Amerind Studies in Archaeology

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Leaving Mesa Verde

Peril and Change in the Thirteenth-Century Southwest

Edited by **Timothy A. Kohler,**
Mark D. Varien,
and **Aaron M. Wright**

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Remodeling Immigration

A Northern Rio Grande Perspective on Depopulation, Migration, and Donation-Side Models

Jeffrey L. Boyer, James L. Moore, Steven A. Lakatos, Nancy J. Akins, C. Dean Wilson, and Eric Blinman

The depopulation of large parts of the northern Southwest by Pueblo people is an iconic event in the intellectual development of southwestern archaeology. The Pecos Classification (Kidder [1924] 1962) codified a complementary relationship between the central "Anasazi" area (the northern San Juan/Mesa Verde and southern San Juan/Chaco regions) and the eastern Pueblo area (the northern Rio Grande region). In the Pecos framework, the Pueblo III period ended with depopulation of the San Juan regions, while the Pueblo IV period began as large villages formed in other areas of the northern Southwest, including the northern Rio Grande. This sequential framework still contributes to archaeological interpretations that couple temporal and cultural continuity between the San Juan regions and the post–AD 1300 northern Rio Grande. Those interpretations usually invoke migrations of people from the former to the latter and imply that historical northern Rio Grande Pueblos are descendant from San Juan populations.

Depopulation of the San Juan regions by AD 1300 is beyond dispute, and chapters in this volume provide detailed descriptions of the circumstances, with emphasis on the northern San Juan. As archaeologists working in the northern Rio Grande, however, we are not confident about assumptions and models that present those circumstances as formative events for the cultures of the northern Rio Grande. Numerous attempts have been made to reconcile the timing, visibility, and impacts of proposed movement(s) of people from the San Juan regions into the northern Rio Grande (e.g., Ahlstrom, Van West, and Dean 1995; Cordell 1995; Cordell et al. 2007; Dean, Doelle, and Orcutt 1994; Dutton 1964; Ford, Schroeder, and Peckham 1972; McNutt 1969; Mera 1935, 1939; Moore 2008; Peckham 1984; Reed 1949; Wendorf 1954; Wendorf and

Reed 1955; Wilson 2008). Most, however, are largely based on viewpoints from the donating sides rather than from the presumptive receiving side of such movements.

Like Cordell (1995), we recognize a variety of problems with reconstructions of twelfth- and thirteenth-century population movements into the northern Rio Grande. We also see several areas of research that must be addressed to understand population movement into the northern Rio Grande. For example, if population movement as a significant event or process is a matter of scale (Cordell 1995), then data relevant to identifying and describing immigration into the northern Rio Grande must be collected at regional and interregional scales. There must be comparable evidence, chronological *and* material, from the donating *and* receiving regions (Haury 1958). Further, interregional aspects of population movement cannot be addressed synchronically, since the dynamics at AD 1250–1300 in the San Juan and northern Rio Grande regions are only relevant within their respective social-cultural-economic trajectories. Consequently, migration from one region to another must be addressed through comparisons of diachronic trajectories. In other words, if a single site or assemblage is inadequate to identify significant population movement (Cordell 1995:206–207), then it follows that a specific point in time is equally inadequate because the significance of the archaeological record at that point is predicated on the specific trajectories that led to it.

In this chapter, we assert a perspective of indigenous, long-term cultural development in the northern Rio Grande. This perspective demands that northern Rio Grande people be viewed as active participants in their own culture-historical trajectories and in their interactions with peoples in other regions. Northern Rio Grande Pueblo people were neither so few in number nor so intraregionally disengaged that the dynamics of their cultural developments were determined by events and processes occurring in other regions.

The northern Rio Grande was not a nearly empty landscape available for use or colonization by people from other regions. From about the middle of the first millennium AD, the region was home to a growing, expanding indigenous population that developed its own suite of traditions comprising a cultural trajectory superficially similar to but actually quite distinct from those of the San Juan regions.

This perspective is certainly not new—witness Peckham (1984); Peckham's position in Ford, Schroeder, and Peckham (1972); Stubbs (1954); Wendorf (1954); and Wendorf and Reed (1955), for instance—but its substance and implications have been ignored in models of interregional Pueblo interaction and movement that emphasize donation-side perspectives, particularly from the northern San Juan. Nonetheless, the northern Rio Grande record is far from silent regarding interregional interactions, including San Juan immigration.

