Exploring Classic Period Mimbres Social Networks through Neutron Activation Analysis: A Pilot Study

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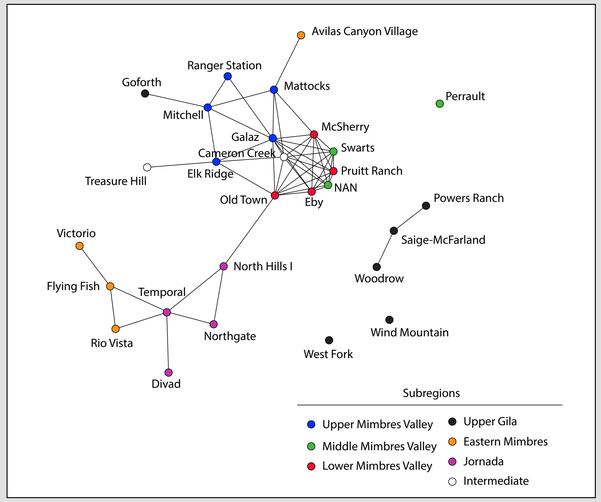
This study uses the large Neutron Activation Analysis (NAA) dataset that has been compiled for the Mimbres region in order to conduct Social Network Analysis (SNA) for the Mimbres Classic period (A.D. 1000–1130). Previous SNA studies in the American Southwest have used ceramic wares to build ties between sites (Mills et al. 2013; Lewandowski 2015). The use of NAA data to build social networks allows for these methods to be used within a region and temporal period that lacked diversity in decorated ceramic wares.

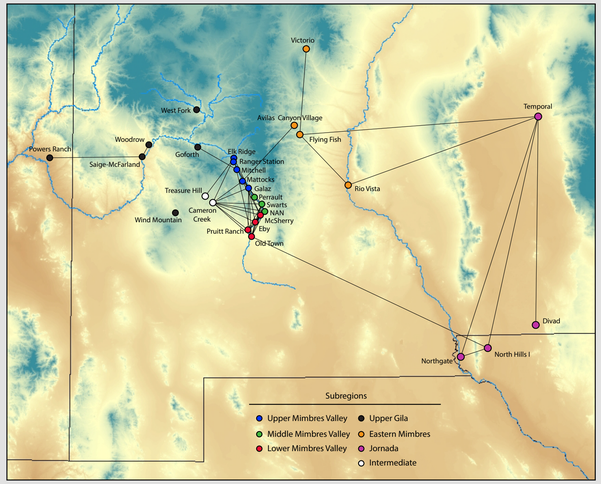
Recent Mimbres NAA and pottery studies provide a context of production, distribution, and social significane from which the social networks can be viewed. NAA studies within the Mimbres region demonstrate that pottery was produced widely across the area and mostly distributed between sites situated near one another (Creel and Speakman 2018). Speakman's (2013) NAA study of pottery within the Mimbres region identified 33 compositional groups and multiple production locals. The regional distribution of painted Mimbres pottery was bounded and design style was quite homogeneous and embedded with meaning, signaling an acceptance of and belonging within Mimbres society (Hegmon et al. 2021).

Methods

I used the NAA data compiled by Speakman (2013) to create the dataset, selecting for sites with > 10 samples of decorated ceramics dating to the Mimbres Classic period (Style II/III, Style III, and Mimbres Polychrome). Samples with unassigned compositional groups were not included, nor were samples from Macro Group D (Jornada pottery). Additional data was added for the Woodrow site (Sedig 2015). The resulting dataset consists of 1009 ceramic samples across 28 sites, with 25 compositional groups represented.

The SNA was conducted using previously established methods (Mills et al. 2013) and published R scripts (Peeples and Roberts 2013). Similarity scores were calculated in order to create ties between sites. Here, I present the results using a 0.60 similarity score to define ties between sites. Centrality was also calculated in order to identify central sites within the network. Mills et al. (2013) previously found that eigenvector centrality most accurately captures the different flow processes being measured by similarities in ceramic assemblages. Eigenvector centrality takes into consideration not only the position of a node within a network, but also the position of all other nodes it is connected to. Degree and betweenees centrality are also presented. Degree centrality is the number of ties connected to a node, while betweeness centrality measures the amount of network flow that a given node controls (Borgatti 2005).



