear to have been every-day or common occurrences. Several or many years may have lapsed in between each event, at an average of one bird every twelve years. Surely their depositions were more unevenly spread over time than this, but nonetheless may have marked major occasions in the life of Pueblo Bonito.

Certain aspects of the ritual deposition of birds were elaborated as Pueblo Bonito was expanded. Offerings took place in more recently constructed portions of the pueblo, and expanded to include more taxa, predominantly raptors. This pattern mirrors that of tradition coupled with elaboration evident at the level of the entire canyon as well. Thus, at the turn of the Pueblo I/Pueblo II period, while most bird offerings outside of Bonito still focused on turkey as they had in the Pueblo I and Basketmaker III periods, these practices at Bonito focused on macaws. Further into the Pueblo II period, as existing great houses were expanded, and new pueblos both great and small were built in the canyon, bird offerings began to include a greater range of taxa, especially raptors.

Stored Ritual Items

In the analysis presented above, both complete birds and articulated bird parts were considered as clear or probable intentional depositions. The possibility remains, however, that some of these articulated portions could potentially represent objects of ceremonial paraphernalia that were left as stored objects intended for later retrieval, but ultimately abandoned in their places of storage, rather than deposited in offering. Ethnographically, many objects of ritual paraphernalia and ceremonial dress are stored in houses or designated rooms when they are not in use (Gnabasik 1981:47– 84; Stevenson 1894:113; Strand 1998:75; White 1962 :304). Prayer feathers are stored in between use either in wooden boxes or wrapped in buckskin, and placed in the rafters of an individual's home (Crown 2016b:335; Gnabasik 1981:77, 147, 192). Bird skins, animal skulls, and stuffed birds have been documented as kept in society houses (Crown 2016b:336; Gnabasik 1982:147, 189; Schroeder 1991:18-20). Partial articulations in the Chaco avifaunal assemblage, especially wings, legs, feet, and heads, may represent objects of ritual paraphernalia that could, in their archaeological context, be stored rather than offered. In many cases, excavation records are lacking fine enough detail to be able to resolve this issue. Thus in tables 6.3 and 6.4 many of these are listed as probable cases of intentional dedicatory deposition, rather than definitive.

To test the effects of including partial articulations in consideration with whole articulated birds on the patterns discussed above, two analyses were performed. First, 16 cases from Tables 6.3 and 6.4 were removed because they could conceivably have been—based on the parts represented (head, wings, legs/feet) and their contexts—stored items intended for later use rather than offertory deposition. This resulted in the removal of six cases of golden eagle parts (head, wings, feet), one turkey wing, one macaw head, the left and right wings of a raven, and several parts (heads, wings, feet) of hawks and owls. Removing these creates a more conservative set of intentionally deposited articulated birds with which to assess differences in practices at great houses and small houses. After removing these instances, the patterns described above are still maintained. Dedicatory deposits containing birds are still present at both small and great house sites and a greater breadth of taxa were still used by people at great houses. Local, more abundantly available birds were still the predominate choice by people at small houses (especially turkey), while macaws and raptors stand out at great houses.

What did change in this analysis was the strength of the patterning regarding the deposition of birds predominantly within kivas and pithouses at small houses, and predominantly in rectangular rooms at great houses. By removing possible stored bird parts, this pattern was only strengthened (Table 6.10). In this “moderately restricted sample”, no individuals were found in kivas at great houses. An even greater proportion of individuals at small houses were found in kivas than in the full sample. Next, the sample of articulated deposits was further restricted by removing *all* partial articulations. In this “very restricted sample,” again the pattern concerning rectangular rooms and kivas/pithouses was only strengthened (Table 6.1).

These analyses of articulated depositions suggest that differences in great house and small house ritual involving the deposition of birds are robust. Nonetheless it is important to keep in mind when assessing these cases that partial articulations could instead represent stored objects left in place rather than intentional dedicatory deposits.

Table 6.10. Effects of removing partial individuals on the distribution of articulated bird deposits in rectangular rooms, kivas, and pithouses at small houses and great houses.

	Full Sample[1]	Moderately Restricted Sample[2]	Very Restricted Sample[3]
Great Houses			
rectangular rooms	60%	71%	74%
kivas+pithouses	4%	0%	0%
Small Houses			
rectangular rooms	16%	16%	17%
kivas+pithouses	70%	72%	73%

[1]all cases of partial or complete articulations.
[2]instances that could represent stored paraphernalia removed.
[3]all partial birds removed.

Summary of the Nature of Ritual Practice

The application of the framework of archaeological expectations for Bell's (2009b) mechanisms of ritualization (Table 3.1) provides insight into the nature of ritual practice revealed through the analysis of primary context deposits containing birds. Using this framework reveals differences between great houses and small houses, as well as changes in ritual over time. Throughout Chaco Canyon, maintaining certain ritual traditions concerning birds appears to have been important. These practices likely had their origin in the Basketmaker II period, and continued into the Pueblo I period, focusing on the deposition of turkeys in kivas or pithouses. As great house construction began and throughout the Pueblo II period, ritual practices involving the deposition of birds were elaborated, and flexibility developed in how specific details were enacted, including the types of birds involved and the location of their placement.

The mechanisms of formalism, performance, and sacral symbolism are particularly revelatory in understanding differences in great house and small house ritual. Ritual involving the deposition of articulated birds and parts does not appear to have been especially performative at either type of site. None of the types of spaces most often chosen to deposit these birds could have accommodated large groups of participants or witnesses. While these rituals may have been private affairs at both great and small houses, in that participation was likely not open, there may have been differences in who was allowed to be present or involved. At great houses, these acts occurred in some of the most private spaces available (rectangular rooms). At both small houses and great houses, these activities took place in relatively formalized spaces, but highly formalized at the latter.

Overall, ritual practice involving the deposition of birds at small houses appears to have occurred predominantly in spaces that would have, for each small house, served both domestic and ritual functions. These spaces would have served functionally as living rooms at small house sites, where other activities took place as well. The taxa involved were primarily those that were locally and abundantly available, such as turkey and common raven, though on occasion hawks or falcons were used. When they were deposited on floors, they were likely left as a part of ritual closure of the space or the site. These domestic rituals may have still been restricted in viewership, and though they may have been conducted by small house ritual leaders, they were not carried out by the specialized ritual leaders of great houses who possessed esoteric knowledge.

Such ritual occurring at great houses was, by contrast, highly-prescribed and formalized. These took place in what may have been specialized ceremonial rooms whose function was strictly related to ritual, including the carrying out of ritual and the storage of ritually important items. The ethnographic record demonstrates that, among the Western Pueblos, ceremonial rooms are a “functionally distinct” type of room (compared to habitation rooms and storage rooms) (Ciolek-Torrello 1978: 98; see also Beaglehole 1937:5, Mindeleff 1891; Stevenson

1904:292-293). At Zuni in particular, these were large, above-ground rooms with trap door entrances and a special fireplace (Ciolek-Torrello 1978: 99; Mindeleff 1891:112). Given the formalized nature of the great house rooms with bird offerings, and their private nature relative to other types of spaces, these rooms may represent specialized rectangular ceremonial rooms that did not serve other purposes beyond being the loci of private, esoteric ritual. Who could witness such events was likely prescribed, related as it is in the Pueblo world today to membership in a particular social group. An element of secrecy may have been important in conducting these ritual practices. This secrecy may have been a component of establishing and maintaining ritual leadership, a topic that is discussed further below. In keeping with this difference, ritual deposits of whole and partial birds at great houses involved exotic taxa (macaws, parrots) and local taxa that would have been more challenging to procure (eagles, hawks) to a greater extent than did these deposits at small houses.

Some Thoughts on Actual Ritual Practices

Because Chaco Canyon is understood to have been the location of an important ceremonial center, and because birds were involved in this aspect of life, it may be reasonable at this point to attempt to offer some interpretations about what some ritual practices might have looked like. Obviously, birds were often valued participants in ritual, being offered in the foundational dedication of a particular space, it's ritual closure, or marking some other event. Whole complete birds were usually involved, and whether they were deposited fully fleshed and feathered is unclear. Presumably in some cases they were, but in others they may have been plucked in order to use feathers in manufacturing other objects; the birds' body then received proper disposal in the form of offering or burial. At Chaco Canyon great houses, the location of such bird burials or offerings suggests that the rituals of which they were a part were esoteric, carried out by ritual leaders and witnessed by those with the appropriate knowledge and affiliation, and involving taxa that were more special than others.

It was also important that the same types of activities involving birds were carried out at small houses. Here, ritual also involved the offering of whole birds, but of taxa that were locally available and relatively more abundant. The acts in which the deposition of these birds were involved do not appear to have been led, necessarily, by ritual leaders whose authority was grounded in ritual knowledge or the ability to procure distinct types of birds. Instead, in these dedicatory rituals in kivas or pithouses, esotericism was not a defining character and ritual was seemingly domestic. Birds, especially turkeys, were placed on pithouse or kiva floors, probably in the act of symbolically closing these spaces.

Articulated parts, like wings and legs, of birds also appear to have ended up in similar contexts as whole birds. It is not always clear whether these parts were objects whose first and only purpose after removal from a bird was as an offering, or whether these were ceremonial objects that had reached the end of their repeated use-lives. If the latter, their entry into the archaeological record may have been because their ceremonial significance dictated that they be ritually retired in a formal way, because they were taken out of circulation and retired from use specifically for the purpose of offering, or because they were forgotten or left behind. There also remains the possibility that, in some cases, articulated parts of a bird may have stood in as substitute for a whole bird in offering.

Intriguingly, sometimes *nearly* complete birds were given the same formal burial or placement as complete birds. Five cases of otherwise complete birds missing one or two distinct parts are evident, from both great houses and small houses. One sandhill crane, missing its skull, feet, and distal wing tips, was buried beneath a floor at Pueblo Bonito. A nearly complete turkey, missing below the knee and its distal wing tips, was also buried beneath a floor at Bc 57. A raven missing feet and part of its left wing was also found at this site. At Leyit Kin, a turkey missing both legs was buried beneath a floor with a human infant. And a macaw, without its left wing or left leg, was place in the east refuse mound at Pueblo Bonito. While the absence of certain parts could theoretically be due to recovery bias, these birds were excavated by projects that by and large paid attention to animal burials, and hand-collected even the smallest of parts.

In each of these nearly complete cases, parts are missing (wings, legs, feet, skulls) that might otherwise be important as or in the manufacture of ceremonial paraphernalia. That these birds, missing these parts, were still treated in similar ways to their whole counterparts suggests that they too were sacred. Even in using them first for specific parts, the bird itself still required special disposal. Meanwhile, removed portions may have been involved in ceremonial life in other ways. Of particular relevance is a similar example from Homol'ovi, discussed in Chapter 3. The body of a red-tailed hawk, missing wings and legs, had been discarded in a formerly-used kiva (Walker 1995a:77-78). This practice also calls to mind the caching of the byproducts of ritual production with their finished materials in Chaco Canyon (Mills 2008:89). Debris and unworked fragments of turquoise and shell were treated as "part of the materiality of ritual practice" (Mills 2008:99), sacred through their association with the finished products, and placed in sealed caches with them. Historically, Voth (1912) and Fewkes (1900a) documented that an eagle, once plucked, received formal and special burial at Hopi.

All of these examples highlight the ceremonial value ascribed to even the materials and animate beings that archaeologists might consider ceremonial trash, the unused byproducts of ceremonial production, or discarded ceremonial items past their use-lives. But a fine line is drawn here. Really, the caching of unfinished products (such as turquoise), and the careful disposal of birds who have already had certain parts removed, or potentially been plucked for their feathers, is part of the whole treatment of materials and beings considered to be sacred.

For example, when the sandhill crane described above was acquired, the lower portions of its wings were removed, as well as its skull and feet. This bird, very large, non-local to the canyon, with bright red feathers on the crown of its head, and which likely had ritual associations with water, would have required a fair amount of effort to procure. Once specific parts were removed, the bird was carefully interred below a floor, in an act of dedicatory foundation or closure. This series of acts comprise the necessary steps in treating a bird, from start to finish, whose value was ceremonial.