People of the Northern Rio Grande

Previous population reconstructions for the northern Rio Grande suggest inconsequential Developmental-period (ca. AD 600–1200) populations before a dramatic increase began in the 1300s (Crown, Orcutt, and Kohler 1996; Dean, Doelle, and Orcutt 1994; see also Cordell 1995). Resulting graphs of population increase are compelling visual suggestions of an in-migration that is usually linked to the twelfth-century decline of the southern San Juan Chaco system and the thirteenth-century depopulation of the northern San Juan region. Although pre–AD 1100 northern Rio Grande settlement is well documented (e.g., Boyer 1994, 1997; Frisbie 1967; Lakatos 2006; Lakatos and Post, in press; Schmader 1994), these data have not been adequately synthesized in prevailing northern Rio Grande population reconstructions. In large part, this is because published syntheses have focused on post–AD 1100 occupations of subregions that were unoccupied by Pueblo people before that time. Consequently, assessing northern Rio Grande population trends in relation to postulated immigrations has been impossible because the pre–AD 1100 population could not be considered.

As Dean, Doelle, and Orcutt (1994) point out, prehistoric population estimates ordinarily combine site and room function with chronology, resulting in figures that reflect general trends rather than precise demographic fluctuations (though see chapter 3 of this volume for a different approach). Establishing population estimates is particularly challenging when using data from surface inventories generated over many years using varied approaches (see Ortman, Varien, and Gripp 2007). In the northern Rio Grande, where chronometric data are limited and pottery assemblages do not yet support high-precision dating (Wilson

2003), population trends are largely grounded in phase-based chronologies and settlement patterns (Crown, Orcutt, and Kohler 1996; Dean, Doelle, and Orcutt 1994).

Methods

To improve our understanding of Developmental-period population trends, a database of AD 600–1200 structural sites was compiled from the New Mexico Cultural Resource Information System and from previous research (Lakatos 2006; Lakatos and Post, in press). Site records were consulted for forty-nine U.S. Geological Survey 7.5 min quadrangles within the central corridor of the northern Rio Grande. The quadrangles were grouped into three subregions: Albuquerque to Cochiti (ABQ-COH, twenty-one quadrangles), La Bajada Mesa to Velarde (BAJ-VEL, seventeen quadrangles), and the Taos Valley (TSV, nine quadrangles). The subregions, shown in figure 12.1, approximate the locations of modern Pueblo linguistic groups (Keres [ABQ-COH], Tewa [BAJ-VEL], and northern Tiwa [TSV]) and also correspond to topographic and environmental variation that likely conditioned population settlement and movement. Subregions flanking the central portion of the study area that also had Developmental-period occupations, such as the lower Rio Jemez, the upper Rio Pecos, the Picuris area, and the eastern flanks of the Sangre de Cristos, were not included in this preliminary study. Other subregions that generally lack Developmental-period sites, such as the Pajarito Plateau, the Galisteo Basin, and the Rio Chama drainage, were also not included.

When possible, sites were assigned to hundred-year periods based on reported age, associated ceramic types, or chronometric dates. Because archaeologists working in the northern Rio Grande generally use period- and phase-based chronologies, most sites in the database have date assignments in excess of one hundred years. Those sites were reassigned to hundred-year intervals based on the proportional percentage of excavated structures dating to each hundred-year interval within each of the three geographic subregions (Lakatos 2007). Sites that lack clearly described temporal components or structural elements or are aceramic were not included in this reconstruction.

