An Assessment of Projectile Points and Chronometrics for Talus Village and the Falls Creek Rock Shelters: Perspectives on Early Maize on the Colorado Plateau

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Preface

This study was initiated May 12, 2023, under Colorado State Historic Fund Project Number 23-AS-005. The purpose of the study is to analyze projectile points from the Falls Creek Rock Shelters and Talus Village near Durango, Colorado. Point typologies will be described using multivariate statistical techniques and, in conjunction, the chronological placement of these types will be evaluated for purposes of comparison on a regional scale. The ultimate goal is the determination of the timing and processes involved in the movement of maize-based populations from the Southern Basin and Range Province of the Southwest to the Colorado Plateau.

Acquisition of the projectile points from collections at the Bureau of Land Management (BLM) Canyons of the Ancients Visitor Center and Museum (CANM) necessitated consultation with an inclusive group Tribal Historic Preservation Officers (THPOs) of Southwestern Tribes. Consultation was undertaken by Dr. Michelle Stevens, Heritage Program Lead for the San Juan National Forest. In consultation between Ms. Cassandra Atencio, THPO of the Southern Ute Indian Tribe, and Dr. Stevens, concurrence with the project was approved given the proviso that the following statement be included in all documents developed by the Dominguez Archaeological Research Group.

> "This study seeks to better understand the morphological characteristics and distribution of projectile points from semi-sedentary site contexts occupied between 400 B.C.–A.D. 500 in the greater Upper San Juan Region of the Southwest. Projectile points from other site types, e.g., short-term camps or limited activity sites, occupied during the same period are not included. Therefore, results of this study should not be used to imply that only one culture group occupied the entire study area during this period. Dominquez Archaeological Research Group (DARG) acknowledges that the study area is the traditional, ancestral, and contemporary homelands of many indigenous peoples including the Pueblos, Ute, Din**é** (Navajo), and Jicarilla Apache. DARG understands and respects all indigenous Tribes' deep cultural connection to this landscape."

DARG certainly concurs with the concerns of the Southern Ute Indian Tribe. Acquisition of the projectile points was accomplished with the assistance of Blythe Morrison, Collection Specialist at CANM.

I) Introduction

The publication of the Falls Creek Rockshelters and nearby Talus Village described in *Basketmaker II Sites Near Durango, Colorado* (Morris and Burgh 1954) was, as reviewed by Walter W. Taylor (1955), "… one of the landmarks of Southwestern prehistory." The sites have subsequently been defined as the essential definition of "Eastern Basketmaker II" as opposed to "Western Basketmaker II". At the time of publication, Western Basketmaker II was comprised of several rock shelter sites, primarily in the Marsh Pass area of northeastern Arizona (Amsden 1949; Guernsey and Kidder 1921; Pepper 1902; Kidder and Guernsey, 1919), containing burials, an abundance of perishable artifacts and maize. Domestic architecture in Western Basketmaker II was unknown at the time and the discovery of shallow surface structures at the Durango sites was considered a significant breakthrough. However, an abundance of Western Basketmaker II sites with architecture have been recovered in the subsequent decades. As will be discussed later, it is reasonable to consider the Marsh Pass cave sites as precursors to the later Basketmaker II pithouse villages [I should note that many of these sites have been termed the White Dog Phase of Basketmaker II by Smiley and Robbins (1997), but the temporal range has been subject to disagreement and, as will be indicated later, the regional occurrence of the precursors is broader than suggested by the original formulation].

Morris and Burgh (1954) also reported on tree-ring dates from the first to the third centuries A.D. and a suggestion that a number of unanalyzed trees may date back to several centuries B.C. This, by association with architecture, made the sites the earliest known presence of maize in the Southwest. Subsequent work by the Laboratory of Tree-Ring Research (Dean 1975) updated all remaining specimens, clarifying the temporal record. The Basketmaker II occupation of North Shelter spanned from the third century B.C. to A.D. 272. South Shelter Basketmaker II was occupied from 216 B.C. to A.D. 413. Talus Village contained no B.C. dates and was occupied from 192-330 A.D. Dean recognized a gap in the shelters of from 50 to 150 years between the early, non-architectural period and architectural Basketmaker II period. The onset of domestic architecture at both the shelters and Talus Village was initiated, following the temporal gap, in the late second or early third centuries A.D.

While the Falls Creek Shelters and Talus Village were, for the most part, analyzed and reported by what were then recognized professional standards (Taylor 1955), too many questions remained for modern investigators. Analytic methods and the nature of broader chronometric inquiries evolved markedly over the decades and a reassessment of these important sites was ripe for application of modern analytics. Two studies funded by the Colorado State Historical Fund (SHF) were undertaken to reassess the museum collections available for the Falls Creek Shelters. The first, SHF Project #09-01-035 (Adams et al. 2011), dealt with the analyses of Native American Graves Protection and Repatriation Act (NAGPRA) items and, eventually, repatriated the skeletal materials and associated funerary objects to the Hopi Tribe. The second, SHF Project #2012-01-038 (Conner 2014), dealt with in-depth analyses of the sizeable non-NAGPRA material items. A voluntary collaboration among scholars involved in both studies has resulted in an updated and enhanced version of the results that is currently in press with the University of Utah Anthropological Papers (Mulhern and Charles n.d.).

II) The Temporal Record

One important aspect of the recent analytic research was a better understanding of the available tree-ring and radiocarbon dating for the Falls Creek Shelters, Talus Village, and the Animas Valley as a whole. As noted above, the B.C. tree-ring dates were not related to any of the architectural features. Rather, they came from essentially unknown proveniences or locations underneath particular structures. A possible explanation of the temporal context of the tree-ring B.C. dates was revealed in the radiocarbon dating reported in Conner (2014) and Mulhern and Charles (n.d.). The radiocarbon dating of the North Shelter focused on remains from the associated "Burial Crevice" containing the remains of 27 individuals. Morris and Burgh (1954) assumed that the Burial Crevice remains were contemporaneous with the North Shelter pit structures. Given the absence of radiocarbon dating, there was no reason to suspect otherwise. Any possibly relevant stratigraphic evidence that may once have existed was destroyed by the fact that a local amateur archaeologist, Zeke Flora, had plundered the skeletal material and associated objects prior to Morris and Burgh's involvement. Radiocarbon analyses were conducted on sixteen samples of perishable remains and annual plants from the Burial Crevice (Conner 2014). The results are displayed in Figure 1. The Burial Crevice was in use from as early as 400 B.C. to the late first century A.D., thus pre-dating the onset of architectural construction.

The significance of this temporal sequence is that it echoes what is now known of Western Basketmaker II. The Burial Crevice is analogous to the Marsh Pass burial caves that have been so admirably dated by Joan Coltrain, Janetski and Carlyle (2007). The date distribution from these five sites is shown in Figure 2. Occupation of these began by 400 B.C., terminating at A.D. 1, again preceding the onset of domestic architecture in Western Basketmaker II at 200 A.D. (Matson 1991, Smiley and Ahlstrom 1998).

To provide a broader temporal perspective on Eastern Basketmaker II, it is useful to view the occupational sequence of the Animas Valley as a whole. That radiocarbon distribution is depicted in Figure 3 which shows a significantly punctuated series beginning with the non-architectural period associated with the Burial Crevice, followed by boom-and-bust episodes of architectural village life. This likely occurred as a consequence of climatic variation through time, leading to population movement in and out of the Animas Valley over a millennium. The valley was finally abandoned after the Basketmaker III/Pueblo I period.

