The Social History of Mogollon Village: A Bayesian Approach

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INTRODUCTION

Mogollon Village (LA 11568) is a mesa top site overlooking the San Francisco River in western New Mexico (Figure 1). The site is estimated to contain at least 25 pithouse structures with no superimposed pueblo structures (Figure 2). Three excavation projects have occurred at Mogollon Village. In 1933, Emil Haury excavated 11 pithouse structures. Haury (1936) placed the site in the Late Pithouse, San Francisco phase based on tree-ring dates (see Supplemental Text) from the rectangular pithouses. He also suggested that there was likely an earlier component to the site. In 1989 and 1991 six circular pithouse structures were excavated by the Mogollon Village Archaeological Project (MVAP), a collaboration between the USDA Forest Service, University of Oklahoma, and the University of New Mexico (Duncan et al. 1991; Gilman et al. 1991). In 1993 two additional pithouses were excavated by the Mogollon Village Field School (MVFS) from the University of Washington, Seattle (Linse 1997). Nineteen wood charcoal samples from MVAP and MVFS excavations were submitted for conventional radiocarbon dating, with dates returned ranging from roughly A.D. 1 to 1000. Reassessment of the dates by Mauldin and colleagues (1996) posited an occupational range from A.D. 120 to 898, with intensive occupation in the 700s; however, the earlier occupation of the site could not be well defined. The lack of pueblo structures, coupled with excavation results from 10 circular pithouses, and 11 new AMS dates, make Mogollon Village an ideal site to examine Early Pithouse period pithouses.

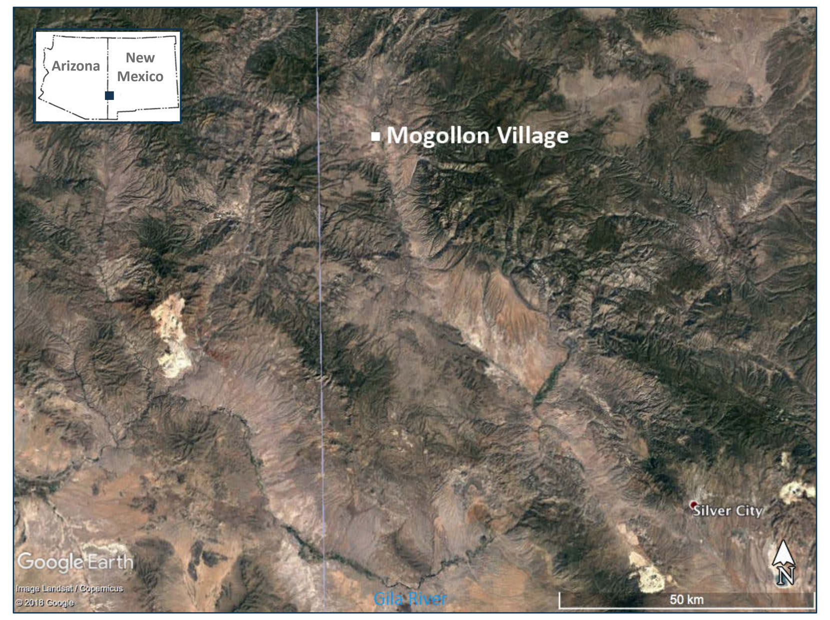

Figure 1. Location of Mogollon Village.

RESEARCH OBJECTIVES

This project explores the Early Pithouse component of Mogollon Village using new and existing radiocarbon dates examined within a Bayesian chronological framework (Bayliss 2009; Buck et al. 1996) to address the following research objectives:

- **Determine if an inbuilt age offset (i.e., "old wood") exists on the wood charcoal radiocarbon samples;**
- **Estimate construction/occupation dates for individual circular pithouses;**
- **Determine if circular pithouses were constructed/ occupied contemporaneously;**
- **Provide more precise date range estimates for the Early Pithouse (circular pithouse) component of Mogollon Village.**