The three subregions were used to monitor the numbers and location of sites for each hundred-year interval. Estimated numbers of residential

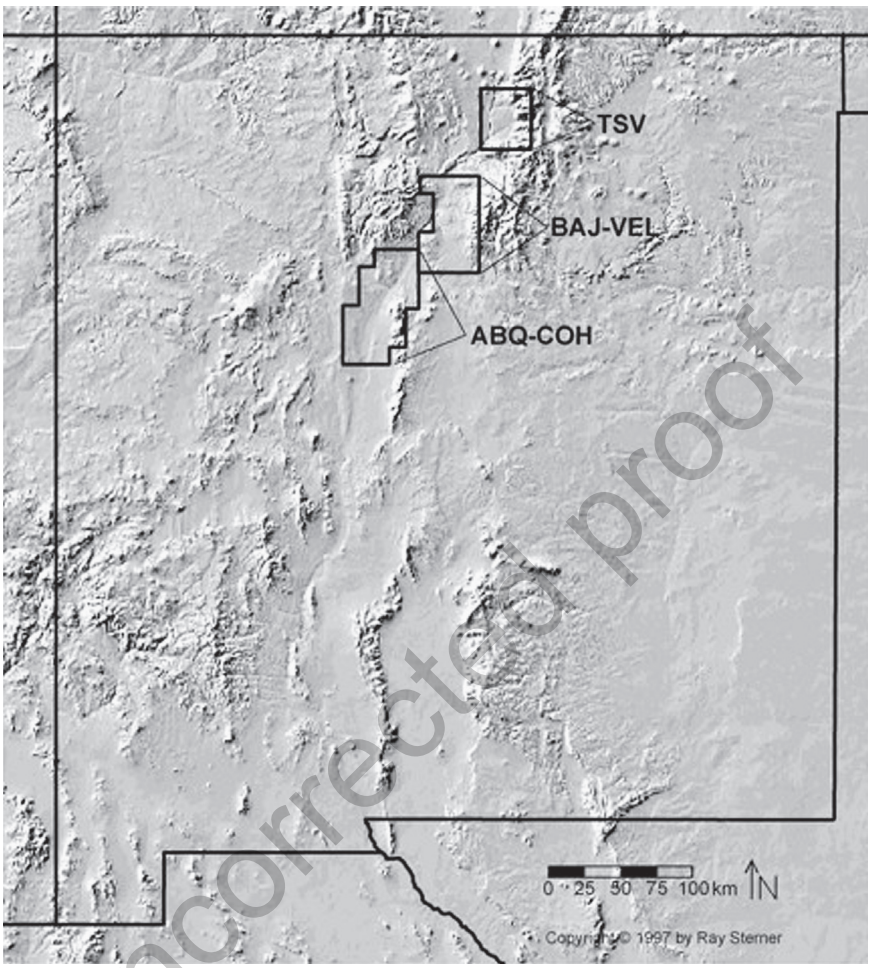

Figure 12.1. Overview of New Mexico and subregions used in the current study. Adapted from Sterner (1997). (Courtesy of Ray Sterner and North Star Science and Technology, LLC.)

structures for each interval were calculated by dividing the number of reported sites by the estimated percent of surveyed space in each subregion, and by assuming two contemporaneous residences per site (Lakatos 2007; Stuart and Gauthier 1981). This approach does not account for all sites occupied at a particular time within each subregion, for variations in survey coverage, or for uneven reporting practices. As a preliminary study, however, it does offer a baseline for estimating population

during and after the Developmental period. It is a conservative estimate, for three reasons.

First, the quadrangles included in this study do not represent the entire spatial range of Developmental-period occupation. Including other subregions would increase the overall population estimates. Second, longevity of site occupation, as discussed below, is based on an assumption of relatively high settlement mobility. If residential sites had longer occupations, overall population estimates would be increased. Finally, this study focuses on structures arguably used to house single families, primarily pit structures. By the late twelfth century AD, settlements began to include substantial surface structures arguably used to house multiple families. Including such structures in a population reconstruction would require methods better suited to projecting numbers of families housed in multiroom structures. Because our purpose was to characterize Developmental-period demographics, we focused on single-family residential structures.

Population trends in this study are based on estimated numbers of households, defined as social units occupying the same residential structure (Wills 2001; Wilshusen 1988). Average prehistoric Pueblo household sizes ranged between five and eight people and remained stable over time and across space (Lightfoot 1994; see also Kosse 1989). Momentary household estimates were calculated following Duff and Wilshusen (2000:173) and assume a fifteen-year habitation-structure use life (fig. 12.2; Varien et al. 2007: fig. 4). Momentary populations for each subregion and hundred-year interval were calculated by multiplying the estimated number of households by six (Hill 1970; Lightfoot 1994; Varien et al. 2007). Total population for each hundred-year interval reflects the sum of subregional momentary population estimates.