Interestingly, burials of complete eagles appear, based on this assemblage, to be entirely absent from any excavated contexts. This is in contrast to their abundance in the avifaunal assemblage, and their ceremonial importance evident in the disposal of their wings in the Alto Bird Pit and Pueblo Bonito Room 334. Why were the bodies of eagles not treated in similar ways to other types of birds? What happened to, for example, the remainder of the 18 eagles whose wings were placed in the Bird Pit or Room 334: where they disarticulated and reserved for other purposes, such as manufacturing bone objects? One intriguing possibility that cannot be fully assessed with the data at hand is suggested by the historic and modern practice of burying eagles *away* from the village at Hopi (Fewkes 1900a; Voth 1912). Whole or partial birds need not have been buried in intramural contexts in Chaco, and the ethnographic record suggests that today they are not. Therefore, the absence of burials of complete eagles within sites need not indicate that these birds didn’t receive such treatment, but that their treatment may have been even more unique and singular than that of other birds, as it is today. If this were the case, we should not expect to find them in intramural contexts, or even to recover them at all.

Another behavior that has not been fully treated here is the use of feathers. With skeletal remains and articulated deposits, all that can be assessed to shed light on ritual is the final deposition of birds and their parts. Less visible are the many ways that birds, and especially their feathers, may have been used prior to the ultimate disposal of their remains. The importance of feathers in Chaco Canyon is indicated by, for example, the many wings of the Alto Bird Pit and Pueblo Bonito Room 334, and by their use in the manufacture of other objects such as feathered cordage. At least 166 individual feathers, bunches of feathers, or feathered cordage fragments were encountered and recorded in the course of the analysis of avifaunal remains. Identified taxa[7] include turkey, golden eagle, red-tailed hawk, great-horned owl, screech owl, red-shafted flicker, and macaw. Feathers and feathered objects will be given systematic treatment in the future, but here they provide evidence of the importance and use of feathers, and those of specific types of birds.

Additionally, pathological trauma was observed in this analysis on the ulnae of several types of birds that suggest repeated plucking. In some species, normal, bony knobs—called quill knobs, ulnar papillae, or ulnar tubercles—are present on the lateral surface of the ulna. These form attachment points for the secondary flight feathers. Repeated trauma to this area of the bone can cause these knobs to become inflamed (Fothergill 2012:186). Hargrave (1970) noted these "roughened" ulnae for some macaws, and such trauma is also present on multiple turkey ulnae in the Chaco avifaunal assemblage.

[7] Identifications of material from the American Museum of Natural History and in several other cases were provided by or made with the gracious help of Chuck LaRue.

So far, the developing picture of the involvement of birds in Chacoan ritual demonstrates that whole birds, their parts, and their feathers were frequent ritual participants, and that bird remains in general had special ceremonial significance. A range of practices, activities, and behaviors resulted in the placement and discard of many avifaunal remains in a variety of contexts. While birds were ceremonially important throughout the canyon, these practices differed between great and small houses. How these practices may have been organized at higher scales, intra-site, inter-site, and canyon-wide, is the next topic of discussion.

Ceremonial Organization

As argued in Chapter 3, the final deposition in a variety of contexts of objects involved in ritual and ceremonial life can reveal important, structuring principles concerning how and where these materials were used and taken out of circulation. Patterns in the spatial distribution of such objects in the archaeological record can in turn reveal organizational principles that structured ceremonial life. The promise of such an approach has already been demonstrated by other scholars (e.g. Bishop and Fladd 2018; Bishop et al forthcoming; Ditto 2017; Mattson 2015, 2016; Neitzel 2003; Plog and Heitman 2010). In this dissertation, I focus on examining principles that structured the organization of ritual across the canyon, with a special focus on evaluating evidence for the principles of duality and plurality as important, and on evidence for the presence of hierarchical organization based in ritual authority.

The analysis presented below highlights prominent themes in how ritual was organized within sites, between sites, and across the canyon, as visible in the use and treatment of avifauna. Given the scale at which this research objective is addressed (at the site, inter-site, and canyon-wide level), this analysis relies not only on formalized ritual deposits (e.g. articulated bird burials or placements), but on the entire “ritual avifaunal” sub-dataset segregated for analysis in this chapter and described above. The discussion below is organized as follows: first, I discuss patterns at the inter-site level in the deposition and treatment of avifaunal remains, examining differences between great houses and small houses categorically, between specific sites, and between different clusters of sites. Next, at the intra-site level, I examine patterns in the spatial distribution of avifaunal remains across portions of individual pueblos. Lastly, I assess evidence for both horizontal and vertical ceremonial organization, considering first evidence for the principles of duality or plurality as structuring ritual and ceremonial life, and second, evidence for social inequality based in ritual authority and control over ceremonial resources.

In each of these analyses, the ritual avifaunal dataset has been split into two samples, the first comprised of sites that were predominantly constructed and occupied before 850 CE, and the second of those constructed and occupied after 850 CE. Before this time, occupation in the canyon was at small house sites and pithouse sites. The period from approximately 850 CE onwards marks the origins and increase of great house construction, and the appearance of the hallmarks that mark the Chaco “phenomenon,” and coincides approximately with what is referred to locally as the Bonito Phase (900-1150). Chronological information for each site was gathered from a variety of available sources, and each site was assigned to a period (Basketmaker II, Pueblo I, Pueblo II, Pueblo III) (Table 6.11). For sites with occupation during multiple periods, period was assigned based on the contexts from which the material was recovered, wherever this information was available. For sites whose occupation spanned the 850 CE divide, placement in one or the other samples was based on whether the majority of the occupation span fell before or after 850 CE. Note in particular that, although the earliest portion of Pueblo Bonito was built before around 850 CE (Windes and Ford 1996; Windes 2003), materials continued to be deposited in this northern arc throughout the occupation of Pueblo Bonito (Bishop and Fladd 2018; Plog and Heitman 2010; Watson et al 2015). Without direct dating and an extensive reconstruction of room-by-room deposits, it would be impossible to distinguish between avifaunal remains that were deposited in the northern arc before 850 CE, and those that were deposited after. For this reason, Pueblo Bonito was lumped with the other post-850 sites.

Table 6.11. Sites in the pre-850 and post-850 CE samples, avifaunal NISP, and temporal assignments.

	Avifaunal NISP	**Temporal assignment**
Pre-850 Sample		
29SJ 299	233	BMIII-PI[1]
29SJ 423	6	BMIII[1]
29SJ 628	21	BMIII-PI[1]
29SJ 724	32	PI[1]
Half House	3	PI[1,2]
Pumphouse Site	23	early BMIII[3]
Shabik'eshchee	3	BMIII[4]
Post-850 Sample		
29SJ 1360	28	PI-PII[5,6]
29SJ 589	48	PIII[1]
29SJ 626E	9	PIII[7]
29SJ 627	343	PI-PII[8]
29SJ 629	571	PII[6,7]
29SJ 633	167	PIII[1]
29SJ 827	72	PIII[1]
Bc 50	33	BMIII, PI, PII, PIII[1]
Bc 51	82	PII[9]
Bc 53	15	PII[9]
Bc 55	3	PII[1]
Bc 57	837	PI-PII[9]
Bc 58	37	PII[9]
Casa Chiquita	2	PII[10]
Chetro Ketl	56	PII[10]
Gallo Cliff Dwelling	35	PIII[6]
Kin Bineola	1	PII[11]
Kin Kletso	238	PII[10]

Leyit Kin	125	PII[12]
Pueblo Alto	2166	PII[13]
Pueblo Bonito	3156	PI, PII, PIII[9]
Pueblo del Arroyo	271	PII[10]
Pueblo Pintado	17	PII[11]
Rabbit Ruin	3	PII[13]
Talus Unit No. 1	169	PII[4]
Una Vida	1386	PI, PII[10]

[1]McKenna and Truell 1986; [2]Adams 1951; [3]National Park Service 2019; [4]Vivian and Hilpert 2002; [5]McKenna 1984; [6]Mathien 2005; [7]Windes 1993; [8]Truell 1992; [9]Heitman 2011; [10]Lekson 1984; [11]CRA site pages; [12]Dutton 1938; [13]Windes 1987

Inter-site Ceremonial Organization

Much debate has surrounded the function and purpose of Chaco great houses and small houses in the canyon, as they differ in size and elaboration. Some differences in the deposition of articulated birds between these two site types have already been discussed above. In addition to these, there are further patterns in the distribution of other avifaunal remains, concerning especially the extent to which birds were involved in activities at each and possible restriction of the use of certain bird types.

Considering the post-850 CE sample, the ritual avifaunal assemblages of great houses and small houses were categorically compared to one another. All great houses represented were considered together, as were all small houses, and features of these assemblages are presented in Table 6.12. On average people at great houses appear to have involved a greater number and greater variety of birds in ritual life. To assess these differences, avifaunal densities were calculated for each site in the dataset, standardizing NISP by the number of rooms excavated for each site (Table 6.2). The average of these densities was calculated for great houses and then for small houses (Table 6.12) The same calculations were done for the number of taxa present at each site, which were standardized both by number of rooms excavated and by site NISP. Table

6.12 reveals that, on average, people at great houses used birds more extensively than those at small house sites, as indicated by both average NISP and standardized average NISP. Higher average NISP might be expected at great houses, since they are larger. Even when standardized by room counts, however, average avifaunal density is greater at great houses than at small houses.

Furthermore, people at great houses used a greater number of species than did those at small houses, but when standardized by assemblage size (NISP) or number of rooms excavated, the two site types actually appear to have had comparable densities of the number of taxa. Therefore, while people at great houses made greater use of birds, both great houses and small houses had access to a comparable breadth of species. This does not mean, however, that they employed the same types of birds, nor the same types of birds to the same degrees.

Table 6.12. Avifaunal NISP, density, and taxa count for post-850 CE great and small houses.

	Great Houses	**Small Houses**
Average NISP	729	123
Average avifaunal density (NISP/# rooms excavated)	41.3	14.96
Average # taxa	8.3	4.7
Average # taxa (standardized by #rooms excavated)	0.5	0.6
Average # taxa (standardized by NISP)	0.3	0.2

When the taxa present at great houses and small houses categorically are examined, overall it does not appear that the inhabitants of great houses in general had *exclusive* access to certain types of birds. The majority of taxa used at great houses were also used at small houses.

Nine species occur only at great houses, but these are all represented by low NISP, indicating that their lack of recovery at small houses is probably related to assemblage size and recovery problems rather than an actual absence. The notable exception to this is macaws, which occur predominantly at great houses, a distribution that is discussed further below.

In an analysis of avifaunal taxa at fourteenth century CE sites in the El Morro Valley, Potter and Perry (2000) argue that circular and rectilinear pueblos had complementary ritual roles, the former responsible for acquiring and using waterfowl, and the latter for raptors and perching birds. Unfortunately, similar patterns could not be assessed for the Chaco avifaunal assemblage. Of the nine great houses represented in the avifaunal assemblage, five are D-shaped (Bonito, Alto, Arroyo, Una Vida, and Chetro Ketl), one L-shaped (Pintado), one E-shaped (Kin Bineola), one square (Casa Chiquita), and one rectangular (Kin Kletso). Those of L-, E- and square-shapes had assemblages too small (56 NISP and less) and excavation extents too limited to provide adequate comparison to the D-shaped great houses. The only great house of non-D-shaped form with an assemblage size large enough was Kin Kletso (238 NISP). The only apparent difference in the presence of types of birds between Kin Kletso (rectangular), and the D-shaped great houses is the absence of water birds at the former. However, water birds are not well represented in the entire avifaunal assemblage (52 NISP). Although Kin Kletso was nearly completely excavated, the absence of water birds may be related to a variety of other factors, such as the length of occupation of the site, or the recovery methods employed in its excavation.