BAYESIAN MODELING

- All models were run using the radiocarbon calibration and Bayesian chronological modeling program, OxCal 4.3.2 (Bronk Ramsey 2009a) with the IntCal13 (Reimer et al. 2013) calibration curve.
- 30 radiocarbon dates were included in the model (19 wood charcoal dates previously run and 11 new AMS dates on short-lived specimens).
- The chronological model for Mogollon Village consists of two components: circular pithouses and rectangular pithouses. Ten radiocarbon-dated circular pithouse/ features from the MVAP and MVFS excavations are included in the circular pithouse phase. Given that there are no radiocarbon dates available, the rectangular pithouse phase consists of a single cutting date from Pithouse 2, excavated by Haury (1936), as *terminus ante quem*, to serve as an ending constraint for the model (see Figure 3).
- A General Outlier Model or a Charcoal Outlier Model (Bronk Ramsey 2009b; Dee and Bronk Ramsey 2014) was used on all wood charcoal radiocarbon dates to control for potential "old wood" effects.
- See Supplemental Text for full details on the radiocarbon dates and the model.

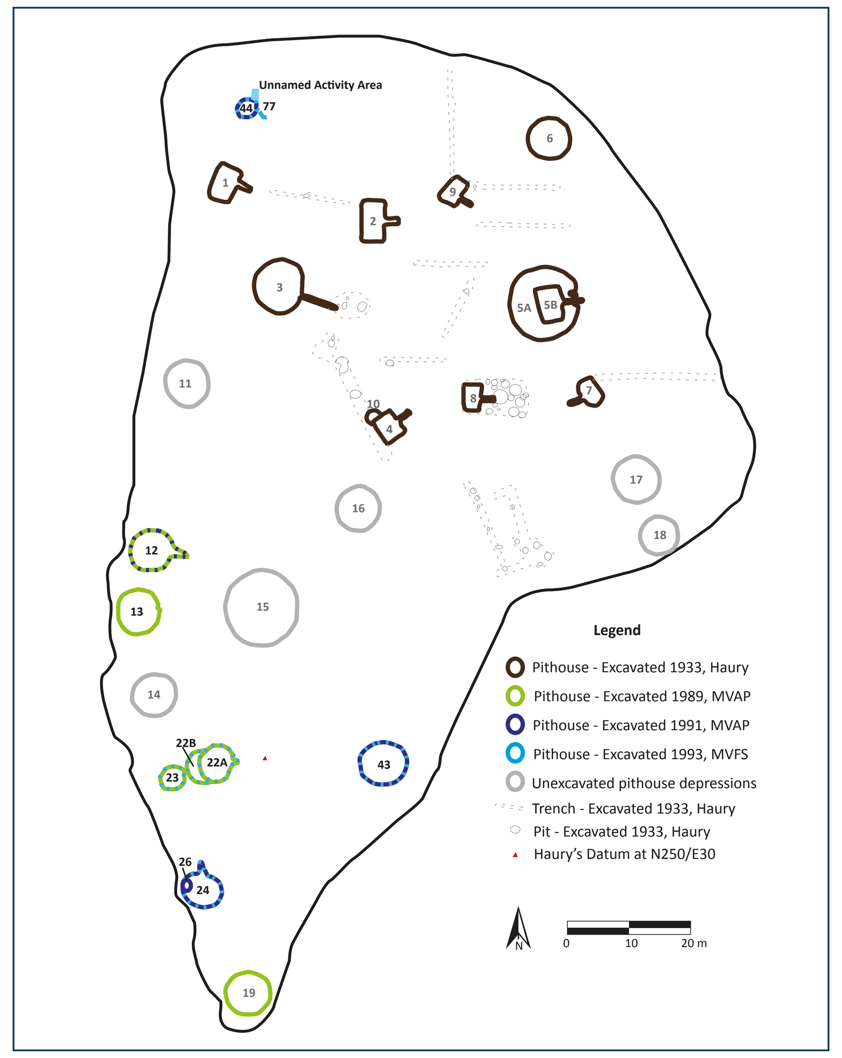

Figure 2. Map of Mogollon Village with units excavated by Haury, MVAP, and MVFS (after Haury 1936:Figure 2; Gilman et al. 1991:Figure 1.2; Duncan et al 1991:Figure 3.1; Linse 1997:Figure 3.2)