Results

The early Developmental-period (ca. AD 600–900) population in the ABQ-COH subregion remained relatively low, fluctuating between about 100 and 160 households containing 590 to 980 people (table 12.1). We suspect, although we cannot demonstrate, that the AD 800–900 figure is artificially low, perhaps representing a lack of artifacts that can be securely used to date sites to that century. Between AD 900 and 1000, the ABQ-COH population increased to about 340 households,

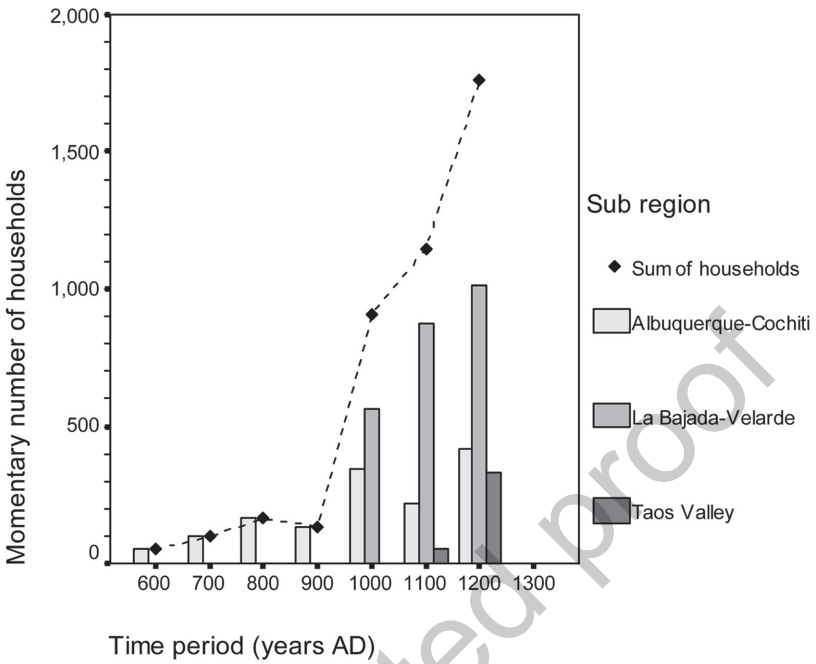

Figure 12.2. Momentary number of Developmental-period households, by subregion, AD 600–1200.

and the BAJ-VEL subregion, previously unoccupied by Pueblo people, was settled by 560 households, together totaling about 5,450 people. By AD 1100, the ABQ-COH population declined to fewer than 220 households, while the BAJ-VEL population increased to about 870 households and the TSV was settled by about 50 households. In all, an estimated 6,870 people inhabited the study area at AD 1100.

By AD 1200, the ABQ-COH population had increased to 418 households (2,508 people), but most of the approximately 10,600 people in the study area lived in the BAJ-VEL (1,014 households; 6,084 people) and the TSV (330 households; 1,980 people) subregions. These population figures, especially for the late Developmental period (ca. AD 900–1200), are substantially greater than previous estimates (fig. 12.3). The higher regional numbers and evidence of subregional population expansion result in a new and more dynamic view of regional population trends.

To estimate population at AD 1300, we used the hundred-year and two-hundred-year changes between AD 1100 and 1200 and between

Table 12.1. Population estimates for the Northern Rio Grande subregions, AD 600–1200

Time interval (years AD)	Momentary number of households	Momentary population[a]	r^b	km² per household	Hamlets[c]		Villages[d]	
					Minimum	Maximum	Minimum	Maximum
Albuquerque-Cochiti (ABQ-COH)								
600–700	99	594	—	32.65	5	17	3	6
700–800	163	978	.0050	19.97	8	27	5	10
800–900	134	804	−.0020	24.20	7	22	4	8
900–1000	343	2058	.0094	9.48	17	57	10	21
1000–1100	219	1314	−.0045	14.80	11	37	7	13
1100–1200	418	2508	.0065	7.76	21	70	13	25
La Bajada–Velarde (BAJ-VEL)								
800–900	0	0	—	0	0	0	0	0
900–1000	534	3384	—	4.71	28	94	17	34
1000–1100	872	5232	.0044	3.05	44	145	26	52
1100–1200	1014	6084	.0015	2.62	51	169	30	61
Taos Valley (TSV)								
900–1000	0	0	—	0	0	0	0	0
1000–1100	54	324	—	26.76	3	9	2	3
1100–1200	330	1980	.0181	4.38	17	55	10	20