Figure 1. Kernal Density Estimate of the Burial Crevice

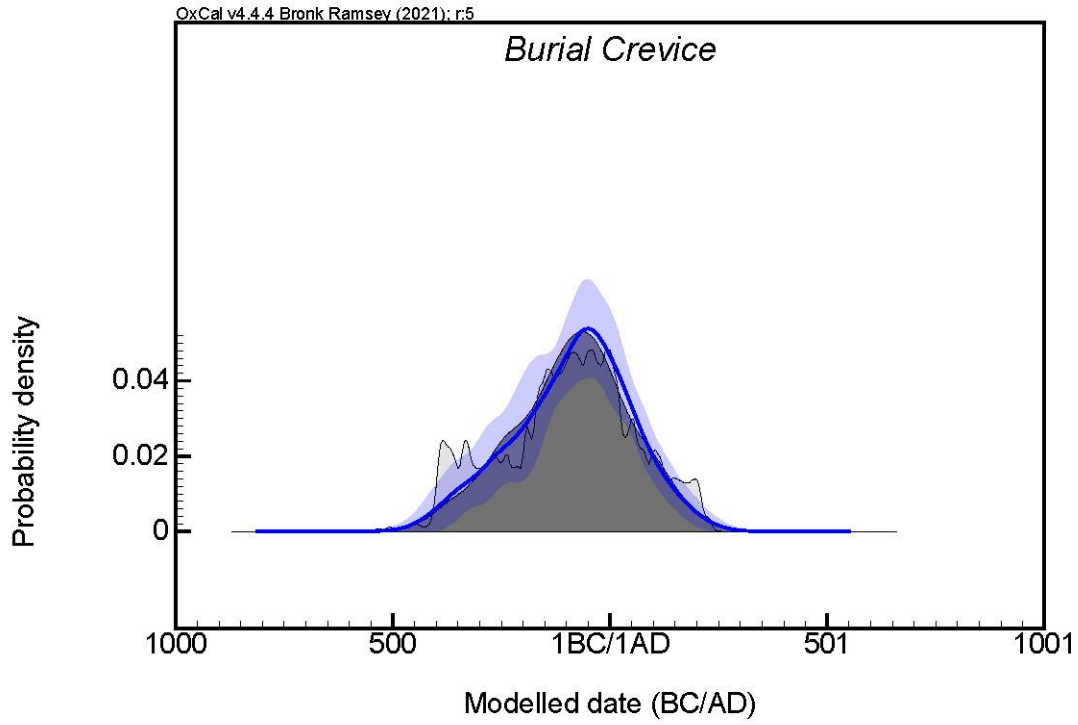


Figure 2. Kernal Density Estimate of Five Marsh Pass Cave Sites

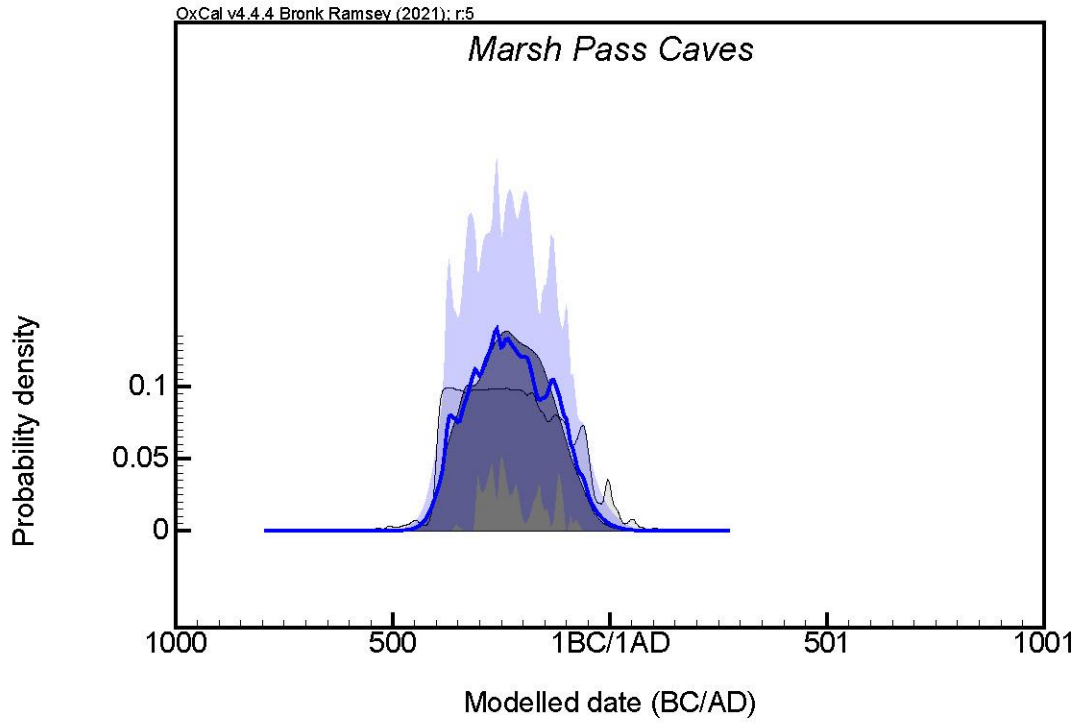
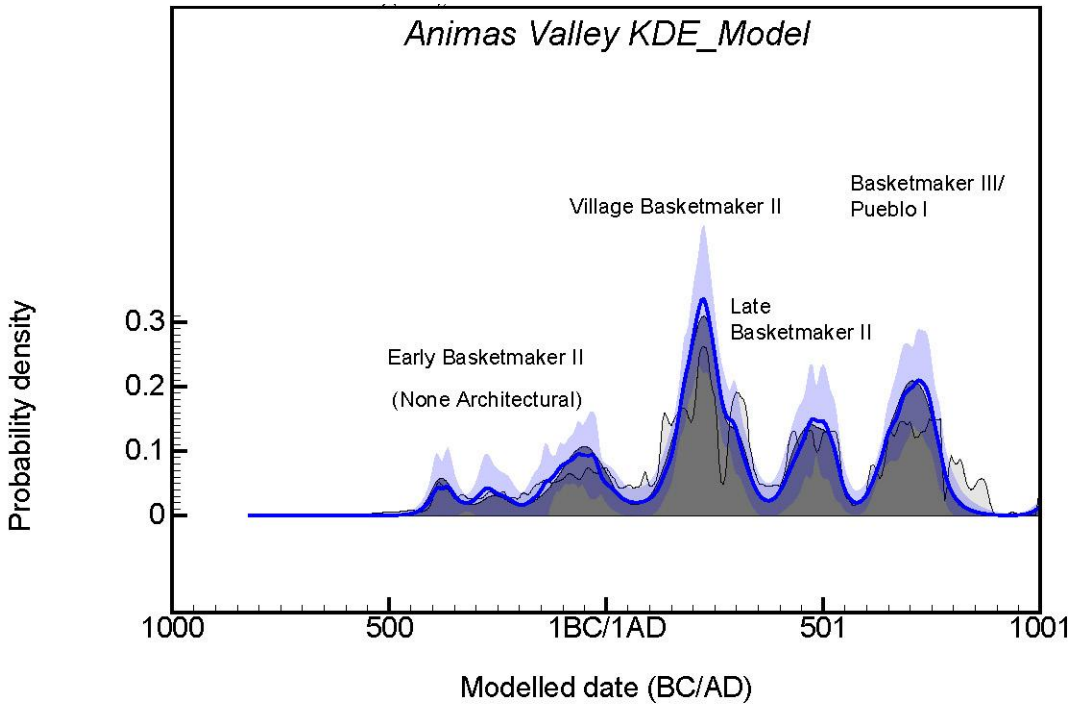


Figure 3. Kernal Density Estimate of Radiocarbon Dates from the Animas Valley



III) Projectile Point Classifications and Comparisons

None of the Falls Creek Shelters studies have dealt with the associated Talus Village materials and that will be the initial focus herein including the association and temporal context of projectile point typologies on a regional scale. While limiting analyses to the category of projectile points may seem restrictive given the plethora of perishables (basketry, sandals, gaming pieces, etc.) known to exist at many Basketmaker II sites, dart points are the common thread that occur in all site contexts. Perishables, in contrast, occur only in sites with extraordinary preservation and, thus, have limited applicability for regional comparison. The point images displayed in Morris and Burgh (1954; Figure 81 and 82) for both sites were of insufficient quality for quantitative measurement, hence a new set of jpeg photographs was required for the current analysis.

The points from Talus Village are curated at the University of Colorado Museum of Natural History. Rather than giving a temporary loan of the artifacts for DARG to photograph, collections manager Christina Cain opted to conduct the photography and send us the images. The collection of 61 points was photographed and submitted to DARG.

A subset of points from the Falls Creek Shelters was photographed during the non-NAGPRA portion of that project (Conner 2014). We sought access to the full collection available and acquired a temporary loan from BLM Canyons of the Ancients Visitor Center & Museum (CANM) with the concurrence of Museum Technician Blythe M. Morrison. The collection of 47 points was photographed at DARG headquarters in Grand Junction, Colorado.