Though total exclusivity in taxonomic use between site types is not evident, there are clear differences in the degree to which the people of great houses and small houses made use of certain taxa (Table 6.13). Again considering the ritual avifaunal dataset for sites in the post-850 CE sample, 74% was recovered from great houses and 26% from small houses. The proportionate contribution of several types of birds appears to deviate from this overall distribution. Notably, the vast majority of eagle remains were recovered from great houses, as were the majority of remains of the smaller raptors (hawks, falcons, and harrier). In contrast, small houses differ from the overall distribution in having more quail and raven than great houses, and slightly elevated proportions of turkey. The inhabitants of great houses may therefore have made greater use of raptors in general, especially eagles, while those at small house sites made greater use of several types of locally more abundant birds. A larger proportion of Passeriformes was also recovered from great houses, but these patterns may be related to excavation biases between earlier excavated small houses and later great house excavations at Pueblo Alto, since the remains of the generally smaller perching birds are less likely to be recovered in the absence of screening.

Table 6.13. Proportion of NISP of several types of birds between post-850 great houses and small houses.

	Great Houses	**Small Houses**
Eagles	90%	10%
Hawks and falcons	79%	21%
Owls	56%	44%
Water birds	89%	11%
Quail	29%	71%
Turkey	66%	34%
Raven	35%	65%
Passeriformes	81%	19%
OVERALL	**74%**	**26%**

While the inhabitants of great houses did not maintain exclusive access to certain species, access to two types of birds—macaws and eagles—was likely restricted, and their distribution within the canyon may have been controlled. Overall there is limited evidence that certain species were routinely used and restricted to individual sites, as might be expected if each community had designated responsibilities related to types of birds. The major exception to domination at the level of the individual site is Pueblo Bonito. Here, 37 out of 45 of the individual macaws or parrots (from all types of deposits) recovered from Chaco were found at Bonito. Additionally, 67% of all eagle remains from the avifaunal assemblage of post-850 sites are from Pueblo Bonito alone. Similarly, Bonito and Pueblo Alto together contained 76% of all hawk and falcon remains (with 38% each). Within small houses (of assemblages larger than 40 NISP=9 sites), turkey is present at all sites, raven at all but three, and smaller raptors (hawks and falcons) are widely distributed at almost all sites (except one), though in small numbers. Therefore, the inhabitants of great houses—especially Pueblo Bonito—appear to have dominated the use of macaws in the canyon, those at Pueblo Bonito appear to have dominated the use of eagles, and those at Alto and Bonito made greater use than people at other sites of hawks and falcons. While raptors were available to the inhabitants of small houses, they were used only in small quantities.

The domination of certain types of taxa by people at specific great houses becomes even clearer when we expand to consider both articulated deposits and clusters of sites. When the spatial distribution of all formally deposited articulated birds or parts (Tables 6.3, 6.4) are examined, several patterns are evident when comparing post-850 CE great houses and small houses (Table 6.14). Overwhelmingly, turkeys were the predominant choice at small houses, with the occasional raven, hawk or falcon, and in one case macaw. The picture of articulated deposition is quite different for great houses, where a much wider range of taxa were deposited as articulated birds or parts than at small houses, including macaw, turkey, eagle, hawk and falcon, Sandhill crane, owl, black-billed magpie, and horned lark. Of course, by far the most abundant of these are the macaws, a markedly different situation than at small houses. Interesting patterns are revealed when great houses are compared to one another.

Table 6.14. Taxa involved in formal articulated deposits at post-850 CE great houses and small houses.

	Great Houses	**Small Houses**
Golden eagle	5	0
Swainson's hawk	2	0
Red-tailed hawk	3	0
Hawk (*Buteo* sp.)	0	2
Northern harrier	1	1
American kestrel	0	1
Great-horned owl	1	0
Macaw	18	1
Thick-billed parrot	2	0
Black-billed magpie	4	0
Sandhill crane	2	0
Common raven	0	2
Horned lark	1	0
Turkey	9	23

Bishop et al (forthcoming) examined the distribution of all eagle, turkey, and macaw remains from Pueblo Bonito, Pueblo Alto, and Pueblo del Arroyo. They found that while turkey remains were present at all three sites, macaw remains were restricted to Pueblo Bonito and Pueblo del Arroyo and eagle remains were restricted to Pueblo Bonito and Pueblo Alto (Table 6.15). At Pueblo del Arroyo the remains of any species of hawk or falcon are also conspicuously absent. Therefore, people at Bonito seem to have maintained access to all three types of birds (where eagle remains are even more abundant than those of turkey), while those at Alto and Arroyo had access to turkey and only one of the other types but not both (eagle or macaw).

Table 6.15. Turkey (NISP), eagle (NISP), and macaw (MNI) representation at three great houses (ritual dataset only, so numbers differ from Bishop et al (forthcoming)).

	Pueblo del Arroyo	**Pueblo Bonito**	**Pueblo Alto**
Turkey	168	192	1224
Eagle	0	311	89
Macaw (Scarlet and *Ara* sp.)	5 individuals	35 individuals	0 individuals

This same pattern is born out in the distribution of articulated individuals, but provides further insight. At Pueblo Alto, both eagle and turkey occur in formal articulated deposits, but no macaws were deposited. At Pueblo del Arroyo, both macaws and turkeys were formally deposited, while eagles were not. While these absences make sense in light of the absence of these remains in each site's overall assemblage, they contextualize a peculiarity at Pueblo Bonito. While turkey remains (in addition to eagle and macaw) are present in Pueblo Bonito's overall assemblage, and despite the fact that turkey burials are common in the canyon at large, and even though Bonito has more articulated deposits than any other site, the burial or placement of articulated turkeys or turkey parts is conspicuously absent at Pueblo Bonito (Table 6.16). No articulated turkeys or turkey parts appear to have been deposited in dedicatory fashion, while other types of birds, especially macaw and hawk, feature prominently in such deposits.

Table 6.16. Number of formally deposited articulated birds and bird parts at three great houses.

	Pueblo del Arroyo	**Pueblo Bonito**	**Pueblo Alto**
Turkey	2	0	6
Eagle	0	3	10
Macaw (Scarlet and *Ara* sp.)	4	35	0

The abundance of articulated deposits at Bonito in general, the monopolization of high-status hard-to-procure birds (like macaws), and the absence of turkey in articulated deposits suggest that the latter may not have been suitable for use as dedicatory deposits at Pueblo Bonito. Perhaps only high-status birds that were expensive to procure (either in effort or resources) were appropriate as offerings or dedicatory deposits at Pueblo Bonito. This is further supported by the other taxa that were chosen for deposition at this site, including notably several species of hawk as well as sandhill crane. Raptors in particular would have been some of the most challenging local birds to procure, based on species-level biological and behavioral characteristics (Bishop forthcoming), and their scarcity on the landscape. This picture of high-effort, high-status ritual deposition of a select range of challenging-to-procure birds at Pueblo Bonito is also in keeping with the location of their deposition. As argued above, ritual practice involving the deposition of birds occurred predominantly in smaller, more restricted-access rectangular rooms. The acquisition of such birds by ritual leaders would have demonstrated the extent of social connections and resources, and the restriction of activities involving these acquired birds would have lent an air of secrecy to the ritual experience.

Pre-850 CE Sites

So far the discussion of ceremonial organization has dealt only with sites constructed and occupied primarily after 850 CE, roughly coincident with the Bonito Phase (900-1150 CE). Sites represented in the pre-850 CE sample are few in number and limited in their avifaunal assemblages (Table 6.11), but merit some discussion here. Of course, no great houses are represented in the pre-850 CE sample. Several interesting patterns emerge when the pre-850 and post-850 assemblages are compared in terms of several major groupings of taxa. First, within pre-850 sites, turkey comprises the majority of the assemblage; the same is true at post-850 sites. Also at both pre- and post-850 sites, hawks and falcons are the next most abundant grouping. Other types of birds are poorly represented in pre-850 assemblages, but are also poorly represented at post-850 sites. Interestingly, eagle remains are nearly completely absent at pre-850 sites, with only one eagle talon recovered from a feature within Pithouse A at small house site 29SJ 724. While this near absence may be a sampling size issue, it could also indicate that the procurement and use of eagles had its origins in the elaboration of ritual practices that appears to have occurred after 850 CE.

Table 6.17. Proportion of NISP of several types of birds within pre-850 and post-850 site assemblages.

	Pre-850 CE	**Post-850 CE**
Eagles	0%	7%
Hawks and falcons	13%	11%
Owls	0%	1%
Water birds	0%	1%
Quail	3%	1%
Turkey	82%	73%
Raven	1%	2%
Passeriformes	1%	5%
OVERALL	**4%**	**96%**

Summary of Ceremonial Organization Evident at the Inter-Site Level

To provide a hypothetical narrative that accounts for the patterns just described, the ritual leaders of Pueblo Bonito may have controlled or dictated access to certain types of birds, especially macaw and eagle, for the residents of both other great houses and small houses. People at Pueblo Bonito made frequent use of the three most abundant birds in the Chaco avifaunal assemblage, and in the case of macaws and eagles involved them in dedicatory deposits. They also appear to have maintained the greatest access to or control over macaws of all sites in the canyon. Macaws were only available to the inhabitants of several great houses, including Pueblo del Arroyo, but were absent from other sites (e.g Pueblo Alto). They do not appear to have been available to those at small houses, with the exception of the single macaw from 29SJ 1360, which may have been a post-occupational offering. Instead, people at small houses made greater use of turkeys in formal articulated deposits, a bird that does not seem to have been suitable for ritual deposition at Pueblo Bonito.

A similar situation is evident with eagles. While these birds were available to the inhabitants of Pueblo Bonito and involved in articulated deposits, their use at other great houses and some small houses may have been restricted. They are absent, along with all hawk remains, from Pueblo del Arroyo, though raptor parts were extensively used at Pueblo Alto. While eagle remains are present at small houses, these are never involved in articulated depositions, and in fact only occur in frequencies of 9 NISP or fewer at each small house. The restriction of eagles is further supported by their absence at other great houses that otherwise had articulated bird deposits, and their absence from the general avifaunal assemblages of multiple great houses.

The only truly exotic bird in the Chaco avifaunal assemblage, macaws would have been the most challenging and expensive to procure. Either distribution could have been controlled as the birds were brought into the canyon, or the cost of acquiring them may have been the prohibiting factor. If the former, their abundance at Pueblo Bonito suggests that ritual leaders at this site may have been in charge of distribution, and if the latter, they were the most capable of acquiring them.

Contrary to macaws, eagles are local and theoretically could have been taken by anyone. However, the large territorial home ranges of eagles in general would have ensured their scarcity on the landscape, and likely only one to two breeding pairs may have been available in the canyon in any given season. This scarcity, coupled with the biological and behavioral characteristics (such as nesting location preferences, body size, and aggressiveness) that would have made them more challenging than many types of birds to procure (Bishop forthcoming), may have elevated their status and restricted their distribution in use. As has been documented ethnographically, social rules may have existed dictating who was allowed to procure these birds. Such a scenario is further supported by their limited distribution at both great houses and small houses. While more great houses had access to eagles than had access to macaws, they are absent from several notable great houses, especially Pueblo del Arroyo which otherwise had access to macaws. The lack of articulated deposits containing eagles at small house sites, and the presence of eagle remains in low quantities at these sites, suggests that the inhabitants of small houses may have only received eagles as disarticulated remains. The same may have also been true for some great houses. The scarcity or cost of acquiring both eagles and macaws likely increased their prestige, leading to the restricted (and possibly controlled) distribution of both within Chaco Canyon.

The Effects of Excavation Bias on Evident Patterns in Inter-Site Ceremonial Organization

Perhaps the biggest hindrance to doing inter-site analyses of the distribution of any material type within Chaco Canyon is the incomparable nature of the many different excavations that have taken place over the last 130 years. Disparity exists across sites in the avifaunal dataset in terms of extent of excavation of each site, the methods used to excavate the site (whether hand-collection, big machinery, or screening was employed), and the different agendas of each project, which would have affected the types of contexts that received the most attention and the artifacts that were collected.

