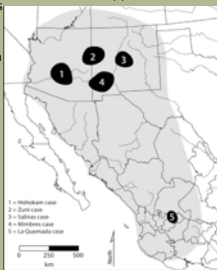


## What Role does Social Diversity Play in Transformations?

Resilience literature hypothesizes that diversity is beneficial – within limits – and contributes to the persistence of social-ecological systems (Chapin et al. 2009; Folke 2006; Norberg et al. 2008); however, little research has explored the social component of such systems. The **Long-Term Vulnerability and Transformation Project (LTVTP)** focuses on configurations of social and ecological diversity in relation to the persistence of coupled social-ecological systems (SES) using case studies from the US Southwest and northern Mexico (Figure 1). This poster focuses on two transformations: the **Pueblo II to Pueblo IV transition (ca. AD 1275) in the Cibola region** as an example of continuity with change and the **Classic to Postclassic transition (ca. AD 1130) in the Mimbres region** as an example of transformative relocation. These “non-collapse” reorganizations involve institutional and/or spatial reorganizations that allow the transformed society to persist. Characterizing their social configurations will help us understand the role social diversity may play in the outcome of different transformations.

Figure 1. Case studies of the LTVTP. This study focuses on the Cibola (2) and Mimbres (4) cases.



## Multi-Scalar Analysis of Social Diversity

Our methodology characterizes and compares diversity across cases and various social realms. Preliminary analyses, focusing on the *intrasite* level (and averaging diversity scores across sites) revealed few differences between these two quite different transformations (Table 1). Here we focus on diversity at larger (subarea and regional) scales to further assess the relationship between social diversity and transformation.

Table 1. Diversity in various social realms, assessed at the *intrasite* scale.

Form of Social Diversity	Archaeological Data	Continuity with Change (Cibola PIII Period)	Transformative Relocation (Mimbres Classic Period)
Cooking technology	Hearth styles; grinding facility styles	Low	Low
Subsistence activities	Faunal remains	Moderate	Moderate
Household organization	Architectural arrangements; mean room size	Low	High
Local production	Local ceramic wares	Low – 2 types	None – 1 type

Hypothetical diagrams illustrate the importance of assessing diversity at multiple scales. In Figure 2a, *intrasite* diversity is low (each site has only two colors), but there are considerable *intersite* differences resulting in a high degree of subarea/regional diversity (five colors). In Figure 2b, *intrasite* diversity is higher (five colors), but each site has the same range of colors so subarea/regional diversity is the same as Figure 2a.

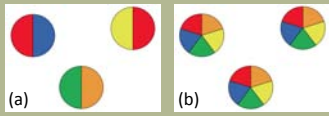


Figure 2. Hypothetical data of two idealized distributions of scalar diversity.

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## Cooking Technology: Hearth Styles

Cooking technology diversity in both case studies is low at the intrasite scale and tend to form small spatial clusters that also have low diversity (Figure 3). The diversity within each site cluster, however, is different and causes diversity at the subarea and regional scales to be higher (Table 2). The spatial patterning in these data is similar to that in Figure 2a.

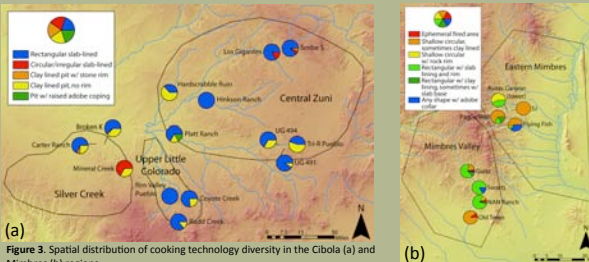


Figure 3. Spatial distribution of cooking technology diversity in the Cibola (a) and Mimbres (b) regions.

Table 2. Diversity of cooking technology assessed at multiple scales.