Not all examples were adequate for typological analyses. Points with excessive damage were removed from consideration as well as those that were clearly outliers due to poor craftmanship or

extreme values in the diagnostic parameters. The final tally was 23 points for Talus Village and 24 points for the Falls Creek Rockshelters. DARG will make the full number of images available for qualified scholars on request.

III a) Analysis Methods

Digitization of Variables

Digitization of the points is being accomplished using tpsDig software. tpsDig can read jpeg files and measure both linear and angular variables. Ten variables are currently being employed: 5 angular and 5 linear. These are encoded into an Excel spread sheet and then subjected to various iterations of cluster analyses and discriminant function analyses for the purpose of defining discrete types. The variables are depicted in Figure 4. Note that both edges of the notch angles (Distal Shoulder Angle and Proximal Shoulder Angle) are used in the analysis. Thomas's (1981) approach as well as similar methods used by Holmer (1978) and Berry (1987) was to select a single edge to represent the angular variables based on the assumption of symmetry. However, it became evident that very few points show significant symmetry, hence using both edges yields a better representation of shape variability.

The current variables for the reduced set of points from Talus Village and the Falls Creek Shelters are shown Tables 1 and 2.

Cluster and Discriminant Function Analysis

These data have been analyzed via numerous iterations of cluster analyses to develop coherent subsets into point types. The most effective method thus far evolved for these data sets has been Ward's Minimum Variance cluster analysis using standardized variables and squared Euclidian distance arrays (Ward 1963) [See Berry 2020 for an application of this method].

Using the typological groups derived through cluster analyses, the data were subjected to discriminant function analyses to test the robustness of the classification and develop a linear equation for evaluated group membership of new projectile points base on the derived Fisher's linear discriminant function coefficients.

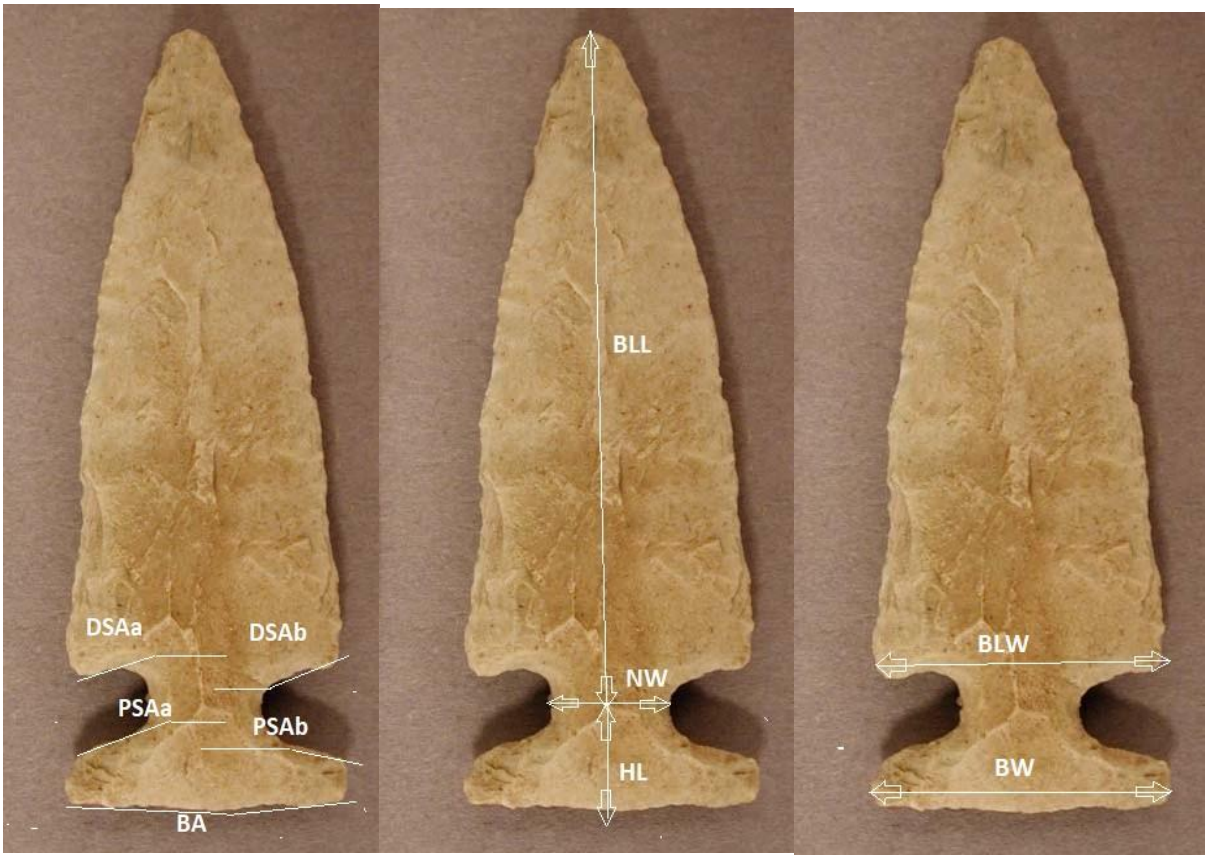
III b) Classification Results

Talus Village projectile points fell into four distinct groups. Figure 5 is a dendrogram of the exploratory results. Subsequent discriminant analysis validated the distinctiveness of the classification by accurately assigning all points to the appropriate group designation. That analysis employed using all ten independent variables rather than a stepwise approach with initial probabilities calculated on groups size ($n_1 = 8$, $n_2 = 4$, $n_3 = 7$, $n_4 = 4$).

Falls Creek Shelters projectile points fell into three well-formed groups. Figure 7 is a dendrogram of the classification results. Discriminant analysis also validated the distinctiveness of the groupings with all points accurately predicted. Again, all ten independent variables were used, but the initial group probabilities set to equal because the groups did, in fact, have equal sizes ($n_x = 8$).

In both cases, the group membership probability of additional projectile points can be predicted using the classification scores calculated with the coefficient generated with Fisher's linear discriminant functions. These coefficients are shown for Talus Village (Table 3) and Falls Creek Shelters (Table 4).

Figure 4. Projectile Point Variables



DSA = Distal Shoulder Angle (a and b) (Thomas 1981)

PSA = Proximal Shoulder Angle (a and b) (Thomas 1981)

BA = Base Angle (Thomas 1981)

BLL = Blade Length (Andrefsky 1998)

HL = Haft Length (Andrefsky 1998)

NW = Neck Width (Andrefsky 1998)

BLW = Blade With (Andrefsky 1998)

BW = Base Width (Andrefsky 1998)

Table 1. Talus Village Point Variables

Point	BLL	HL	BA	BLW	NW	BW	DSAa	DSAb	PSAa	PSAb
Talus_1	2.15	0.86	198	2.12	0.94	1.53	135	143	120	117
Talus_14	2.44	1.06	214	2.55	1.53	1.85	164	169	102	113
Talus_15	2.34	0.89	208	2.08	1.27	1.69	176	176	102	121
Talus_22	3.25	1.00	220	2.97	1.52	2.03	170	166	107	133
Talus_24	2.36	0.80	217	1.97	1.21	1.70	197	201	120	135
Talus_25	2.41	0.78	215	1.96	1.18	1.68	158	161	138	116
Talus_26	2.30	0.66	204	2.00	1.00	1.36	189	161	122	124
Talus_27	1.85	0.78	199	2.56	1.35	1.74	185	167	101	122
Talus_28	2.05	1.09	228	2.39	1.38	1.94	200	192	113	135
Talus_29	2.65	0.77	209	2.54	1.50	2.09	177	164	131	142
Talus_30	3.47	0.97	216	3.08	1.88	2.38	183	164	132	132
Talus_33	3.06	0.91	213	2.37	1.48	1.92	166	191	118	126
Talus_34	2.67	0.81	205	2.70	1.75	2.20	192	193	123	137
Talus_39	1.90	0.77	210	2.09	1.34	1.84	199	213	128	126
Talus_4	2.33	0.73	220	1.95	1.02	1.52	150	151	129	125
Talus_42	2.49	0.98	208	2.71	1.78	2.17	184	180	104	122
Talus_43	3.38	0.92	206	2.15	1.34	1.70	180	207	112	129
Talus_44	2.45	0.81	217	2.28	1.47	1.68	155	172	121	121
Talus_45	1.91	0.73	231	1.86	1.20	1.37	207	196	102	131
Talus_5	3.18	0.74	211	2.10	1.00	1.36	150	154	117	121
Talus_57	2.56	0.95	222	2.15	1.13	1.68	158	158	121	141
Talus_60	1.75	0.94	231	2.09	0.97	1.53	147	140	132	134
Talus_8	2.90	1.22	220	2.75	1.63	2.25	155	168	117	134