Pueblo Bonito is the only extensively excavated great house in the canyon, with nearly all of its rooms excavated. Consequently, the "Pueblo Bonito bias" plagues research concerning great houses in the canyon (Plog 2018:240). The other great houses that have been excavated are either associated with very poor artifactual and contextual records (Chetro Ketl, Pueblo del Arroyo), or had only a few rooms excavated (Pueblo Alto). Therefore, in assessments of the material and behavioral differences between great and small houses, the risk is that Pueblo Bonito is taken to be representative of all Chaco great houses. This is problematic because Pueblo Bonito may, in fact, have been unique among its fellow great houses in its role in the canyon, its material culture, and the individuals that lived there. Specifically, the risk is that the Pueblo Bonito assemblage will swamp any aggregate consideration of remains from multiple great houses, and therefore bias our interpretations. The Bonito avifaunal assemblage comprises 31% of the overall assemblage, and 44% of all great house avifaunal material.

To evaluate whether the disparity in excavation extent and nature across the 38 sites represented in the Chaco avifaunal assemblage had a measurable effect on any of the important patterns already described in this dissertation, I reanalyzed only that portion of the avifaunal assemblage that was excavated from the 1970s onwards (predominantly Chaco Project material). This was done under the assumption that excavation methods would have been more consistent across sites. This also helps to account for the Bonito bias, since Bonito was excavated well before the 1970s and its material is therefore excluded. The resulting sub-assemblage is comprised of 3,650 NISP, or 33% of the overall avifaunal assemblage. In brief, none of the major patterns already described were significantly altered in ways that would undermine the arguments made in this dissertation. In fact, almost all patterns were replicated, or in some cases, strengthened.

First, as is the case for the overall assemblage, turkeys (2,213 NISP), eagles (107 NISP), and hawks (370 NISP) remain by far the most abundant types of birds. Turkeys continue to comprise a huge portion of the assemblage (60%). Macaws, which are also numerous in the overall assemblage, could not be evaluated within this sub-assemblage since the majority are known from excavations occurring before the 1970s, specifically at Pueblo Bonito.

Considering the sub-assemblage, the burial of articulated birds and parts was still prominent, with at least 38 cases. Again, these occur more frequently in rectangular rooms (25% of all cases) at great houses than in kivas (0%), though a higher proportion was from trash mounds (50%), owing principally to the trenching of the Pueblo Alto Trash Mound done by the Chaco Project. The reverse pattern is again true at small houses, where 86% of articulated cases came from kivas and pithouses, 0% were recovered from rectangular rooms, and 14% were from plaza contexts in this sub-assemblage.

One difference in previous patterns was evident. Compared to Table 6.13, a more even distribution in NISP between great houses and small houses is apparent (Table 6.18). However, as is the case in the overall assemblage, the inhabitants of great houses still appear to have maintained greater access to eagles, hawks, and falcons than did the residents of small houses, who made greater use of more locally abundant birds including quail and turkey than did great houses. One minor switch is the case of the raven, where, contrary to the overall assemblage, a greater proportion of raven remains was found at great houses than small houses.

Table 6.18. Proportion of NISP of several types of birds between great houses and small houses, using only remains excavated after 1970.

	Great Houses	**Small Houses**
Eagles	83%	17%
Hawks and falcons	72%	28%
Owls	60%	40%
Water birds	88%	12%
Quail	24%	76%
Turkey	55%	45%
Raven	60%	40%
OVERALL	59%	41%

The analysis of the sub-assemblage consisting of material excavated after 1970 reveals that in general, the patterns evident in the entire avifaunal assemblage are relatively robust. It also indicates that, while Pueblo Bonito contributes a large portion of the overall assemblage, other great houses are still reasonably well represented and their assemblages influence overall patterning.

Intra-site Ceremonial Organization

The intra-site analysis of spatial patterning in the distribution of birds was unfortunately less informative than the analysis of inter-site patterns. In most cases, patterns could not be assessed, and where they could, they do not seem strong. Mapping the spatial distribution of different taxa could only be done for several sites, as many have avifaunal assemblages arguably too small to reveal patterns. Distributions were not mapped for assemblages below 100 NISP. Additionally, some sites had material that was unprovenienced below site level, and therefore could not be mapped. For yet others, excavation was so concentrated in one portion of a site that no patterns would have been evident. Distributions could only be mapped for Pueblo Bonito, Pueblo Alto, Pueblo del Arroyo, Bc 57, Leyit Kin, and 29SJ 629. In all cases, patterns were searched for across the four directional quadrants (especially east-west and north-south distributions), between different types of rooms (rectangular and round), and in the co-occurrence or exclusivity of different taxa by individual room. None of these sites revealed informative site-level patterns, except Pueblo Bonito.

At Pueblo Bonito, avifaunal remains are spread throughout the pueblo, occurring in all parts and in both rectangular rooms and kivas (Figure 6.2). All major types of birds are found more or less across the site, with the exception of macaws. Remains of eagle, hawk, and turkey are particularly widespread across the pueblo, occurring in all quadrants (N, S, E, W) and in both kivas and rectangular rooms. None of these seem to occur with significantly greater density on either the east or west side, in the northern arc relative to the rest of the site, or in kivas versus rectangular rooms.

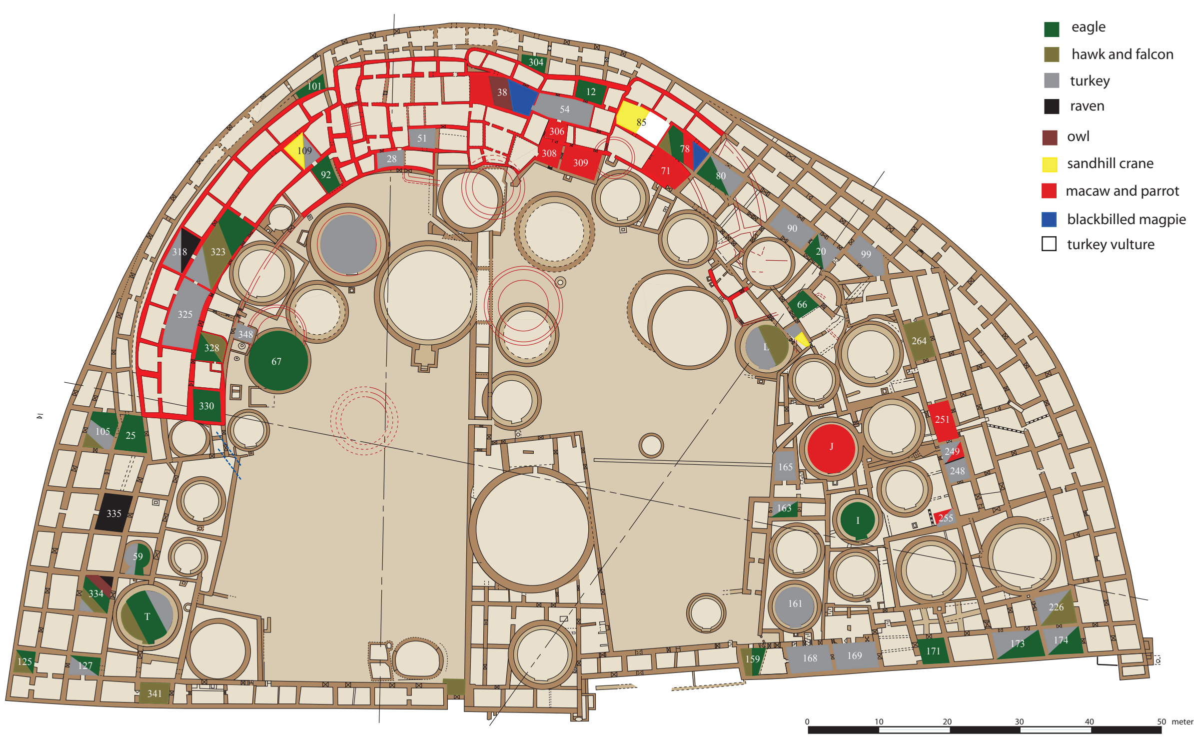

Figure 6.2. Presence/absence distribution of all avifaunal remains identified to species within the ritual avifaunal dataset at Pueblo Bonito. Pueblo Bonito base map provided by the Chaco Research Archive and designed by Edward Triplett.

The only major pattern in spatial distribution concerns macaws. Without exception, all cases of articulated macaws in formal deposits (Table 6.3) are located exclusively in the foundational northern arc of Pueblo Bonito. Furthermore, all cases of macaw remains, regardless of articulation, are exclusive to the eastern half of the pueblo. This pattern was also noted by Bishop and Fladd (2018). The restriction to the eastern half of the pueblo even extends to the two macaws found in the Bonito refuse mounds, both of which were recovered from the East refuse mound. This restriction is suggestive of the principle of dualism operation in ceremonial organization, discussed further below.

Minor patterns are also evident at Bonito that might indicate particular practices rather than overarching structuring organizational principles. Considering the distribution of taxa between rectangular and round rooms at Bonito, the only taxon to occur in kivas are eagle, turkey, hawk, and in one case, macaw. Since all of these also occur in rectangular rooms, no taxa were exclusively deposited in kivas. All other taxa, however, were only deposited in rectangular rooms.

In addition to the exclusive deposition of articulated macaws in the northern arc, black-billed magpies (5 MNI) (found in rooms 38 and 78), were also exclusive to this portion of the pueblo. Considering the spatial distribution of articulated individuals at Pueblo Bonito (Figure 6.1), in addition to the restriction of macaws to the northern arc, articulated hawks only occur outside of the northern arc on the eastern side of the pueblo. Two partial articulations of eagle occur on the western half of the pueblo, one in the northern arc, while a third was found on the eastern half in closer proximity to the two articulated hawks.

Concerning co-occurrence of different taxa, several combinations appear to co-occur with regularity: turkey and eagle, eagle and hawk, turkey and hawk, and turkey/hawk/eagle are frequent combinations within the same room. These co-occurrences are also evident at Pueblo Alto, Bc 57, Leyit Kin, and 29SJ 629. Macaws at Bonito, on the other hand, tend to not co-occur at the room level with the remains of other birds. Black-billed magpie remains only occur in rooms that also have macaw remains at Bonito.

Duality and Plurality as Organizing Principles

Prior studies have found spatial patterning in the distribution of material remains suggesting structuring principles of organization (e.g. Bishop and Fladd 2018; Bishop et al forthcoming; Ditto 2017; Neitzel 2003). Expectations for spatial distribution in avifaunal remains in support of general overarching patterns of dualism and pluralism structuring ritual practice in Chaco Canyon were laid out in Chapter 3 (Table 3.2). It is against these expectations that spatial patterning in the ritual avifaunal dataset were assessed. The patterns of dualism already found by Bishop and Fladd (2018) and Bishop et al (forthcoming) are supported by the analyses presented in this dissertation, with several new insights.

Duality. As previously mentioned, Bishop and Fladd (2018) found that all macaw remains were restricted to the eastern half of Pueblo Bonito. Additionally, all definitively articulated macaws in formal depositional contexts are exclusive to the northern arc. There does not seem to be a particular bird type that, in complementarity is located exclusively on the western half. However, Bishop and Fladd (2018) found that bird talons, the claws of mammals, and carnivore skulls were restricted to the western half. This dualistic east-west pattern in different types of remains highlights the need for cross-faunal-class studies and probably cross-material-class studies to reveal spatial patterning.

The relationship between eagles and macaws at both the inter- and intra-site level provides another example of the possibility of dualism as a structuring principle. This pattern was first highlighted by Bishop et al (forthcoming). At the inter-site level, inhabitants of different great houses appear to have employed in ritual the three most prominent birds in the avifaunal assemblage. While those at Pueblo Bonito incorporated eagle, turkey, and macaw into ritual life, those at Pueblo Alto did not have access to macaws but extensively used eagles, while those at Pueblo del Arroyo had access to macaws but did not use eagles. Eagles and macaws, therefore, only overlap in this group of great houses at Pueblo Bonito. It should be noted that one partial macaw was found at Kin Kletso, where 5 NISP of eagle were also found. At 29SJ 1360, however, macaw is present but eagle is absent.