Total Northern Rio Grande								
600–700	99	594		79.00	5	17	3	6
700–800	163	978	.0050	48.39	8	27	5	10
800–900	134	804	−.0020	58.67	7	22	4	8
900–1000	907	5442	.0191	8.68	45	151	27	54
1000–1100	1146	6876	.0023	6.87	57	191	34	69
1100–1200	1763	10578	.0043	4.46	88	294	53	106
1200–1300	2712[e]	16273[e]						
1200–1300	3506[f]	13526[f]						
1200–1300	2710[g]	16262[g]						
1200–1300	2452[h]	14714[h]						

[a] Momentary population = momentary number of households × 6.
[b] Coefficient of population growth (Odum 1971:181), calculated from mid-interval of the previous century to mid-interval of the present century.
[c] Hamlets: minimum = momentary number of households / 20 (Adler 1994); maximum = momentary number of households / 6 (Kintigh 1994).
[d] Villages: minimum = momentary population / 200; maximum = momentary population / 100 (Adler 1989).
[e] Projected, based on growth rate of previous century.
[f] Projected, based on growth rate of previous two centuries.
[g] Projected, based on growth rate (*r*) of previous century.
[h] Projected, based on growth rate (*r*) of two centuries.

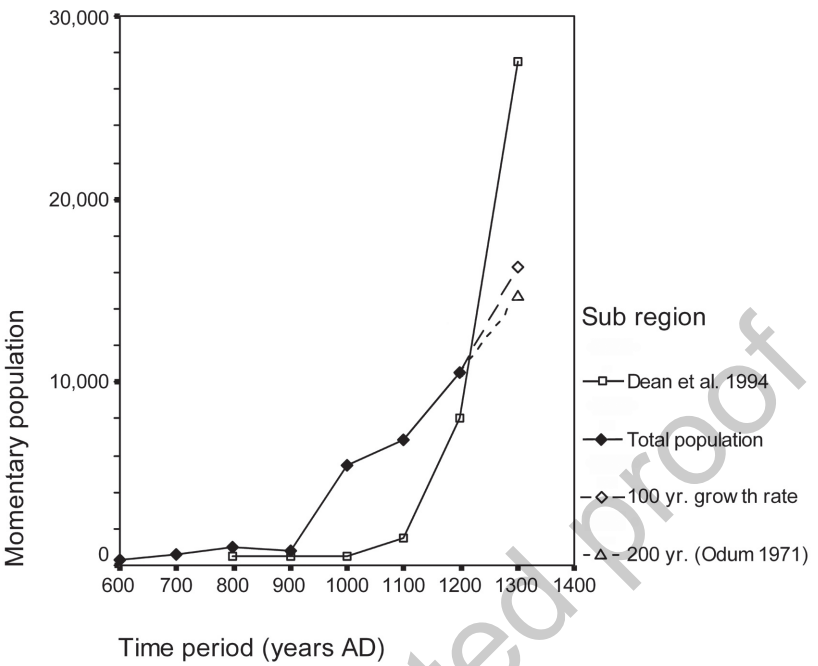

Figure 12.3. Momentary population estimates for the northern Rio Grande, AD 600–1300.

AD 1000 and 1200 (table 12.1) to project population growth between AD 1200 and 1300 (hundred-year rate = [end population − initial population] ÷ initial population; the two-hundred-year rate was calculated using an average of the two hundred-year rates for AD 1000–1100 and 1100–1200). We also compared the results to those obtained by extrapolating the instantaneous coefficient of population increase calculated for these same intervals, which assumes exponential growth (Odum 1971) into the 1200s. The results, presented in table 12.1, allow us to model the effects of intrinsic Developmental-period growth on population numbers in the Coalition and early Classic periods. Using these growth rates, the projected total northern Rio Grande population at AD 1300 was between 13,500 and 16,260 people (2,254 to 2,710 households; fig. 12.3).