Table 2. Falls Creek Shelters Point Variables

Point	**BLL**	**HL**	**BA**	**BLW**	**NW**	**BW**	**DSAa**	**DSAb**	**PSAa**	**PSAb**
FCRS_10	2.43	0.92	220	2.70	1.63	1.98	202	163	119	109
FCRS_11	2.91	1.22	229	2.82	1.85	2.50	210	230	126	128
FCRS_12	2.77	0.94	222	2.80	1.57	1.86	157	158	100	125
FCRS_13	2.72	0.75	219	2.15	1.02	1.31	151	156	115	141
FCRS_15	2.7	1.03	231	2.41	1.25	1.65	133	163	111	113
FCRS_16	2.35	0.79	189	2.17	0.90	1.30	143	143	109	126
FCRS_17	2.14	1.15	218	2.60	1.45	2.24	167	161	120	130
FCRS_18	3.16	1.01	191	2.19	1.34	1.92	176	172	122	127
FCRS_19	3.93	1.06	230	2.09	1.35	1.94	163	173	140	146
FCRS_2	3.26	0.73	196	2.16	0.82	1.26	120	146	114	113
FCRS_21	2.96	0.81	205	2.11	1.15	1.61	168	151	125	128
FCRS_23	2.24	0.82	223	2.06	1.33	1.66	199	203	125	131
FCRS_25	2.26	0.67	205	1.76	0.79	1.15	165	155	106	115
FCRS_27	2.76	0.96	244	2.10	1.26	1.73	189	191	118	144
FCRS_3	2.99	0.88	211	2.58	0.83	1.23	148	148	116	115
FCRS_36	2.55	0.81	185	2.23	1.33	1.84	211	211	114	115

FCRS_38	2.35	1.23	196	2.47	1.69	2.10	207	211	104	109
FCRS_39	2.46	1.12	218	2.49	1.59	2.12	205	213	125	123
FCRS_4	3.60	0.90	194	2.61	1.13	1.41	128	145	113	122
FCRS_45	1.96	0.77	211	2.52	1.31	1.90	159	184	121	139
FCRS_47	1.83	0.6	218	1.90	0.76	1.09	153	137	109	125
FCRS_5	2.83	0.85	229	2.50	0.94	1.49	144	160	125	140
FCRS_8	2.79	0.82	226	1.92	0.84	1.10	158	154	109	101
FCRS_9	2.00	0.86	215	2.00	0.93	1.51	134	134	119	122

Figure 5. Talus Village Dendrogram of Projectile Points

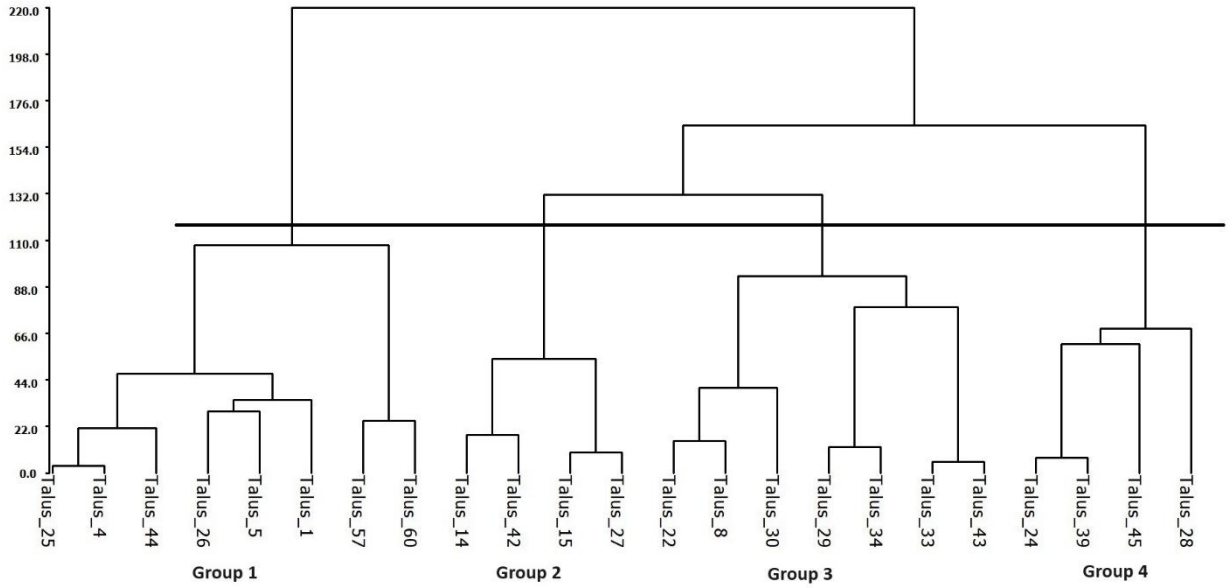


Table 3. Fisher's Classification Function Coefficients for Talus Village

Variable Name	Group 1	Group 2	Group 3	Group 4
BLL	**23.892**	**17.459**	**28.053**	**16.520**
HL	**-156.627**	**-188.656**	**-185.717**	**-207.187**
BA	**8.550**	**8.836**	**8.834**	**9.713**
BLW	**543.977**	**516.651**	**553.181**	**554.040**
NW	**-648.459**	**-689.0643**	**-692.588**	**-762.399**
BW	**-50.107**	**61.209**	**12.354**	**75.547**
DSAa	**-0.071**	**0.345**	**0.023**	**0.449**
DSAb	**8.620**	**8.576**	**9.017**	**9.390**
PSAa	**7.265**	**5.669**	**6.679**	**6.203**
PSAb	**1.099**	**0.226**	**1.091**	**0.199**
Constant	**-2244.026**	**-2111.086**	**-2375.653**	**-2516.444**

Figure 6. Falls Creek Shelters Dendrogram of Projectile Points

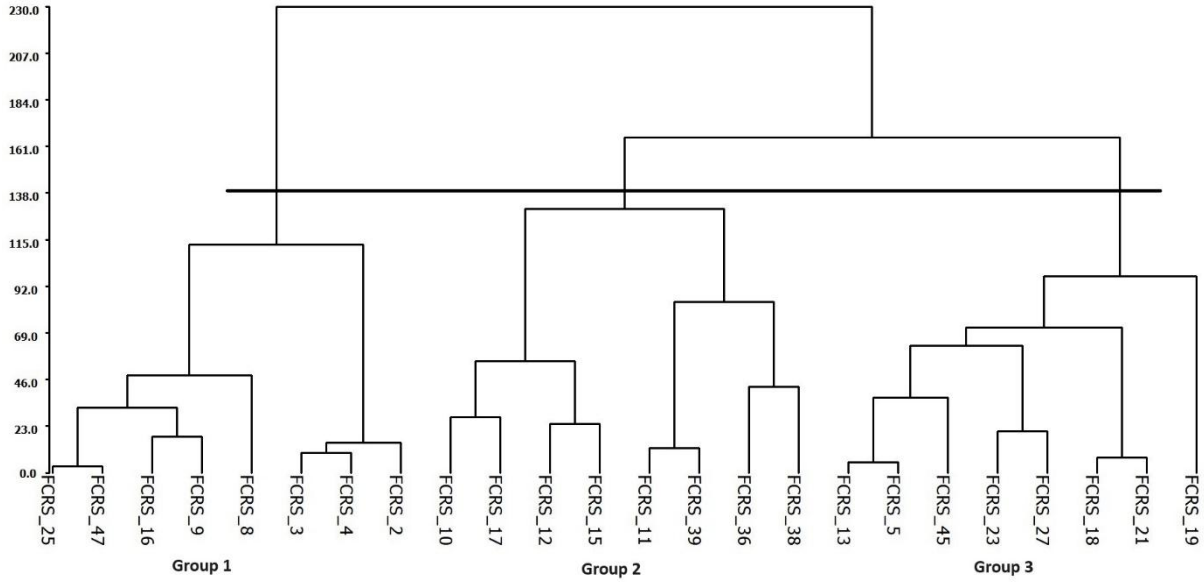


Table 4. Fisher's Classification Function Coefficients for Falls Creek Shelters

Variable Names	Group 1	Group 2	Group 3
BLL	3.486	3.553	4.713
HL	39.229	25.606	28.985
BA	0.386	0.535	0.412
BLW	52.170	56.051	48.571
NW	20.335	34.523	38.476
BW	-109.193	-89.106	-113.292
DSAa	0.786	0.783	0.796
DSAb	0.049	0.083	0.075
PSAa	2.183	1.865	2.303
PSAb	2.023	1.810	2.338
Constant	-357.810	-380.531	-423.046