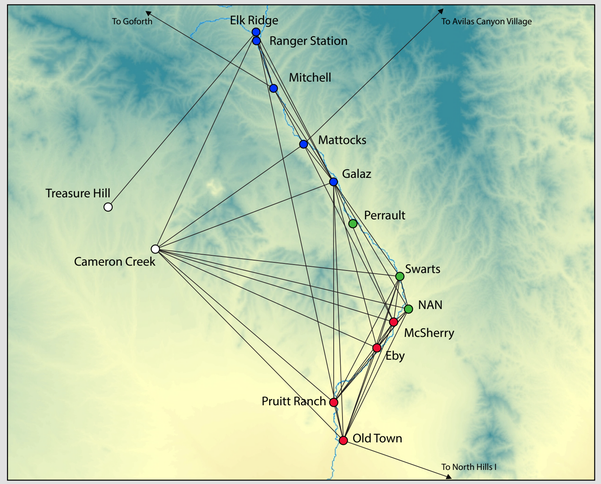


The network configuration shows that sites within the Mimbres River Valley were the most well connected, with Galaz and Cameron Creek being the most central sites within the network. Subregional networks can be identified as sites within the Upper Gila, Eastern Mimbres, and Jornada areas are generally connected more to one another than they are to sites in other subregions. Sample size may be a factor resulting in the isolation of Perrault, West Fork, and Wind Mountain within the current network.

Centrality Scores

Site	Degree	Eigenvector	Betweeness
Galaz	11	2.0164	46.3
Cameron Creek	9	1.9091	12.7
Old Town	9	1.8377	101.3
McSherry	8	1.8066	8
NAN	7	1.7046	0
Pruitt Ranch	7	1.7046	0
Eby	7	1.7046	0
Swarts	7	1.7046	0
Elk Ridge	5	0.8654	28.7
Mattocks	5	0.8611	21.7
Mitchell	5	0.5597	23.3
Ranger Station	2	0.3462	0
North Hills I	3	0.2581	90
Treasure Hill	1	0.1163	0
Avilas Canyon Village	1	0.1157	0
Goforth	1	0.0752	0
Temporal	5	0.0427	71
Northgate	2	0.0404	0
Flying Fish	3	0.0068	20
Rio Vista	2	0.0066	0
Divad	1	0.0057	0
Victorio	1	0.0009	0
Powers Ranch	1	0	0
Saige-McFarland	2	0	1
Woodrow	1	0	0
West Fork	0	0	0
Perrault	0	0	0
Wind Mountain	0	0	0

Examining the eigenvector centrality scores, Galaz is the most central site within the network, followed by Cameron Creek. Interestingly, sites located in the Lower Mimbres River Valley also have high centrality scores.



A close-up geospatial representation of the network configuration within the Mimbres River Valley.

Future Research

Biases and limitations exist within the current NAA dataset, as some sites and compositional groups have small samples and some production locals remain unidentified. As the NAA dataset continues to grow, additional SNA studies may be conducted. For example, conducting SNA for the Late Pithouse (A.D. 550–1000) period would allow for changes in Mimbres ceramic social networks to be examined across time. The use of NAA data to build ceramic social networks may also allow for differences in painted and utilitarian pottery networks to be examined.

I was unable to create and examine a utilitarian pottery network for the current study, due to concerns of temporal control and sample size. Two potential solutions may be selecting for utilitarian ceramic samples that come from excavated dated contexts, or apportion the utilitarian ceramics into specific intervals (e.g. 50 years).

Conclusions

The current results using NAA data to generate Mimbres painted pottery social networks during the Classic period align with conclusions drawn by previous Mimbres NAA studies. Creel and Speakman (2018) identified Galaz as a major ceramic production locale during the Classic period. This is reflected here in the high centrality score of Galaz. They also identified that the primary factor in the acquisition of pottery was proximity to production sites. This appears to be represented in the social and geospatial network configurations, as subregional networks can be identified.

Creel and Speakman (2018) found that pottery production was minimal within the lower Mimbres River Valley at sites south of Swarts. The high centrality scores of these sites demonstrates their position as consumers and distributors within the Classic period Mimbres painted pottery social network, further begging the question put forth by Creel and Speakman (2018), "what did the residents at these sites exchange for these ceramic vessels?"

The results demonstrate the applicability of SNA as an additional tool for examining the production and distribution of pottery within the Mimbres region, as well as the viability of NAA data for building such networks.

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