The limited overlap in the presence of eagle and macaw remains at the inter-site level is seen at the intra-site level as well. Bishop et al (forthcoming) note that, even at Pueblo Bonito where macaws and eagle remains were both present, these rarely co-occurred in the same space. There is overlap within the same room in these two taxa only in Room 78. In this room two macaws were placed on or near the floor. Two eagle talons of unknown species were also recovered from the fill of this room. The separation between these remains, macaws in association with the floor and eagle talons higher up in fill, indicate that though they were recovered from the same space, they were not deposited together. The exclusivity in the deposition of eagle and macaw remains at both the inter- and intra-site level suggests that the ritual practices that involved these birds may have been dualistically exclusive but complementary.

Lastly, dualism as a structuring principle may be evident at an even higher level, between the ceremonial functions of great houses and small houses categorically. Ritual at great houses involved a variety of taxa—especially those challenging to procure—in smaller, more private, spaces. On the contrary, ritual involving whole or partial birds at small houses occurred predominantly in kivas and pithouses, and involved mostly turkey—which may have been husbanded in the canyon. At the canyon-wide scale, this contrast between esoteric and domestic ritual, may have been intended to complement one another in a dualistic way, with both types of ritual being necessary. Both public ceremonies and more esoteric, secretive ceremonies are carried out in the modern and historic Pueblos (Levy 1992; Ortiz 1969; Whiteley 1988), and different religious societies have different tasks for which they are responsible to the society as a whole (Brandt 1994:15). It is possible that a similar complementarity is reflected in Chaco Canyon.

Plurality. Limited evidence exists for pluralism as a structuring principle in ritual, though I believe this principle is more challenging to see than dualism. Relative to the expectations of Table 3.2, pluralism might be expected to appear as, for example, the spatial clustering of the use of certain types of birds in different portions of the same site (for example a kiva and adjacent rooms, or simply different corners of a pueblo), or even at the site level with different sites responsible for rituals involving specific but pluralistically complementary birds to one another. No such patterns were found among or within sites in Chaco Canyon in the distribution of avifaunal remains.

Also relative to the expectations in Table 3.2, the preponderance of taxa at sites like Pueblo Bonito may be indicative of pluralism, but there is no spatial patterning across the site in bird type to suggest discrete clusters where specific birds were used in ritual. While it is certainly possible that pluralism was a theme of overall ceremonial organization that structured ritual practice, the actual deposition of avifaunal remains in Chaco Canyon does not seem to have been structured by this type of organization.

Unstructured Organization. In an unstructured organizational schema, limited or no prescriptions concerning how birds are used in ritual exist. Such a situation seems unlikely for Chaco Canyon for multiple reasons. First, access to eagles and macaws, two ceremonially important birds, appears to have been restricted within and between great houses and small houses suggesting proscriptions concerning bird use. Second, multiple dualistic patterns exist that suggest that the principle of dualism did structure ritual life. Third, even if patterns for dualism or plurality are not considered to be strong, there are certainly patterns in the ritual use of birds that indicate prescriptions about how they were to be involved in ritual, how and where they were to be deposited, and especially which sites had access to them. And lastly, if the historic ethnographic record is considered to be an appropriate guide for informing our understanding of past Pueblo ritual, there certainly was no such thing as unstructured ritual.

Vertical Ceremonial Organization

In Chapter 2, I outlined 6 criteria identified by Haviland (1975) as components of hierarchical societies, and Brandt's translations of these to the ethnographic Pueblos (Table 3.3). I also outlined expectations in the avifaunal record for positive or negative evidence of social hierarchy founded in ritual authority (Table 3.4). Haviland/Brandt's criteria 1, 3, 4, 5, and 6 are of relevance in interpreting the picture just developed of ritual involving birds in Chaco Canyon, and both patterns in organization between sites and in the use of the mechanisms of ritualization are revelatory in assessing the presence of social inequality. Overall, patterns in the Chaco avifaunal assemblage appear to strongly indicate that social inequality was present in the canyon, and that it was based in the possession of ceremonial knowledge, materials, and responsibilities (Brandt 1994:15).

Criteria 3 states that there should be differential access to resources in a hierarchical society, and Brandt (1994:15-16) explains that in Pueblo societies, this includes access to specific resources such as animals and plants and to the knowledge associated with their collection and use. The inhabitants of great houses in Chaco Canyon appear to have had nearly exclusive access to macaws, and much greater access to eagles and hawks than did those at small houses. Specifically, the residents of Pueblo Bonito had the greatest access to macaws in the canyon. While Criteria 3 relates to *access* to resources, Criteria 6 relates to *control* over and distribution of resources. Based on the spatial inter-site distribution of avifaunal remains, leaders at great houses, or more specifically Pueblo Bonito, may have been in control of the distribution of macaws, eagles, and to a lesser degree hawks. Leaders at Pueblo Bonito appear to have controlled this distribution for both great houses and small houses. Related to Criteria 3 and 6 is Criteria 5, which in Brandt's translation states that the possession of symbols of authority legitimizes the position of elites in a group. Specific birds, notably macaws, may have been one such symbol. Their acquisition by ritual leaders would have legitimized authority, and their distribution and use was consequently controlled.

Brandt (1994:15, 20) also states that the ceremonial knowledge that forms the fundamental basis of the authority of leaders is protected through secrecy. In the ethnographic Pueblos, special rooms are maintained for "the performance of nonpublic ceremonies" (Brandt 1994:19). Based on the analyses of the mechanisms of ritualization involved in the deposition of articulated birds and bird parts, certain ritual practices at Chaco great houses were esoteric and secretive.

While the avifaunal record does not speak directly to Criteria 4, which Brandt suggests may be archaeologically manifested by the presence of status burials (1994:19), the presence of rich burials at Pueblo Bonito support both Criteria 4 and 5. The two burial crypts in the northern foundational arc of Pueblo Bonito have been interpreted as the potential founding leaders of the pueblo (Plog and Heitman 2010). In the northern burial crypt, at least 14 individuals were interred in Room 33 with an incredible wealth of artifacts. These individuals died and were interred over the span of 300 years, with the earliest burials occurring sometime around the earliest construction on the pueblo (Plog and Heitman 2010). Multiple complete bird offerings were also found in this northern arc, suggesting that their deposition may have been a part of the secretive, esoteric rituals carried out by the possible ritual leaders interred in the northern burial crypt. Because the individuals in the northern burial crypt could have been among the founders of Pueblo Bonito (Plog and Heitman 2010:19623), their ritual authority may have been based, as is suggested by Criteria 5, either in their identities as original founders, or in rank based on some deeper tradition.

Based on the above, Criteria 1 appears to be true: that "hierarchically ranked groups with relatively permanent positions" (Brandt 1994:14) were present, and that the authority of these individuals or groups was based in the possession of and control over ceremonial knowledge and property. This is the "fundamental basis for social ranking in Pueblo societies" (Brandt 1994:15) and appears to have been the case in Chaco Canyon as well. The presence of hierarchically ranked groups or individuals with relatively permanent positions is also consistent with the recent finding of matrilineal relationships among the 14 individuals buried in the Pueblo Bonito northern burial crypt, which was maintained over 300 years (Kennett et al 2017; Plog and Heitman 2010). Hierarchical relationships appear at several levels in Chaco Canyon: between great houses and small houses, between Pueblo Bonito and other great houses, and within Pueblo Bonito itself. Ritual leaders in Chaco Canyon likely lived at great houses, perhaps specifically Pueblo Bonito. And from here they carried out secretive and esoteric rituals in private spaces involving the offering of birds and controlled the distribution of high-value birds to the occupants of other sites in the canyon.

In this chapter I have attempted to explain a variety of details of the nature of ritual practice involving birds in Chaco Canyon. Specifically, I have focused on the expression of the mechanisms of ritualization that can inform our interpretation of ritual, and on patterns in both horizontal and vertical ceremonial organization. In the next chapter, I will attempt to weave together the insights of prior chapters about the nature of Chacoan ritual, and to contextualize these findings in light of the work of other scholars and ongoing debates concerning the canyon.

Chapter 7: Discussion and Conclusions

Two primary goals have driven the research presented in this dissertation: first, to detail and understand the nature of human-bird interaction and relationships in Chaco Canyon, and second, to provide insight into the nature of Chacoan ritual and ceremonial organization. These goals were approached through the analysis of avifaunal remains, a class of fauna that was chosen for two reasons. In American zooarchaeology, avifaunal remains are under-studied relative to other types of fauna, and to other material classes. This is despite deep engagement between humans and birds that has characterized prehistoric life all over the world. Choosing this material class as the focus of research sheds light on a component of human-animal relationships that often does not receive the scholarly attention it deserves. Furthermore, in the Pueblo region in particular, birds have been and remain a significant component of ceremonial, ritual, symbolic, and everyday life. The analysis of archaeo-avifaunal remains, therefore, provides a unique lens into past ritual practices.

To achieve these goals, I attempted to analyze all avifaunal remains recovered from the canyon. I analyzed 11,729 specimens of bird bone, from six different museums or institutions across the country, representing the efforts of at least five major field programs conducted over the last 130 years. This dataset is comprised of 11,014 NISP (Number of Identified Specimens), reconstructing to at least 654 MNI (Minimum Number of Individuals), representing 41 discrete types of birds from 38 different archaeological sites dating from the Basketmaker III (500-750 CE) to Pueblo III (1150-1350 CE). periods.

The theoretical foundations that have structured the preceding analysis operate from the fundamental perspective that human-animal relationships were deeply social, rather than simply economic, and that humans and animals engaged with one another in mutually-influential ways.

Birds were not simply an available resource to be exploited, but an integral, dynamic component of people's perceptions about the natural world. Interactions with birds in Chaco Canyon in particular were driven by motivations and practices intended to ensure the continued working order of the universe through ritual.

From this perspective, three research objectives structured the analysis of the avifaunal assemblage. The first objective sought to develop an understanding of the nature of human-bird interactions in prehispanic Chaco Canyon, and of the different ways that birds were involved in daily life. Addressing this objective forms the foundation for addressing the following two objectives, which in turn help to complete the picture of human-bird relationships in Chaco Canyon. In the second research objective, an analysis of how birds were involved in ritual was used to develop an understanding of the nature of ritual practice. The third research objective sought to provide insight into how ceremonial life was organized in Chaco Canyon. Below, primary findings, interpretations, and conclusions are provided for each research objective.

Bird Use and Human-Bird Relationships in Chaco Canyon

It is abundantly clear that Ancestral Pueblo peoples of Chaco Canyon maintained great interest in a variety of local and even nonlocal birds. Relationships existed and were developed with a variety of local taxa. Great investment was made and little effort spared to procure birds that were decidedly important to the occupants of Chaco Canyon. Foremost in importance appear to have been the turkey, the eagle (both golden and bald, but primarily the former), a range of lesser raptorial species (hawks, falcons, owls), and macaws and parrots. While many other local species were also procured in smaller quantities, these were the most abundantly represented, and those which appear frequently in the burial or deliberate placement of articulated individuals or parts.

The primary motivations driving the acquisition of birds and their involvement in Chaco life do not appear to have been utilitarian. Birds were not an important part of Chacoan diet, as indicated by the remarkable infrequency with which zooarchaeological indicators used to assess consumption—such as burning and butchery—appear on avifaunal remains. Nor were the species chosen economical from a dietary standpoint. Nor were birds frequently acquired to fulfill a demand for their bones to be manufactured into other objects. No evidence for a robust bird-bone-working industry exists, especially compared to that of mammals (Watson 2012). While certainly some birds were consumed on occasion and the bones of multiple species were used to make objects and ornaments, the primary driving force behind the acquisition of the majority of birds represented in the Chaco avifaunal assemblage was likely to obtain feathers for use in ritual and in manufacturing ceremonial objects, and for the use of whole birds and their parts in ritual practice.