Subarea	N (sites)	N (hearthths)	Diversity Measures (1-C)		
			Site Average	Subarea	Region
Central Zuni	18	167	0.32	0.49	0.53
Silver Creek	4	59	0.35	0.54	0.53
Upper Little Colorado	3	27	0.20	0.25	0.53
Mimbres Valley	3	80	0.34	0.52	0.66
Eastern Mimbres	4	34	0.39	0.69	0.66

## Local Production: Decorated Ceramic Wares

In the Mimbres region only one type of decorated ceramic is produced locally – Mimbres Black-on-white – thus there is no diversity in this realm. In contrast, in the Cibola region several wares are produced locally, in different subareas. At the intrasite (and site cluster) level there is low diversity, although there are considerable differences between clusters and thus diversity is higher at larger spatial scales (Figure 4, Table 3). The spatial patterning in these data is also similar to that illustrated in the hypothetical Figure 2a.

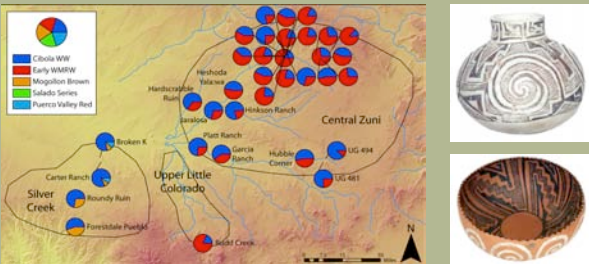


Figure 4. Spatial distribution of local ceramic production diversity in the Cibola region.

Table 3. Diversity of local ceramic production assessed at two spatial scales.

Subarea	N (sites)	N (sherds)	Diversity Measures (1-C)	
			Site Average	Subarea
Central Zuni	51	29493	0.41	0.50
Silver Creek	5	20249	0.39	0.35
Upper Little Colorado	1	2884	0.30	0.30
Mimbres Valley	8	25178	0	0
Eastern Mimbres	7	10765	0	0

## Local Production: Mimbres Black-on-white Designs

Peeples (2011) identified strong homogeneity in ceramic designs across the Cibola region. Our analyses of the layout of Mimbres designs (Figure 5, Table 4) show considerable *intrasite* diversity, but with the same range of designs present at different sites (similar to the hypothetical Figure 2b). Thus, at an *intersite* scale, there is considerable homogeneity in Mimbres designs, comparable to that observed by Peeples in the Cibola region.

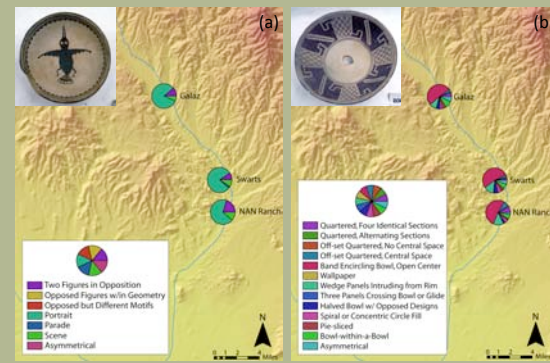


Figure 5. The diversity and distribution of Mimbres Black-on-White representational (a) and geometric (b) designs.

Table 4. Diversity of representational and geometric designs on Mimbres Black-on-White bowls at two spatial scales.

Design Style	N (sites)	N (sherds)	Diversity Measures (1-C)	
			Site Average	Subarea
Representational	3	518	0.40	0.38
Geometric	3	892	0.72	0.72

## Conclusions and Future Work

- The spatial dimension of diversity data allows us to explore the scale at which social diversity was experienced in past societies.
- When comparing the social configurations of different transformation types, it is important to assess diversity at multiple scales.
- Even when the spatial distribution of diversity data is taken into consideration, our two case studies still appear to have similar social configurations (i.e., only notable difference is observed in ceramic decoration and is a factor of the design categories chosen for analysis), which suggests that social diversity may not play a major role in determining the transformation(s) to which a SES is vulnerable.
- Future work will focus on integrating the diversity data with the spatial distribution of agricultural risk on prehistoric landscapes (Strawhacker et al., this session). This research will provide us with a fuller understanding of how different configurations of social and ecological configurations relate to the resilience of coupled social-ecological systems.

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