Group determination for each new, unknown point is based on the highest score as determined by the linear combination of the products of each variable and the appropriate coefficient. For example, the scores on Group 1, 2 and 3 for the Falls Creek Shelters example given the ten variables for any unknown point are:

Group 1 = (bll * 3.486 + hl * 39.229 + ba * 0.386 + blw * 52.170 + nw * 20.335 + bw * -109.193 + dsaa * 0.786 + dsab * 0.049 + psaa * 2.183 + psab * 2.023) -357.810;

$Group 2 = (bll * 3.553 + hl * 25.606 + ba * 0.535 + blw * 56.051 + nw * 34.523 + bw * -89.106 + dsaa * 0.783 + dsab * 0.083 + psaa * 1.865 + psab * 1.810) -380.531;

Group 3 = (bll * 4.713 + hl * 28.985 + ba * 0.412 + blw * 48.571 + nw * 38.476 + bw * -113.292 + dsaa * 0.796 + dsab * 0.075 + psaa * 2.303 + psab * 2.338) -423.046;

with the point being assigned to the highest group value.

The probabilities of group membership based on the linear products classification score is computed as:

Prob (group = i) = EXP [fi – maxf] / SUM {i=1 to k} (EXP [fi – maxf])

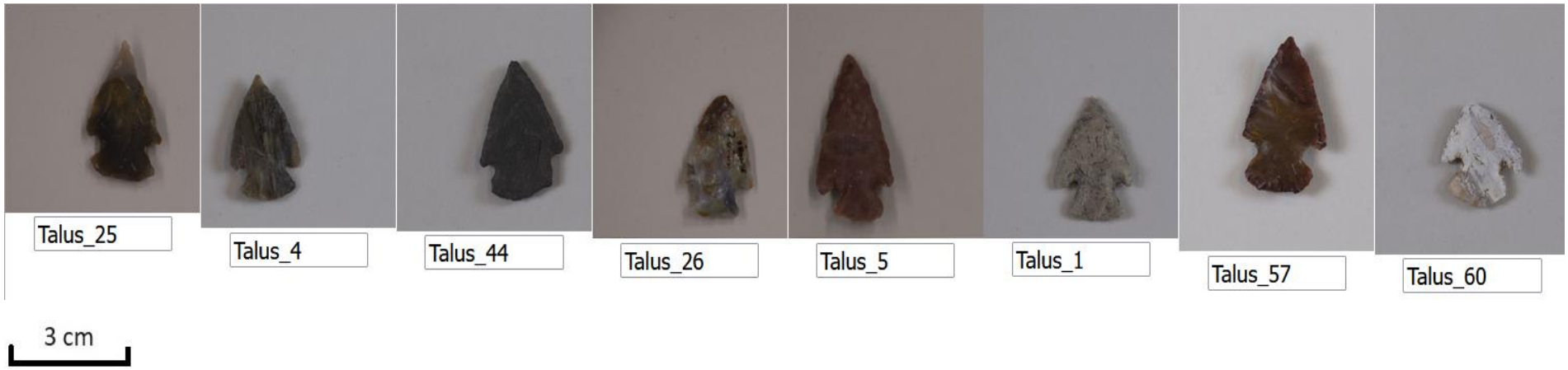
Where fi is the classification score for group i, maxf is the maximum score for the case, and SUM {i=1 to k] represents the summation of EXP [fi – maxf] results over k groups (IBM 2018).

Manual classification can be quite onerous, so I have included a PHP script to implement the calculations in Appendix A for those who have PHP 5 or above installed on a computer.

The scaled photographs of the specimens used for Talus Village and the Falls Creek Shelters are displayed in Figure 6 and 7, respectively.