Turkeys comprise nearly half of the entire avifaunal assemblage from Chaco Canyon. A species available in the mountain ranges that surround Chaco Canyon, turkey was also likely husbanded within the canyon (Grimstead et al 2016). While turkey was probably eaten on occasion, and more often than other birds, this was not its sole intended purpose nor its primary one. Instead, the bones of turkey were used for manufacturing objects and ornaments, and more significantly, turkeys were deposited as complete individuals on floors or as burials.

The macaws and parrots of Chaco Canyon have received abundant attention (e.g. Crown 2016b; Hargrave 1970; George et al 2018; Plog et al forthcoming; Watson et al 2015) as the only truly exotic species known to have been acquired. Though scarlet macaws, the majority of specimens, are native to southern Mexico, they were likely imported to Chaco from a breeding center somewhere in the American Southwest/Mexican Northwest (George et al 2018). Their ceremonial importance is unquestionable given the efforts required to procure them and the many instances in which they were buried or intentionally placed as whole birds.

Perhaps one of the most significant outcomes of addressing the first research objective is the degree to which raptors in general seem to have been remarkably important. Such an expectation is born out in the ethnographic record as well, but in light of the attention that macaws have received in Chaco Canyon, eagles, hawks, falcons, and owls have been somewhat overlooked. Raptors, especially eagles, appear to have been almost as important from a ceremonial standpoint as were macaws. Both eagle and hawk species are abundant in the assemblage, and though their bones were also used to manufacture bone objects (unlike macaws, whose remains were never used in such capacity), raptors also appear as complete or partially articulated individuals in dedicatory deposits. Several remarkable instances of the deposition of the feet, legs, and wings of many individual eagles and hawks are also known from the canyon. Notably, the most abundant raptorial species are golden eagle and red-tailed hawk, arguably the two most important raptors in the historic and modern Pueblo world (Fewkes 1900a; Tyler 1979; Voth 1912). This indicates great continuity in the significance of birds in general, and in specific bird types in particular, in the Pueblo world.

Considering the wide range of bird species locally available in Chaco Canyon, the acquisition of such a great number of eagles, hawks, falcons, and owls is quite remarkable. While most of the raptorial species identified may have occupied the canyon, they are by no means the most abundant birds available, nor the easiest to procure. Elsewhere I have argued that, of the species in the Chaco avifaunal assemblage, eagles and hawks are some of the most challenging to procure, given factors such as body size, aggressiveness, nesting and feeding location, gregariousness, and perhaps most significantly, the size of their territorial home ranges that help to ensure low population densities within an area such as Chaco Canyon (Bishop forthcoming). And yet they are abundantly represented in the assemblage. This finding is in contrast to the expectation that birds were acquired based on availability, opportunity, and ease, and strengthens the case for their ceremonial importance. The raptors pursued by the people of Chaco Canyon likely had great symbolic value related to their perceived qualities and natural abilities, specifically related to power and possibly hunting, as well as symbolic referents to other components of the Chaco worldview.

The developing picture of the relationships between people and birds in Chaco Canyon is one of high-level investment in procuring birds that had great ceremonial and symbolic value. These birds were invaluable participants in ritual and everyday life. While birds were on occasion consumed, and certainly the bones of larger birds were used to manufacture objects, the limited degree to which either of these activities appears to have been engaged in confirms that the primary purpose of acquisition for most birds was for their feathers used in ritual and in the manufacture of ceremonial objects and for the use of actual birds in ritual. Paramount among these were eagles, hawks, macaws, and turkeys, while a great variety of other local species were valued as well. More specifically, how these birds were involved in ritual practice is the purview of the second research objective.

The Nature of Ritual Practice in Chaco Canyon

The use of avifaunal remains to elucidate the nature of ritual is guided by both the knowledge that birds were and are important in the present and ancient Pueblo world, and the belief that the material remains of ritual practice can be identified and analyzed in the archaeological record. Catherine Bell (2009a,b) theorized that ritual as a form of human practice is distinguished from other forms of behavioral practice through various characteristics that mark ritual practice as any combination of special, different, sacred, performative, and so forth. As a form of practice that people *do*, ritual is no more challenging to study than any other form of human behavior that is approached through the analysis of its material remains (Fogelin 2008a). By operationalizing the strategies that Bell (2009b) has argued characterize ritual practice, and outlining expected archaeological manifestations, a greater light can be shed on the actual nature of Chacoan ritual, including how the ritual experience was created and achieved.

Ritual practices involving the dedication of articulated whole birds or parts of birds (e.g. wings, legs, feet, heads) took place at both great houses and small houses. Eighty-five cases of articulated birds or parts of birds were determined to definitely be or probably be intentional, deliberate, formal deposits that were intended to be dedicatory, sacrificial, or otherwise created in the course of some ritual act. The creation of such deposits at small houses involved turkeys, ravens, northern harriers, red-tailed hawk, American kestrel, and in one case scarlet macaw. Predominantly these were found on floors, below floors, in intentional fill, in pits located in plazas, in one case with an infant burial, and in another case in a decommissioned firepit. At small houses, these birds were more often placed in pithouses or kivas than they were rectangular rooms, and were occasionally found in plazas.

At great houses, such deposits included a greater range of species: golden eagle, Swainson's hawk, red-tailed hawk, scarlet macaw, thick-billed parrot, black-billed magpie, Sandhill crane, turkey, common raven, horned lark, great-horned owl, and northern harrier. Notably, great house deposits containing articulated individuals included nearly all of the taxa (except American kestrel) that small houses did, in addition to others. At great houses, these birds were found on and beneath floors, in carefully prepared subfloor pits, in fill, in trash mounds, in pits in plazas, and in one case each in a firepit and with an infant burial. Exclusive to great houses were practices that created large, aggregate deposits of the body parts (especially wings and legs) of multiple individual birds, primarily raptors. Contrary to the case at small houses, articulated birds at great houses were more often placed in rectangular rooms than they were kivas.

Considering these primary context deposits, the application of the mechanisms of ritualization (Bell 2009b) to instances of bird offerings affords special insight into the nature of ritual practice in Chaco Canyon, revealing differences between great house ritual and small house ritual, as well as changes in the nature of ritual over time. Where each mechanism can be identified as having been (or not been) used to distinguish ritual practice, this reveals the degree to which each element (e.g. traditionalism, formalism, rule-governance, etc.) was important to Chacoan ritual. In the application of the model developed, those mechanisms which shed the most light on Chacoan ritual are performance, formalism, sacral symbolism, and traditionalism. Together, these reveal that ritual practices involving birds were conducted somewhat differently at great houses than at small houses.

In general, there appear to have been rules or commonly shared ideas concerning how the dedication of birds and their parts was to be enacted. A finite range of taxa were involved in the rituals that created such deposits, and most involved either raptors, turkeys, or macaws. Thus, it was not simply any bird that fulfilled the desire or obligation of dedication, but specific taxa who held ceremonial significance. Moreover, the location in which these ritual acts occurred appears to have been rule-guided—be they in rectangular rooms, kivas, pithouses, or plazas—rules that differed between great houses and small houses. There was, however, evidently greater flexibility across the canyon in the kinds of spaces that birds could be deposited, and in the details of their deposition.

At great houses, ritual practices involving birds were concentrated in smaller, more private rectangular rooms, rather than larger, more accommodating kivas, great kivas, or plazas. However, even these rectangular rooms were more formally prepared relative to the majority of rectangular rooms at great houses, with prepared walls and floor features. Thus, ritual practice involving the offering of birds occurred in the most formal of the most private spaces. In contrast, ritual practices involving birds at small houses more often took place in kivas and pithouses, which served more domestic functions and were likely relatively less-restricted (though potentially still restricted to some degree). Furthermore, special, exotic or expensive-to-procure taxa were involved in great house ritual (macaws, parrots, eagles, hawks), while at small houses more locally available, easier to procure taxa were more frequently chosen (turkeys, raven, and more rarely hawks).

These patterns highlight a greater contrast between great and small house ritual involving the deposition of birds. At the former, ritual involving the deposition of birds appears to have been esoteric. Likely, only certain individuals with specialized ritual knowledge were involved and used types of birds that were challenging to procure and may have carried greater symbolic importance. The ritual deposition of birds was still important at small houses, but appears to have been more domestic in nature. These practices occurred in spaces that also served domestic functions, and often these acts may have marked the decommissioning of the spaces in which they took place. They involved locally available taxa, with seemingly limited access to most of the taxa employed at great houses. This evidence for esoteric and domestic ritual applies only to the ultimate deposition of articulated individuals and parts. It is likely that the feathers of a great variety of birds were used in more public and unrestricted settings, or even that whole birds were used in other spaces before their deposition in restricted spaces. In other words, not all ritual acts associated with birds at great houses were necessarily private, secretive, and esoteric.

Chacoan ritual also appears to have been characterized by a sense of long-term, overarching traditionalism. The practice of offering birds in the Ancestral Pueblo Southwest began well before the primary occupation of Chaco Canyon, as early as the late Basketmaker II period (50-500 CE) (McKusick 1986:4). Within Chaco Canyon, the practice of offering birds is evident well before Chaco's "florescence" and continued to be practiced throughout the occupation of the canyon into the Pueblo III period (1150-1350 CE). The majority of articulated bird deposits in Chaco Canyon date to the Pueblo II period (900-1150 CE) during Chaco's primary and densest occupation, but the offering of a bird itself in the Pueblo II period may have been a traditional referent to a long-term preexisting practice, lending authenticity to the experience. Specifically, the deposition of macaws, turkeys, and raptors appears to have occurred throughout the late Pueblo I/Pueblo II period occupation of Chaco Canyon, indicating that these birds maintained ceremonial importance for a long time, a pattern that is still evident today.

The majority of reconstructions of and references to the Chaco regional system in the last twenty years have stressed the primacy of ritual in Chaco Canyon (e.g. Kantner 2006; Kantner and Vaughn 2012; Malville and Malville 2001; Neitzel 2003; Van Dyke 2008; Yoffee 2001). Regardless of disagreement concerning the role that Chaco Canyon sites played in the region at large, the presence and basis of inequality, or the size of the population that lived there, many scholars would agree that ritual was an important component of Chaco life, and that the canyon was ceremonially important in the San Juan Basin (Mills 2002:79-80; Plog 2011:52; Schachner

2015:57-59). However, few reconstructions of Chaco as a ritual center have supplied details of the nature of ritual activity that took place in the canyon (Plog 2011:52).

Several earlier and recent efforts have helped to develop what little we do know about Chacoan ritual. The most informative studies of Chacoan ritual have relied on uniting artifact analyses with archival information, the approach taken here. Neitzel's (2003) study of artifact distributions at Pueblo Bonito demonstrated the utility of mapping the spatial distribution of important types of artifacts. Other studies have focused on ornaments (Mattson 2015, 2016), the contents of caches (Mills 2008), artifacts in primary context assemblages (Ditto 2017), turquoise (Mathien 2001, 2003), ceremonial objects and architectural elaboration (Heitman 2011, 2015), cylinder vessels (Crown and Hurst 2009), kivas (Crown and Wills 2003), contents of the burial suites at Pueblo Bonito (Plog and Heitman 2010), perishables (Jolie 2018), and ritual fauna (Bishop and Fladd 2018; Bishop et al forthcoming).