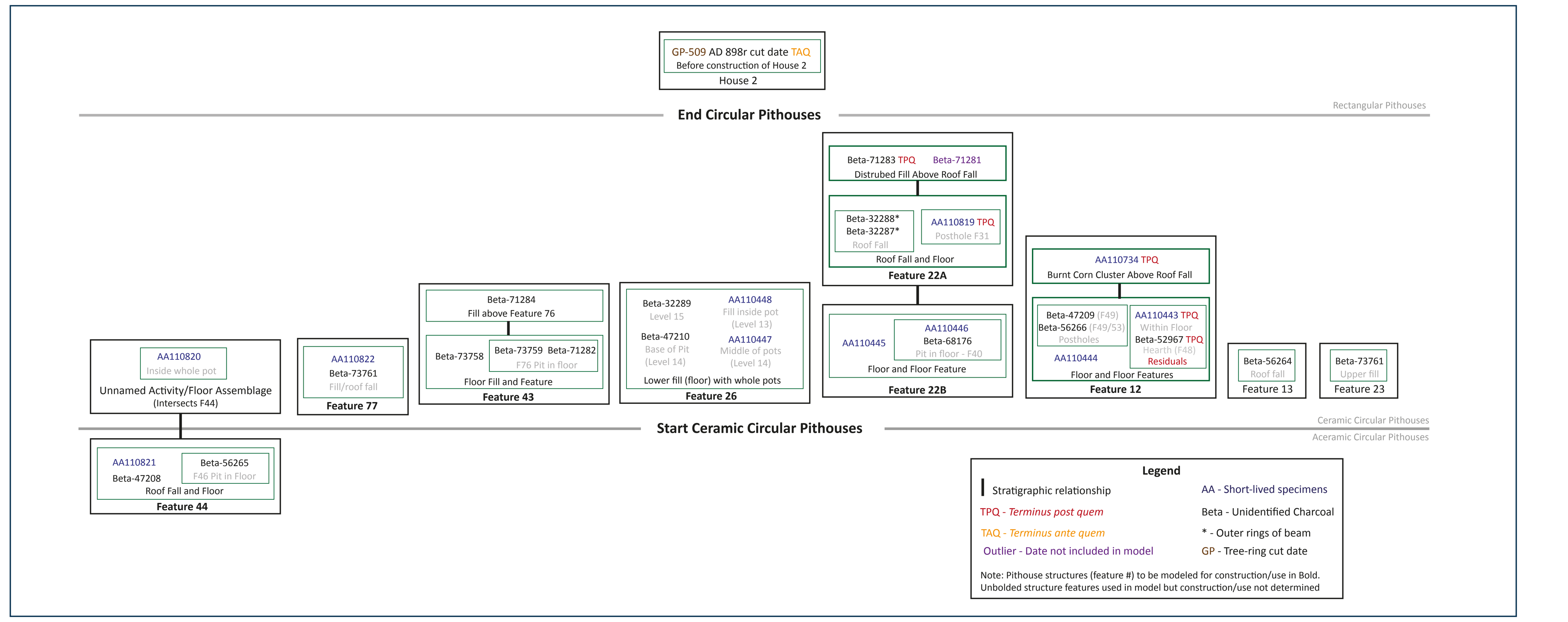

Figure 3. Schematic diagram showing the archaeological information and stratigraphic relationships that have been included in the Bayesian model. Details on the model, features and radiocarbon samples provided in the Supplemental Text.

RESULTS

Comparison of wood charcoal and short-lived specimens

Context	Lab Codes	Chi-square test	Pass/Fail
Feature 22B – Floor pit (F40), Unit 250N/18E, Level 4, 4.26-4.36 mbsd	Beta-68176 AA110446	T' = 0.9, v = 1, T'(5%) = 3.8	**Pass**
Feature 26 – Fill with whole pots, Unit 229N/17E, Level 14, 5.57-5.68 mbsd	Beta-47210 AA110447	T' = 4.0, v = 1, T'(5%) = 3.8	Fail
Feature 77 – Feature fill/roof fall, Unit 355N/27E, Strat. 2, Level 2, 4.07-4.11 mbsd	Beta-73760 AA110822	T' = 2.2, v = 1, T'(5%) = 3.8	**Pass**
Feature 44 – Roof fall, Unit 356N/25E, Level 3, 4.06-4.20 mbsd	Beta-47208 AA110821	T' = 0.4, v = 1, T'(5%) = 3.8	**Pass**

Table 1. To check for "old wood" on the wood charcoal samples, a chi-square test (Ward and Wilson 1978) was conducted on wood charcoal samples and short-lived specimens from the same context. Pass = potential sample contemporaneity. Fail = potential for date discontinuity from "old wood."