Figure 6. Talus Village Projectile Point Typology

Group 1



Group 2

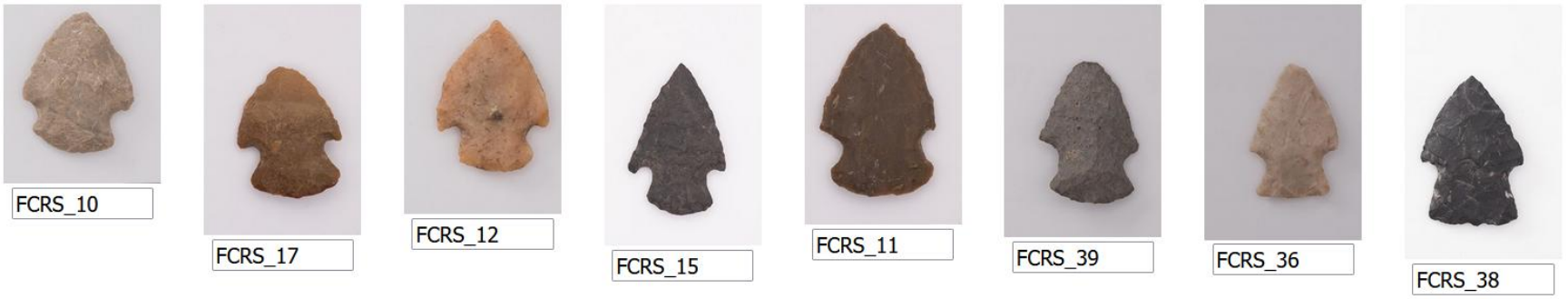
Group 3

Group 4

Figure 8. Falls Creek Shelters Projectile Point Typology

Group 1

Group 2



Group 3


FCRS_13


FCRS_5


FCRS_45


FCRS_23


FCRS_27


FCRS_18


FCRS_21

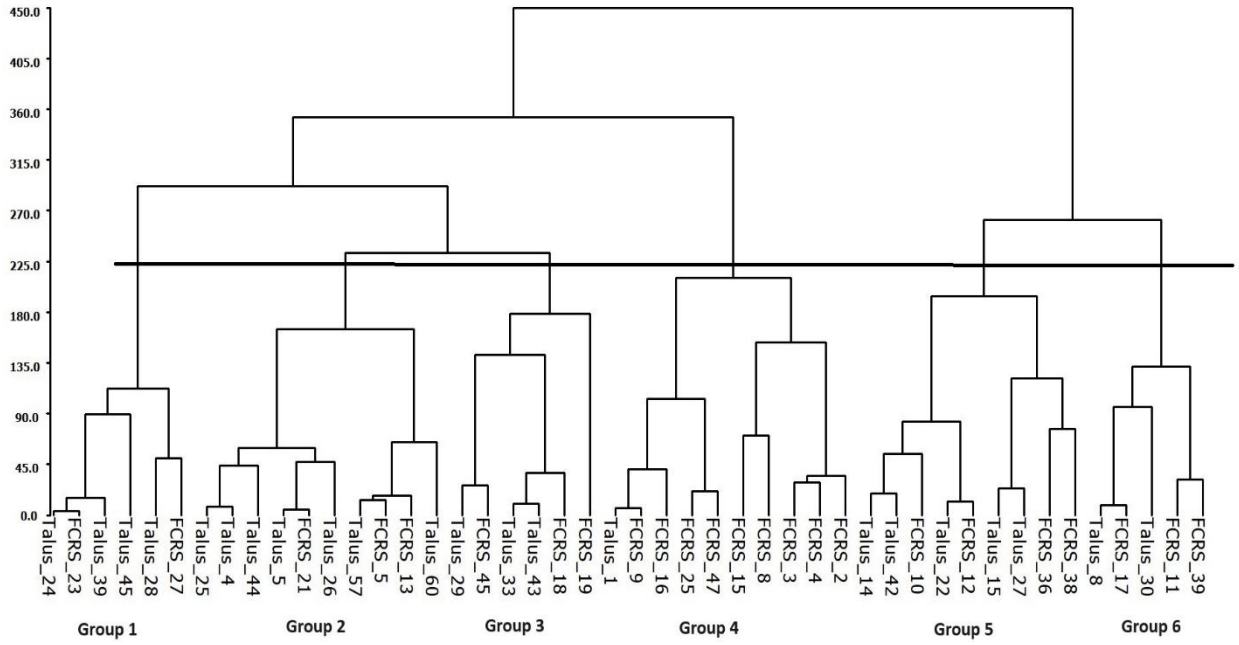

FCRS_19

IV) Issues and Resolutions

The first issue to consider is the temporal placement of the various projectile point groups. The Talus Village groups were recovered primarily in the context of single component, architectural Basketmaker II site, occupied from 192-330 A.D. (although Berry (n.d.) has suggested there may also have been a minor pre-architectural component). As noted earlier, the Falls Creek Shelters group comprise a more complicated circumstance. The pre-architectural component, dated by radiocarbon remains on the Burial Crevice, occupied the shelters for over four centuries prior to the construction of the architectural, Basketmaker II village. However, because Morris and Burgh (1954) assumed these two components to be contemporaneous, the provenience of the projectile points was unalterably mixed.

In order to remedy the situation, another cluster analysis, combining points from both Talus Village and the Falls Creek Shelters, was conducted. This was done to determine whether any of the resultant groups were unique to the Falls Creek Shelters remains. The dendrogram in Figure 9 suggests that Group 4 does show that relationship. That group contains nine points from the shelters and only one point from Talus Village. The other five groups consist of roughly equal numbers from

Figure 9. Combine Dendrogram of Talus Village and Falls Creek Rockshelters Points



the two sites. This suggests that the Group 4 points may have been deposited by the early, pre-architectural occupants of the Falls Creek Shelters including the skeletal remains in the Burial Crevice. That hypothesis will be explored below in the broader context of the expansion of maize farming to the Colorado Plateau from the Southern Basin and Range province of the American Southwest.

V) Broader Perspectives

The first Pecos Conference, organized by A.V. Kidder in 1927, defined the stages of Southwestern indigenous evolution from Basketmaker II and III followed by Pueblo I through Pueblo V (the latter referring to the ethnographic present). The conveners defined Basketmaker II based on the remarkable trove of basketry and other artistic elements, well preserved in dry caves. They also noted the abundance of skeletal remains, also well preserved, and associated with burial offerings. They hypothesized the existence of a Basketmaker I stage, doubting that the cultural elaboration of the Basketmaker II period could not have emerged de novo.

Morris and Burgh (1954) were the first to assert a source area for Basketmaker II as the San Pedro stage of Southern Arizona and New Mexico. The San Pedro was the most recent stage of the Cochise Culture described by Sayles and Antevs (1941). Berry (1982, Berry and Berry (1986) also pointed to the San Pedro area source. That position also asserted migration as the process involved:

> The complementary distribution of radiocarbon dates, combined with the fact that western San Juan points of the Basketmaker II period (Morris and Burgh 1954) are indistinguishable from San Pedro points, strongly suggests that Basketmaker II represents a migration from the Southern Basin and Range to the Plateau (Berry 1982:33).

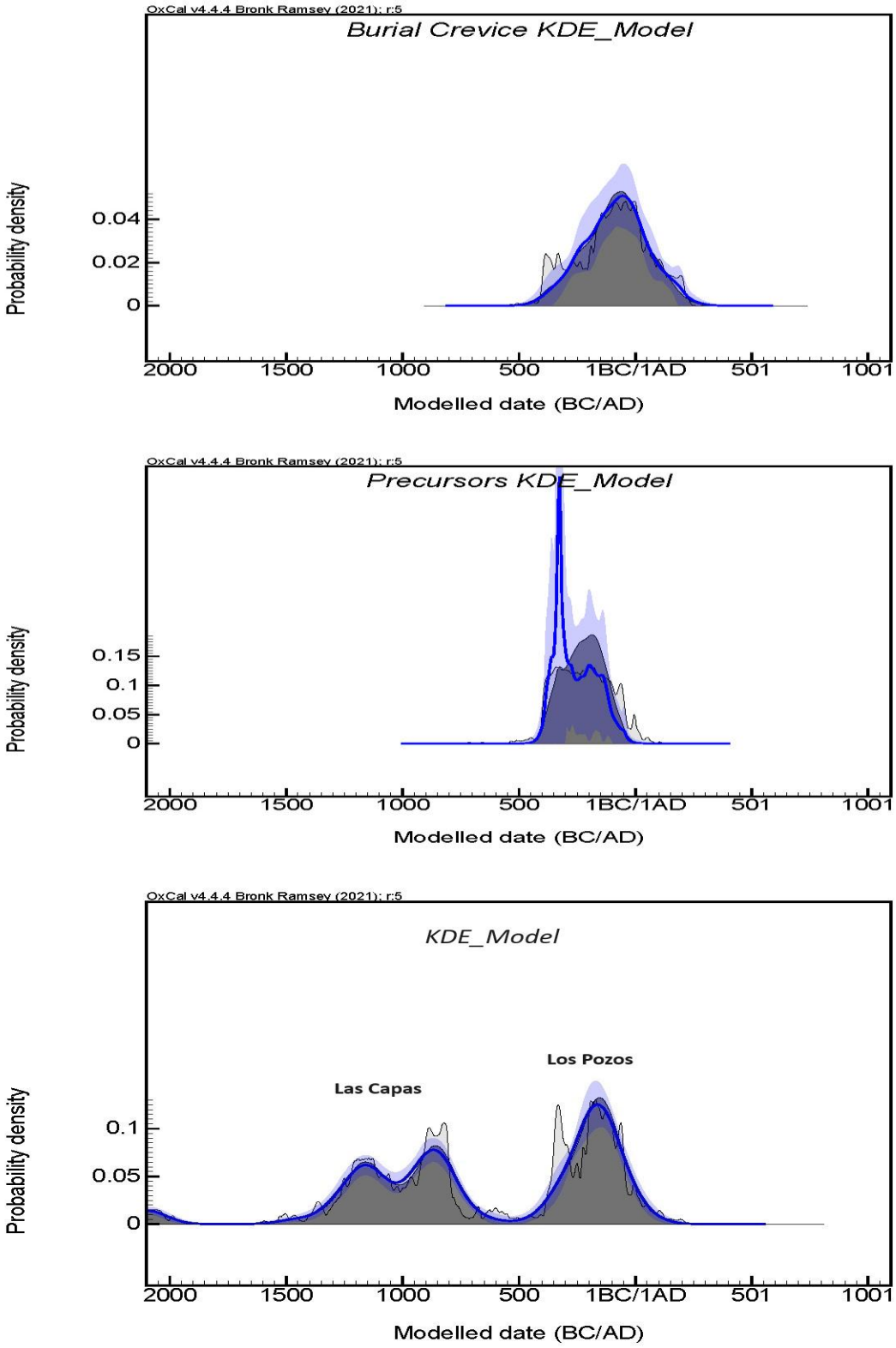
Matson (1991) supported this position for Western Basketmaker II but argued for in situ adoption of maize from an Archaic hunter-gatherer group for Eastern Basketmaker II. However, many archaeologists continued to adhere to the notion that the primary process for the spread of maize farming was the adoption of maize by resident hunter-gatherers (Smiley and Robbins 1997; Reed 2003; Merrill et al. 2009).

The entire corpus of data relevant to such questions evolved markedly beginning in the 1990s and early 2000s. Perhaps of greatest significance were the excavations of early village farm sites with abundant maize remains in southern Arizona. In addition, the precision of chronological assessment was enhanced by the increased use of mass spectrometric analysis of radiocarbon dating (AMS) that can date annual species of less than 100 milligram samples [annual species are preferred over charcoal samples to avoid the “old wood” issue]. The dating of maize cupules or kernels, combined with the Arizona excavations, have restructured our understanding of the beginning and subsequent distribution of maize farming in the Southwest. In particular, for the current study, we can gain a better understanding of the sequence of events that led to the Basketmaker II phenomena on the Colorado Plateau.