Together, these studies are slowly chipping away at the dearth of knowledge concerning Chacoan ritual, and together painting a more elaborate and artifact-based picture of ceremonial life in the canyon. Significant themes and components of Chacoan ritual evident in the contextual and spatial analysis of different material classes have been put forth by the above scholars. At Pueblo Bonito, Neitzel (2003) found that the northern arc of the site, or the "ritual precinct," contained the densest concentrations of many types of ceremonially significant artifacts. This area also contained the two Bonito burial clusters or crypts, the contents of which reveal the repeated deposition and veneration of human remains, in both primary and secondary burials, through the placement of valuable materials over the course of likely three centuries or more (Plog and Heitman 2010). Multiple scholars have argued that the way spaces were constructed and objects were deposited and renewed were important components of creating, maintaining, and altering memory in Chaco Canyon through ritual. Ceremonial items and spaces were dedicated, retired, and memorialized through ritual acts in the construction of social memories and the active reconstitution and maintenance of memory (Mills 2008). One specific goal of ritual practice included the renewal of both kivas and cylinder jars, through the rebuilding of the former and the re-slipping and re-painting of the latter. Kivas were ritually "adorned" using markers of large-scale group identity including various types of shell (Mattson 2015, 2016), and Chacoan houses were consecrated and sanctified through offerings, structured ritualized deposits, and burials (Heitman 2015).

Still other scholars have marshalled knowledge about Chacoan ritual to speak directly to debates concerning the basis of inequality and/or leadership and the nature of social organization. Crown and Hurst (2009) have suggested that cacao consumption by a small segment of the population of Pueblo Bonito was an important component of ritual that distinguished ritual leaders by their access to distant resources. Patterns in the spatial distribution of ritually significant classes of faunal remains at Pueblo Bonito have been used to argue for moiety-like organization at the great house (Bishop and Fladd 2018).

To this burgeoning and complex picture of Chacoan ritual based in the detailed analyses of material remains and contextual data, a new perspective on Chacoan ritual is added. In the research presented here, an understanding of the roles that birds played in ritual in Chaco Canyon is developed. Light is shed on the types of spaces in which these practices took place, and on the specifics of deposition. The great symbolic and ceremonial importance that birds held to the people of Chaco is evident in the efforts to which people went to procure the types of birds that were important to them. Furthermore, information was revealed concerning *how* ritual was enacted, important themes in ritual practice, and the degree to which certain elements (such as traditionalism) were integral to the performance of ritual. Much of the above research has focused on Pueblo Bonito (e.g. Bishop and Fladd 2018; Crown and Hurst 2009; Mattson 2015, 2016; Neitzel 2003; Plog and Heitman 2010); this dissertation, along with the work of others (e.g. Bishop et al forthcoming; Ditto 2017; Heitman 2015), helps to broaden the scale of understanding Chacoan ritual to include many sites, both great house and small. The analysis of the involvement of birds in ritual also sheds light on the details of ceremonial organization, discussed below.

Ceremonial Organization in Chaco Canyon

Multiple scholars have found studies of the spatial distribution of different material classes to be informative in our understanding of Chacoan ritual (e.g. Bishop and Fladd 2018; Bishop et al forthcoming; Ditto 2017; Mattson 2015, 2016; Neitzel 2003; Potter and Perry 2000). Some of these studies have been used to discuss evidence for different forms of ethnographically-documented ritual or social organization in Chaco Canyon. As summarized in Chapter 1, others have relied on architectural layouts of sites in Chaco Canyon (e.g. Fritz 1978, 1987; Vivian 1970, 1990; Whitely 2015). Bishop and Fladd (2018:4) have emphasized that "while architecture may speak to the intended structure of society, discard reveals whether this structure was continually enacted in the daily lives of residents and how these materials may have been manipulated to negotiate social relationships."

Instead of attempting to address the nature of social organization in Chaco Canyon through the analysis of avifaunal remains, the research presented here seeks simply to identify dualism and plurality as structuring principles of ritual practice and ceremonial organization. While these organizational themes are derived from the ethnographic record concerning Pueblo social organization, as outlined in Chapter 3, for the analysis of avifaunal remains these are reduced to expectations that speak more closely and more specifically to the nature and organization of ritual practice (Table 3.2). Findings concerning dualism and plurality as structuring principles of ceremonial life certainly have implications for understanding social organization, but these are not addressed here.

Great and Small House Ritual

The analysis of the spatial distribution of avifaunal remains presented in Chapter 6 at multiple scales, including intra-site, inter-site, and canyon-wide, revealed differences in the nature of ritual practice across the canyon, and specifically differences between great house ritual and small house ritual. The developing picture of great house ritual in Chaco Canyon is one of more intense and more extensive use of the involvement of birds in ritual practice than that taking place at small houses. Overall, the inhabitants of great houses made greater use of birds in ritual and employed a larger number of taxa than did people at small houses (though a comparable breadth of taxa was used at small houses relative to assemblage and site sizes). The greater range of taxa involved in ritual practice at great houses may indicate a proliferation of ceremonial groups at the latter, and thus ceremonial practices and responsibilities that would have involved a greater range of important bird types.

Overall, great house ritual made much greater use of taxa that were more challenging to procure than did small house ritual. While macaws and parrots are nearly exclusive to great houses, these sites also yielded 90% of all eagle remains in the avifaunal assemblage, as well as 75% of all hawk and falcon remains. These taxa seem to have figured far less prominently in small house ritual. Additionally, the definitive loci of ritual activities involving articulated birds and parts of birds at great houses and small houses is markedly different. While such ritual practices at small houses were concentrated in kivas and pithouses, at great houses these practices took place more frequently in more closed-off and private rectangular rooms. This is discussed further below.

Restricted and Controlled Use of Macaws and Eagles

The distribution of eagle and macaw remains at all levels, canyon-wide, inter-site, and intra-site levels, supports the conclusion that access to these birds within the canyon was restricted, either intentionally through means of social control, prescriptions, or rules, or simply by the potentially prohibitive cost of acquisition. Any level of control over these birds could have been employed as control over access to ritual resources, supporting the conclusion that power and leadership in Chaco Canyon was based at least in part on ritual knowledge (e.g. Heitman and Plog 2005; Plog and Heitman 2010; Kantner and Vaughn 2012). Given the limited distribution of macaws and parrots within the canyon, the ritual leaders of great houses may have controlled the acquisition of or access to these birds, or may simply have had the resources to procure them. This especially appears to be true for Pueblo Bonito, from which 37 of all macaws and parrots recovered from the canyon (out of 45) were found. While people at several other great houses appear to have had access to or been able to acquire macaws, these birds occur elsewhere in much lower frequencies. For this and other reasons, if access to macaws was controlled by the ritual leaders of a single site, Pueblo Bonito appears the most likely candidate. Besides its clear monopoly on macaws, Pueblo Bonito is the only site to have yet revealed any evidence of people having kept these birds live in captivity, where two rooms had been modified to contain them (Judd 1954:246, 1921-1927:52; Pepper 1920:195). No such comparable evidence, including rooms modified as cages, bird droppings, and food, have been found at other great houses. While macaws do not appear to have been bred in Chaco Canyon (George et al 2018; Plog et al forthcoming), the inhabitants or important figures of Pueblo Bonito may have been responsible for acquiring the birds from a breeding center, keeping them live and captive at Bonito, and distributing them to several other great houses.

That the use of macaws was restricted in Chaco Canyon is further indicated by their restriction even within Pueblo Bonito. Here, they occur predominantly in the northern arc, and are exclusive to the eastern half of the pueblo. Their localized and repeated placement within this founding section of the pueblo, which has also been labeled a "sacred precinct" (Neitzel 2003:125), and even as multiple instances within the same room, suggests that the use of macaws was not only restricted predominantly to this segment of the pueblo, but even to certain rooms within the northern arc, possibly maintained by specific ceremonial groups (Bishop and Fladd 2018).

In a similar fashion, access to eagles by different groups within the canyon, to whole birds, their parts, and to their feathers may have also been restricted or controlled. A surprising 90% of all eagle remains were recovered only from great houses. While the remainder were found at small house sites, they always occur in frequencies of 9 NISP or less per site. This suggests that when the inhabitants of small houses did procure raptors or parts thereof, it may have been simply as disarticulated elements and never or rarely whole individuals. In lieu of eagles, people at small house sites did have access to smaller raptors (hawks, falcons, owls), and even involved them in the ritual deposition of articulated birds. Such birds may have been less valued but still symbolically appropriate stand-ins for eagle in ritual activities.

Furthermore, even the inhabitants of some great houses do not appear to have had access to eagles. Their remains, as well as those of any other type of raptor, are notably absent from Pueblo del Arroyo, where macaws were involved in ritual activities. Once again, people at Pueblo Bonito had abundant access to what appears to have otherwise been restricted in availability. Eagle remains at Bonito surpass even those of turkey in their numerical contribution to the assemblage.

In yet another way, Pueblo Bonito provides a thought-provoking case. Both macaws and eagles were involved in articulated deposits at Pueblo Bonito. While turkey burials were common throughout the canyon, at both great and small house sites, and even though turkey remains are common at Bonito, turkey burials are strangely absent. Neither articulated turkeys nor turkey parts appear to have been involved in the ritual and dedicatory deposition of birds at Pueblo Bonito. This supports an understanding of the ritual that took place at Pueblo Bonito as involving only the most costly and challenging to procure types of birds, demonstrative of the abilities, knowledge, or power of ritual leaders.

Macaws and eagles are arguably the two highest-cost birds in the entire avifaunal assemblage in terms of procurement. The scarcity and cost of acquiring both birds may have elevated their value and prestige, and consequently led to their restricted or controlled use only by certain communities or by specific groups or individuals.

Location, Restricted Visibility, and Exclusivity of Ritual

As previously described using the mechanisms of ritualization, based on the loci of ritual activity involving birds at great houses and small houses, there are evident differences in the intended size, scale, purpose, and audience of ritual practices at each of these. The ritual deposition of birds occurring at great houses predominately appears to have occurred in rectangular rooms. Relative to kivas, great kivas, or plazas, these rooms would have afforded a different kind of ritual experience. These are generally smaller, have restricted access points, and could have accommodated only a limited-size audience. Additionally, the rooms in which articulated bird placements and burials occurred at great houses are more formally prepared than other types of rectangular rooms. The use of high-cost birds, especially macaws, eagles, hawks, and even Sandhill crane at Pueblo Bonito for example, in ritual, occurred in more restricted spaces and may have been more private or even secretive. Perhaps the ability of ritual leaders to acquire these birds in the first place was known by all, but not all were privy to witnessing the rituals in which these birds were involved.

The picture of great house ritual painted here is quite different than the nature of ritual occurring at small houses. At small houses, most ritual acts involving birds occurred in kivas or pithouses, spaces that served both domestic and ritual purposes. Such rituals included a narrower range of taxa, the majority of which were turkey, than at great houses. Where hawks were occasionally used, they may have been more accessible stand-ins for eagles, and more significant in their offering than turkeys. It is possible, based on the picture developed here, that across the canyon the penultimate bird to involve in ritual was the macaw, followed by the eagle, then the hawk, then the turkey.

Ritual Leadership in Chaco Canyon

The picture of the ritual use of birds in Chaco Canyon developed here supports the interpretation that social inequality was present in the canyon and that the authority of individuals or groups was based in the possession of ceremonial knowledge and property.

Expectations to assess this were discussed in Chapter 3, developed from the work of Elizabeth Brandt (1994). Ritual leaders in Chaco Canyon had greater access to and control over the distribution of certain valuable, ritually important birds. These leaders carried out secretive and esoteric ceremonies involving the offering of whole birds and their parts in special-purpose ceremonial rooms, and likely resided at great houses. They were responsible for the acquisition and distribution especially of macaws and eagles.

This interpretation is consistent especially with prior interpretations of the two burial suites in Pueblo Bonito. In the northern burial crypt, the remains of 14 individuals, belonging to the same matriline, were interred over the course of three centuries (Kennett et al 2017; Plog and Heitman 2010). It seems plausible, then, that "hierarchically ranked groups with relatively permanent positions" (Brandt 1994:14) were present in the canyon, potentially from the founding of Pueblo Bonito. The leaders of these groups had authority based in demonstrated ceremonial knowledge and abilities, and control over some ceremonial resources, including certain types of birds.