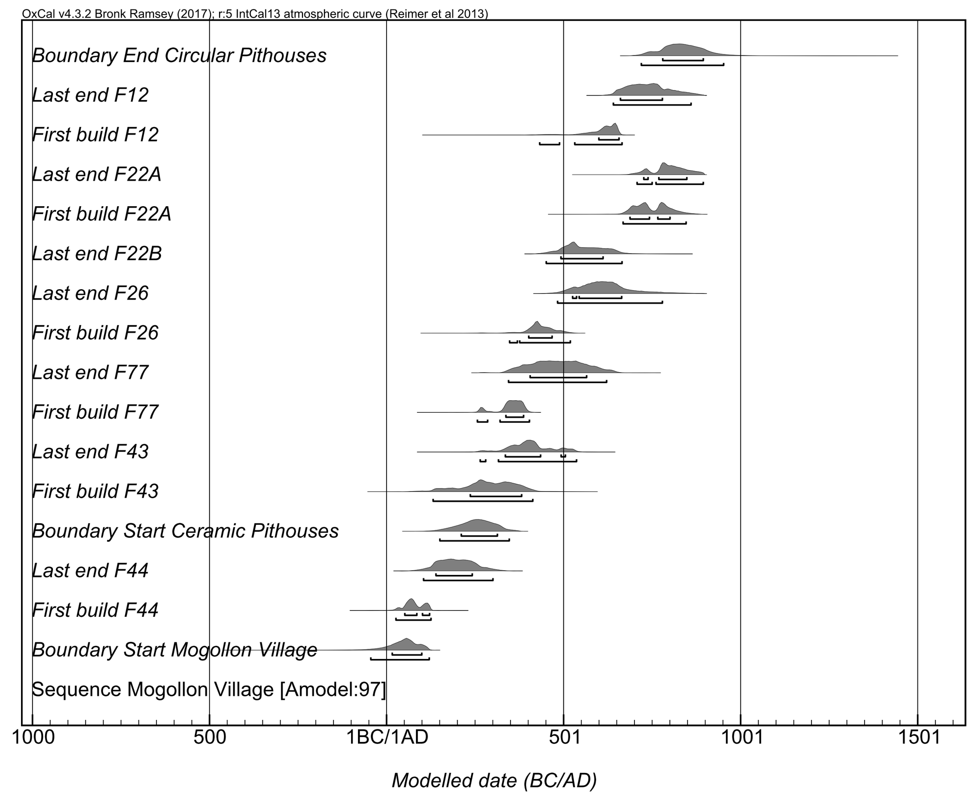

Figure 4. Key parameters for the beginning and ending of the circular pithouse component as well as the individual pithouses taken from the Mogollon Village circular pithouse model. See Supplemental Text for full model details.