Figure 10 represents the relationship between the Arizona site and what I have referred to as the Basketmaker II Precursors. And, with regard to the current study, the Burial Crevice component from the Falls Creek Shelters is shown for temporal comparison. Las Capas and Los Pozos are two of the most significant of southern Arizona sites. Both have an abundance of domestic structure and associated features.

The Precursor sites are located on the northern Colorado Plateau of northeastern Arizona and northwestern New Mexico. The dated Arizona sites are all situated in caves and include Kinboko Canyon

Figure 10.


OxCal v4.4.4 Bronk Ramsey (2021); r:5
Burial Crevice KDE_Model
Probability density
0.04
0.02
0
2000
1500
1000
500
1BC/1AD
501
1001
Modelled date (BC/AD)
OxCal v4.4.4 Bronk Ramsey (2021); r:5
Precursors KDE_Model
Probability density
0.15
0.1
0.05
0
2000
1500
1000
500
1BC/1AD
501
1001
Modelled date (BC/AD)
OxCal v4.4.4 Bronk Ramsey (2021); r:5
KDE_Model
Las Capas
Los Pozos
Probability density
0.1
0.05
0
2000
1500
1000
500
1BC/1AD
501
1001
Modelled date (BC/AD)

Cave 1, Marsh Pass Cave 6, Sayodneechee Cave, Tsegi Canyon Cave 3 and White Dog Cave. All contained numerous burials and the AMS direct dating of skeletal material was accomplished by Coltrain, Janetski and Carlyle (2007). In addition to the radiocarbon dating, stable isotope analyses on the skeletal materials indicated a heavy dietary reliance of maize (~80%). One well-dated precursor site from the Chuska Valley of New Mexico is the Dog Leg Site (Baugh, Kearns and Wheeler, 1998; Kearns and McVickar, 2007). This was an open rather than a cave site, but the remains were strikingly similar to the Marsh Pass sites, including twelve burials, abundant maize remains and an absence of domestic architecture. No stable carbon analyses were performed on the skeletal remains but the abundance of maize, the similarity of artifacts and contemporaneity with the Marsh Pass sites suggests a similar level of maize reliance.

Of importance to the stable isotope analyses, the maize reliance did not gradually increase from early to late in the sequence. Rather, it was consistently robust throughout, suggesting migration rather than adoption of maize by hunter-gatherer groups (Coltrain, Janetski and Carlyle 2007:301).

Finally, the Falls Creek Shelters Burial Crevice occupation began at 400 B.C just as the Precursor sites and terminates a little later into the first century A.D. and stable isotope analyses on hair samples from the skeletal remains indicated strong maize reliance (LeBlanc and Morgan 2010). It seems a decent probability that this should be included as an Eastern Basketmaker II Precursor. As a preliminary test of this hypothesis, we can consider the similarities/differences of the subset of Falls Creek Shelters projectile points shown as Group 4 in Figure 9 (i.e., those points suggested to reference the pre-architectural period at the site). A three-group dendrogram of points from the Los Pozos site, Marsh Pass sites, Dog Leg and the Falls Creek subset is shown in Figure 11. The images of the groups are shown in Figure 12.

Figure 11. Dendrogram of Los Pozos, the Precursors and Falls Creek Sub-set

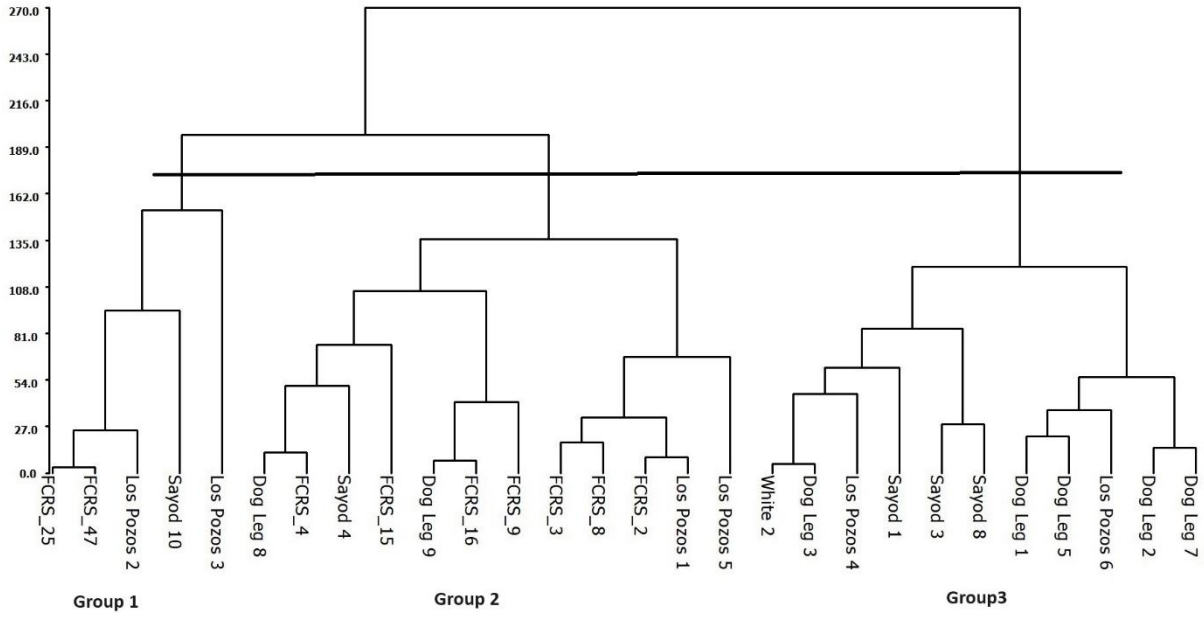
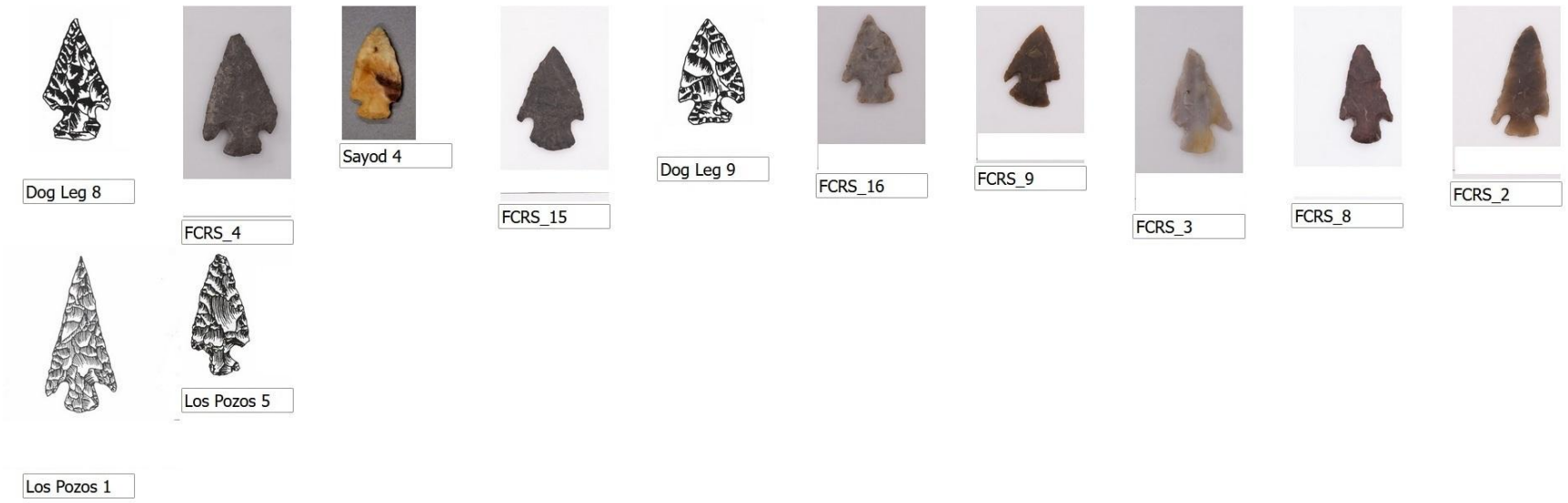


Figure 12. Group Images from Figure 11.