Duality and Plurality as Organizing Principles

Patterns in the spatial distribution of material classes can also reveal higher-level structuring principles of organization. Expectations for the principles of duality and plurality in structuring ceremonial life are derived from ethnographic models of social organization, but here are reduced to implications for the nature of ritual and ceremonial life. Expectations for either principle were discussed in Chapter 3, but rest primarily on identifying evident dualities, structural oppositions, and binary patterning in the distribution of avifaunal remains at the canyon-wide, inter- and intra-site levels. The same is true for interpreting evidence of plurality, but where instead of two oppositional but complementary halves of the same ritual whole, plural but unique sets of practices are expected.

Analysis of the spatial distribution and contextual details of the Chacoan avifaunal assemblage found evidence at both the intra- and inter-site levels of dualism as a structuring principle evident in the use of eagles and macaws. In an analysis of the presence/absence of eagle and macaw remains at three different great houses, Bishop et al (forthcoming) found that the inhabitants of Pueblo Alto had access to eagles but no macaws, while the reverse was true at Pueblo del Arroyo. People at Pueblo Bonito, however, used both macaws and eagles. While both are present in limited quantities at Kin Kletso, at no other great house are they present in comparable quantities to one another (eagle to macaw), or to Pueblo Bonito.

This pattern is also reflected at the intra-site level. At Pueblo Bonito, the only one of the three great houses at which both macaw and eagle remains are present, there is limited overlap within rooms between these remains. In only a single room do they overlap in presence. This near-exclusivity in their deposition at the inter-site level, as well as at the intra-site level, suggests that these birds played different roles in the enactment of ritual, roles that may have been dualistically opposed to one another but complementary within a greater ceremonial whole.

Previous research by others has argued that duality was an important component of Chaco social organization. Specifically at Pueblo Bonito, such research has cited artifact distributions, the symmetrical layout of the great house, the bifurcating wall that divides Pueblo Bonito, the presence of two material-rich burial clusters containing many individuals in the foundational northern arc of the site, and the contents of these burial clusters (Bishop and Fladd 2018; Ditto 2017; Fritz 1978, 1987; Heitman and Plog 2005; Mills 2015; Plog and Heitman 2010; Vivian 1970, 1990:298-299, 446-448). In integrating with these arguments the evidence for dualism as a structuring principle evident in the use of macaws and eagles in Chaco Canyon, I would offer the following tentative suggestion. Because macaws and eagles both appear to have been subject to controlled distribution within the canyon, and because the deposition and evident use of each of these birds was largely exclusive from one another, access to macaws and eagles in the canyon may have been controlled by two distinct ceremonial or social groups, with one responsible for the acquisition and distribution of macaws, and the other of eagles. Given the preponderance of both at Pueblo Bonito, this great house may have been a location for both of these groups.

The presence of the two burial clusters within the foundational northern arc of Pueblo Bonito provides further, specific compelling evidence for this suggestion. Each of these burial clusters, or crypts, contained the remains of multiple individuals, some as primary interments and some secondary. All four rooms in each cluster contained human remains, and the northern cluster in particular contained elaborate collections of grave goods (Plog and Heitman 2010). These crypts have been interpreted as containing the remains of the two founding groups of Pueblo Bonito. Archaeogenomic sequencing of the remains of the individuals in the northern burial crypt has revealed matrilineal relationships between these individuals (Kennett et al 2017).

In her analysis of the material contents of these two burial clusters, Ditto (2017) found evidence that they were significantly different enough to suggest that they indexed different cosmological forces and concepts, interpreting this as evidence that the individuals from each burial cluster “represent two different groups of people associated with different sources of cosmological power” (Ditto 2017:371). Intriguingly, the distribution of eagle and macaw remains discussed here seem to support the interpretation that the two burial clusters represent two groups with different ritual responsibilities. Figure 7.1 shows the locations of the western and northern burial clusters, as well as the locations of articulated depositions of macaws and eagles within the foundational northern arc. Clear proximate association is evident. In close proximity and directly adjacent to the western burial cluster are the only two cases of intentionally deposited articulated eagle parts. Additionally, four disarticulated specimens of golden eagle were found in rooms 326 and 330 in the western burial cluster itself. While no macaw remains were found in the rooms of the northern burial cluster, articulated deposits of macaws in the foundational northern arc are exclusive to the eastern half, and in close proximity to the northern burial cluster.

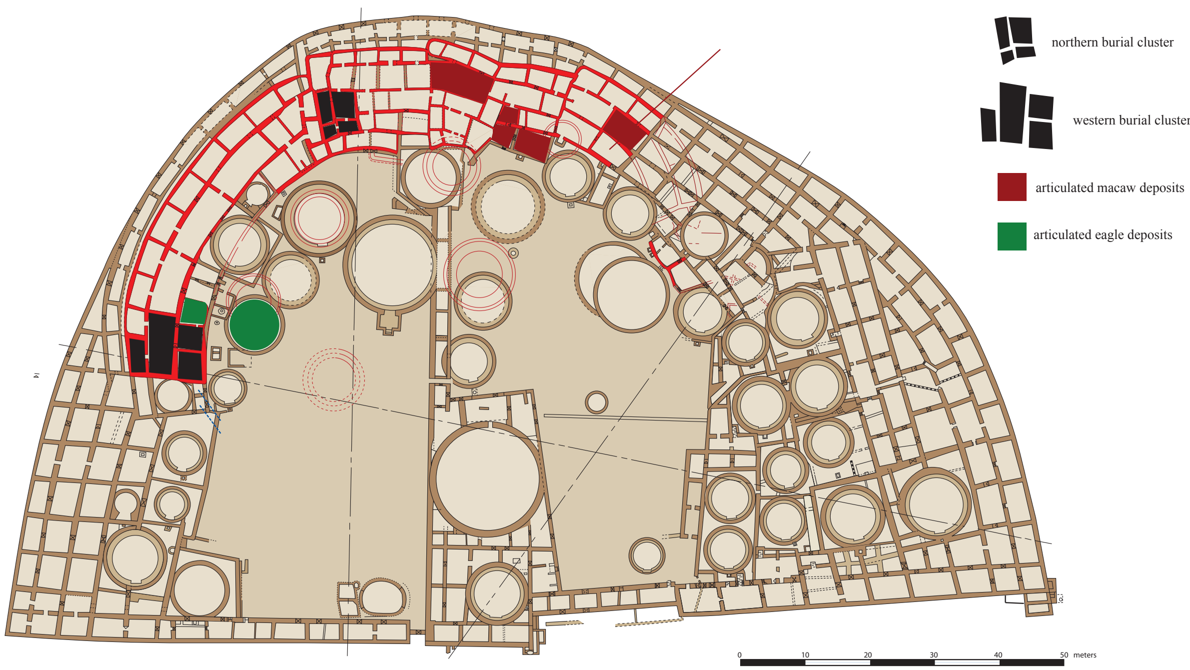

Figure 7.1. Showing the northern and western burial crypts at Pueblo Bonito, and the rooms containing articulated deposits of macaws and eagles. Pueblo Bonito base map provided by the Chaco Research Archive and designed by Edward Triplett.

I would posit then, that even at the founding of Pueblo Bonito, two predominant ceremonial organizations may have been in place, one which may have controlled access to, distribution of, and use of eagles, and the other of macaws, two symbolically valued birds in the

Pueblo world. Such restricted access and the continued, evidently exclusive, use of these birds at different scales appears to have been maintained at Pueblo Bonito, even as the pueblo was expanded, as evidenced by the continued absence of co-occurrence of eagle and macaw remains. It is not surprising that two of the most symbolically charged and valued birds in the modern Pueblo world had such great significance in Ancestral Pueblo Chaco Canyon. It should be clear that their importance today has ancient roots, revealing that the importance of these birds in ritual and ceremonial life has been maintained over at least a millennium.

A Hypothetical Narrative

The picture of the relationships between people and birds in Chaco Canyon is one of high-level investment in procuring birds that had great ceremonial and symbolic value. These birds were invaluable participants in ritual and everyday life, important predominantly for their ceremonial value, but also as minor components of diet and sources of bone as raw material. The ceremonial and ritual importance of birds in Chaco Canyon is historically situated. The practice of offering birds began well before and outside of the major occupation of Chaco Canyon, as early as 250 CE (McKusick 1986:4). Throughout the late Basketmaker II (50-500 CE) and Basketmaker III period (500-750 CE), turkey was the common choice, and often seems to have been placed in pithouses and kivas (Hill 2000; Munro 1994:102-103). This tradition was continued in Chaco Canyon at small house sites occupied during the Basketmaker III/Pueblo I period, when bird offerings were almost exclusively of turkeys on pithouse or kiva floors.

Pueblo II period Chaco ritual involving the deposition of birds was, however, markedly different than Basketmaker III/Pueblo I period ritual in Chaco. Coinciding with the beginnings of great house construction, the proliferation of sites in the canyon, and the "florescence" of Chaco culture, much greater elaboration occurred in the Pueblo II period in terms of what taxa were involved and how they were placed. In this elaboration distinctions in who could use what types of birds appear to have emerged. Ritual involving the deposition of birds at great houses became more esoteric and restricted, with only certain individuals involved in these acts. “Exotic” birds, macaws and thick-billed parrots, were nearly exclusive in use to great houses, with remains from only one bird found at the small house 29SJ 1360 in a unique context that may represent a post-abandonment offering. The use of distant birds from the south illustrates the importance of sacral symbolism in ritual practice, referencing distant Mesoamerica and demonstrating the social power required to bring these birds to the canyon. Moreover, other challenging to procure taxa, such as golden eagle, were more frequent participants in great house ritual than they were in small house ritual. Meanwhile, at small houses, long-standing traditional practices involving the deposition of turkeys in pithouses and kivas were maintained.

As more great houses were constructed, ritual involving birds became increasingly esoteric, with the inhabitants of only certain great houses having access to certain high-value types of birds. The acquisition and distribution of these birds, specifically macaws and eagles, and to a lesser extent hawks, may have been restricted or controlled by ritual leaders at great house sites, whose authority was based in the possession of ceremonial knowledge. Ritual leaders at Pueblo Bonito may have the greatest access to high-value birds, and potentially orchestrated their distribution to other sites. The presence of ritual leaders at Pueblo Bonito is consistent with interpretations of the two, rich burial crypts (Heitman and Plog 2005; Plog and Heitman 2010). Though this is more speculative, members of these two potential founding groups at Pueblo Bonito may have each been associated with the use of either macaws or eagles.

Concluding Thoughts

It is my hope that this dissertation has revealed new insight into the nature of Chacoan ritual, and into human-animal relationships in the canyon. Birds are a unique component of the zooarchaeological record, and given adequate study and attention can provide remarkable insight into past human societies. In the Pueblo world specifically, where birds have been an important component of ceremonial life for centuries, the study of their remains can offer a unique perspective on past ritual practices.

Persistent debate concerning major, fundamental questions may always surround Chaco Canyon archaeology. The best path forward, however, is paved by the analyses and re-analyses of existing and extensive museum collections from Chaco's long history of excavation, and the coupling of such analyses with detailed research into archival documentation and the use of legacy data. Despite the perpetual claim that Chaco Canyon was an empty ceremonial center, that little material was recovered from the canyon, or that few detailed records are available to aid in the reconstruction of context, this dissertation and recent work by other scholars on the material artifacts of Chaco Canyon reveal an entirely different story. New data, new analyses, and detailed material-archival studies can begin to address some of the major questions still unanswered for Chaco Canyon (Mills 2002:100; Schachner 2015:57; Plog 2011).

By addressing the three research objectives set forth in this project, I hope to have provided a fuller, deeper understanding of the involvement of birds in Chacoan everyday life, of the nature of Chacoan ritual practice, and of ceremonial organization in the canyon. The analysis of the avifaunal remains of Chaco Canyon presented here has revealed a complex and still developing picture of Chacoan ritual. Human-bird relationships and interactions in Chaco Canyon were fundamentally two-way, with each capable of mutually influencing the other.

Respected for flight and surely many other qualities and symbolic associations, birds were an integral component of Chacoan ceremonial life. Many of the ways that birds are still significant among the modern Pueblos are echoed in Chaco Canyon.

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