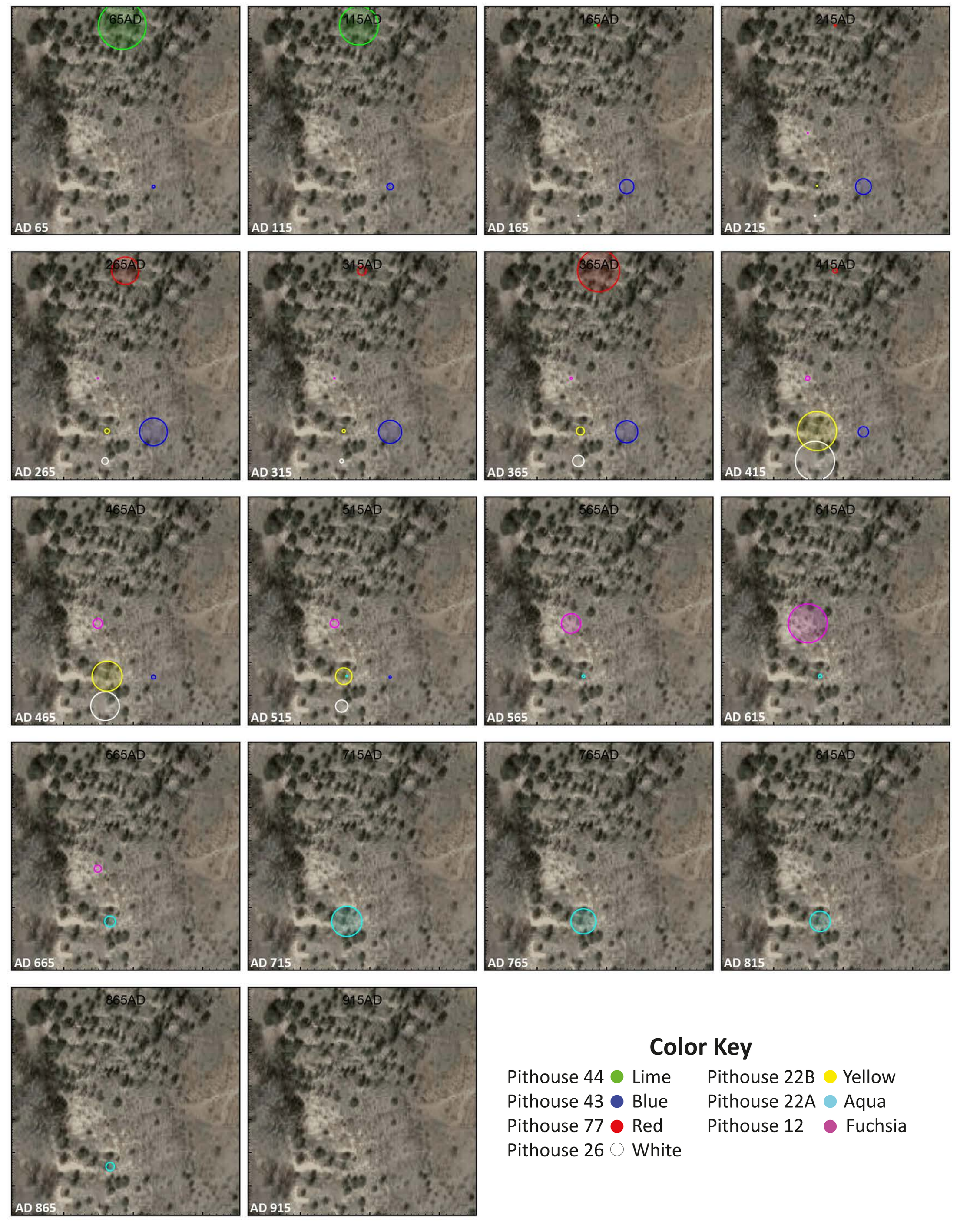

Figure 5. Time-slice map for Mogollon Village between AD 65 and 915 in 50-year intervals showing the modeled estimated construction (*First build* from model – see Figure 4) at the 95% confidence level for circular pithouses 44, 43, 77, 26, 22B, 22A, and 12. The diameter of each circle corresponds to the probability that the date estimate falls within that time slice (i.e., the larger the circle, the higher the probability that the construction date falls within that time slice).

Order matrix for circular pithouse construction

	Build F44	Build F43	Build F77	Build F26	Build F22B	Build F22A	Build F12
Build F44		100%	100%	100%	100%	100%	100%
Build F43	0%		77%	97%	98%	100%	100%
Build F77	0%	23%		96%	98%	100%	100%
Build F26	0%	3%	4%		56%	100%	98%
Build F22B	0%	2%	2%	44%		100%	98%
Build F22A	0%	0%	0%	0%	0%		1%
Build F12	0%	0%	0%	2%	2%	99%	

Table 2. This table provides the probabilities that the construction of the features on the left-hand column is earlier than the construction of the features across the top row. For example, the probability that Pithouse 44 (Build F44) construction is earlier than Pithouse 43 (Build F43) construction is 100%.

Order matrix for circular pithouse end of occupation

	End F44	End F43	End F77	End F26	End F22B	End F22A	End F12
End F44		100%	100%	100%	100%	100%	100%
End F43	0%		79%	99%	96%	100%	100%
End F77	0%	21%		90%	77%	100%	100%
End F26	0%	1%	10%		27%	98%	92%
End F22B	0%	4%	23%	73%		100%	99%
End F22A	0%	0%	0%	2%	0%		17%
End F12	0%	0%	0%	8%	1%	83%	

Table 3. This table provides the probabilities that the end of occupation of the features on the left-hand column is earlier than the end of occupation of the features across the top row. For example, the probability that end of occupation for Pithouse 44 (End F44) is earlier than the end of occupation of Pithouse 43 (End F43) is 100%.