Group 1

Group 2



Group 3

White 2

Dog Leg 3

Los Pozos 4

Sayod 1

Sayod 3

Sayod 8

Dog Leg 1

Dog Leg 5

Los Pozos 6

Dog Leg 2

Dog Leg 7

Group 1 incorporates Falls Creek Rock Shelters (FCRS) with Sayodneechee Cave (Sayod) and Los Pozos. Group 2 is the strongest association of Los Pozos, Sayod and Dog Leg. Group 3 has no FCRS points but demonstrates the connection between Los Pozos (the presumed progenitor of the Precursors), Sayod, White Dog Cave and Dog Leg.

VI) Discussion and Conclusions

The proposal made in the 1980s (Berry 1982; Berry and Berry 1986), in relationship to the origins of Basketmaker II, that "… Juan points of the Basketmaker II period are indistinguishable from San Pedro points" is no longer tenable, as might be expected after four decades of research on that topic. As Sliva (2015) has noted:

> "Unfortunately, no data or illustrations are supplied in support of these assertions…"
>
> "The result is that the tenuous original assertion, lacking explanatory data analysis, is now 'backed' by two citations instead of one, and is repeatedly propagated through continued reference by other researchers…" Sliva (2015:166).

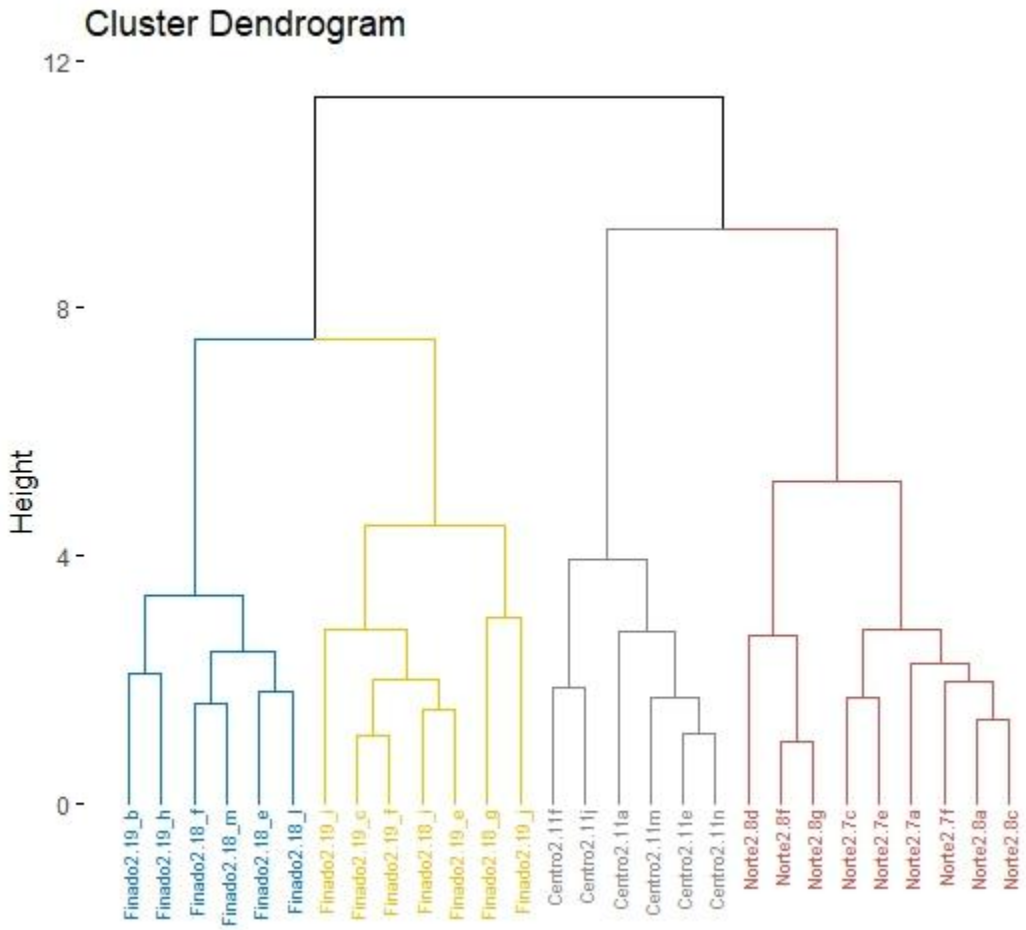
Rather, the statement was based on "eyeball" considerations of Basketmaker II points illustrated in Morris and Burgh (1954) and a few line drawings of San Pedro points Sayles and Antev's formulation on the Cochise Culture (1941) and Haury's discussion in the Ventana Cave report Haury 1950). The extensive research, conducted by Sliva, is based on data from southern Arizona that did not exist until the mid-1990s, so her criticism seems a bit anachronistic. I have attempted to rectify the situation using multivariate statistical techniques. Sliva has defined four types of San Pedro projectile points: Norte, Centro and Finado (with two subtypes). To test if my techniques were consistent with Sliva's definitions I ran a cluster analysis (using RStudio 2022.02.3+492) shown in Figure 13 (This was conducted before the current SHF contract also using Ward's minimum variance clustering). Sliva's method of typology was based on exhaustive, iterative manual sorting similar with the approach of Haury (1950) seven decades ago. Figure 13 replicates Sliva's types with remarkable accuracy, suggesting that the several dendrograms discussed above in the current paper are a reasonable representation of current typological state-of-the art.

The San Pedro Norte and Centro points were dominant in at the Las Capas site which terminated by 800 B.C. (Sliva 2015:28; Figure 10 herein). Therefore, these types shared no affiliation with the Basketmaker II Precursors (beginning at 400 B.C.) or Basketmaker II village sites (beginning at 200 A.D.) The expansion of successful maize farming to the Colorado Plateau occurred coincident with the Los Pozos emergence. The projectile points from Los Pozos cluster with the Falls Creek examples as well as with the other pre-architectural Precursors on the northern Colorado Plateau. The Precursor phase of development was maintained for over four centuries prior to the establishment of Basketmaker II villages with domestic architecture. One possibility of the duration of the Precursor epoch was the adaptive selection of maize to the shortened growing season and reduced precipitation in the higher latitudes of the Plateau versus the more favorable conditions of the Southern Basin and Range province.

Exceptions to this model occurred in several sites with early maize on the Plateau during the Las Capas era. Eagle's Watch (Roberts, Ahlstrom and Spangler 2022) and San Luis De Cabezon (Solfisburg 2016) contained structures and abundant maize remains. The former was poorly dated but may have

been occupied as early as 1200 B.C. The latter was extremely well dated between 1400 and 1200 B.C. As shown in Figure 10, these sites fell within the early peak at Las Capas. The single projectile point from Eagle's Watch qualifies as a San Pedro Norte type. Those from San Luis De Cabezon were indeterminant

Figure 13. Cluster Analysis of Sliva's Types (RStudio)



forms. Both sites were abandoned without any immediate successors. The same fate befell Lukachukai and Salina Springs (Gilpin 1994). Both contained maize, pithouses and indeterminant projectile points. The former was dated from 1400 -1200 B.C and the latter from 800-1 B.C. with no local successors.

The failure of these examples to permanently colonize the Plateau may well have been due to climatic variation during the Late Holocene Dry Period (LHDP). The LHDP (Wise 2010; Mensing et al. 2023; Thomas et al. 2023) was a megadrought lasting from cal 3100 - 1800 B.P. (1150 B.C. – 150 A.D.). The drought was interrupted by a Pluvial Period from cal 2200 - 2000 B.P. (250 to 50 B.C.) followed by the most extreme period in the LHDP from cal 2000 – 1800 B.P. (50 B.C. -150 A.D.). The coverage was essentially the entire Southwest south of 42 degrees north latitude and west of the Rocky Mountains. This model was based on pollen from dated cores in the Great Basin and described the effects of the El Nino Southern Oscillation (ENSO). The temporal accuracy for the Colorado Plateau will undoubtedly be the subject of additional research and the temporal periods will be adjusted. But the prehistoric

movement of maize from south to north will continue to be understood as mediated in the context of the LHDP.

The pre-architectural period of the Falls Creek Shelters can, I believe, be established as one of many Precursor sites leading to the period of Basketmaker II village life. The exact process of that transition remains the subject of additional analyses.

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