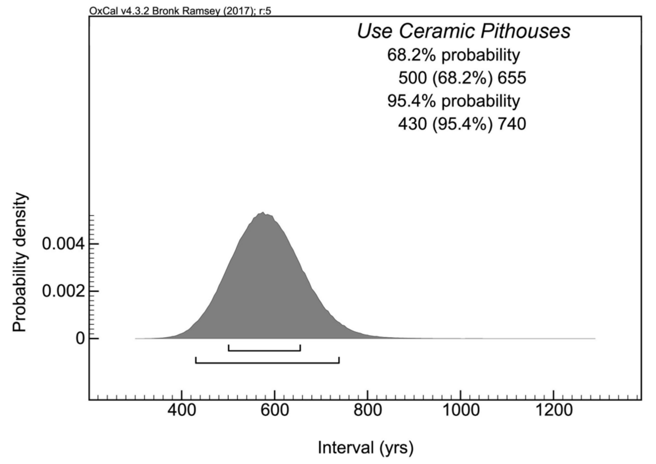

Figure 6. Estimated duration of the Early Pithouse period at Mogollon Village.

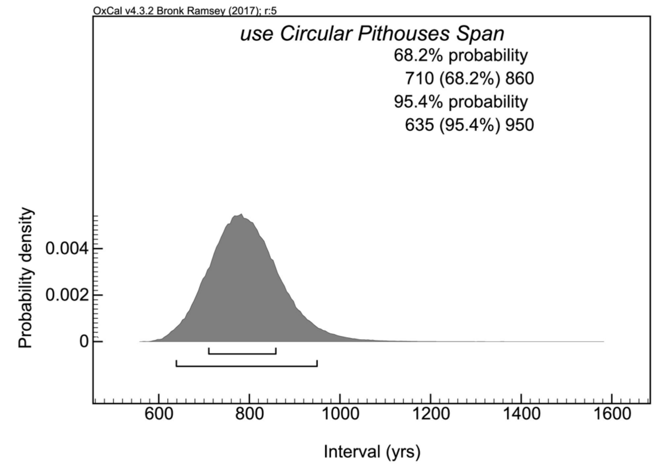

Figure 7. Estimated duration of the circular pithouse component at Mogollon Village.

DISCUSSION/CONCLUSIONS

- This initial chronological model provides an interpretative narrative for the circular pithouse occupation of Mogollon Village.
- Occupation began during the Late Archaic period in *45 cal BC-cal AD 125 (95% probability; Start Mogollon Village)*, and probably in *cal AD 15-100 (68% probability)*.
- The Early Pithouse component began in *cal AD 150-350 (95% probability; Start Ceramic Pithouses)*, and probably in *cal AD 210-315 (68% probability)*.
- The circular pithouse component ended in *cal AD 720-955 (95% probability; End Circular Pithouses)*, and probably in *cal AD 780-895 (68% probability)*.
- The difference between Start Ceramic Pithouses and End Circular Pithouses has been used to estimate that the Early Pithouse period lasted *430-740 years (95% probability; Use Ceramic Pithouses)*, and probably lasted *500-655 years (68% probability)* (see Figure 6).
- There appears to be little overlap between the construction/occupation of the circular pithouses (see Figure 5 and Tables 2-3).
- This initial model supports Gilman's (2010) assessment of the Mogollon Early Pithouse period in which population levels were low and few pithouses were occupied simultaneously at a site.
- The circular pithouse component at Mogollon Village may best be thought of as a "persistent place" (Schlanger 1992) as opposed to an aggregated village.
- The majority of the wood charcoal dates are statistically consistent with AMS dates on short-lived specimens from the same or related contexts (see Table 1 and Supplemental Text). Thus, "old wood" does not appear to be a pervasive problem at Mogollon Village; however, the remaining wood charcoal samples need to be tested on an individual basis.
- Additional radiocarbon dating is planned for more pithouses to further refine the circular pithouse component. In addition, future work hopes to incorporate the rectangular pithouse component into the models to provide better insight into the full occupation of Mogollon Village.

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