These figures are lower than those presented by Dean, Doelle, and Orcutt (1994) by about 11,200 to 14,000 people (1,867 to 2,333 households). The discrepancies may be due to the different methods used, as well as the inclusion, in previous reconstructions, of a larger geographic

area than was included in our reconstruction. Because we want to model intrinsic growth through the thirteenth century to the beginning of the fourteenth century using demonstrable trends in the Developmental period, our reconstruction does not include recorded Coalition- and early Classic-period sites, nor does it involve subregions where Pueblo sites were infrequent or not present before the thirteenth century.

While our estimates are based on a fifteen-year pit-structure use life during the Developmental period, evidence for surface architecture was more substantial after AD 1000, perhaps indicating increasingly longer site occupancy between about AD 1000 and 1200. Longer site occupations would increase the population estimates and significantly reduce the difference between Developmental- and projected Coalition-period estimates.

Population figures presented here suggest that most previous reconstructions significantly underestimated the Developmental-period population and perhaps overestimated the Coalition-period population. These factors decrease the population influx needed to explain Coalition-period and later population increase. Support for this position is found in Dickson (1975), who produced similar trends in population growth for the Developmental and Coalition periods. Maxwell also found that the "intrinsic growth rate in the lower Rio Chama Valley [during the Coalition and Classic period] is not unlike the growth rates estimated for other regions of the prehistoric pueblo world" (1994:17). His analysis showed that migration did not have a "striking effect" on regional population growth, supporting observations made by Wendorf and Reed (1955). As we noted earlier, our methods are intended to provide preliminary estimates for the Developmental period, and we believe that they accurately represent conservative population figures for that period and intrinsic population trends during the Developmental and Coalition periods.

Trends in available land per household for each time interval and subregion were calculated using population estimates and the areas of the included quadrangles in square kilometers. Before AD 900, individual ABQ-COH households had 20–32 km^2 of available land (table 12.1). However, by AD 1000, the amount of land per ABQ-COH household dropped to less than 10 km^2, while households in the newly occupied BAJ-VEL had about 5 km^2 each. The ABQ-COH population decline

in the AD 1000s increased the amount of land per household in that subregion to more than 15 km^2, while the corresponding BAJ-VEL population increase reduced the amount of available land to 3 km^2/household. Yet households expanding into the TSV had more than 26 km^2 available apiece. By AD 1100, the amount of land per household in the entire study area had decreased to slightly less than 7 km^2. During the twelfth century, available land steadily declined in each subregion, so that by AD 1200, ABQ-COH households had less than 8 km^2 each, and BAJ-VEL and TSV households had less than 3 and 5 km^2, respectively, reducing the study-area average to less than 4.5 km^2/household.

Regional population grew throughout the Developmental period, punctuated by subregional decreases as the population periodically shifted further north (table 12.1; fig. 12.2). Each northerly pulse resulted in a temporary increase in available land per household (table 12.1), allowing people to remain residentially mobile and perpetuating traditional socioeconomic practices, while mitigating scalar stress and potential conflicts over arable land (Adler 1989; Crown, Orcutt, and Kohler 1996). Sustained population growth began during the tenth century and resulted in a continual decline in the amount of land per household, which reached its lowest levels in the Developmental period by AD 1200. If characterizations of initial aggregation as a density-dependent process are correct (as Kohler, Powers, and Orcutt [2004] have argued for the Pajarito Plateau), then these trends set the northern Rio Grande population on a trajectory toward aggregation in the tenth century, well before depopulation of the southern San Juan and then the northern San Juan region. Finally, when those regions were abandoned at the end of the thirteenth century, the most sparsely populated subregion in the northern Rio Grande with the most available land per household was the area south of La Bajada Mesa, not the northerly subregions. Although there was room for immigrants within the northern Rio Grande, especially in the ABQ-COH area, the population estimates presented here support other studies (Dickson 1975; Maxwell 1994) that suggest there is little need for immigration to explain northern Rio Grande demographic trends. Further, since these are conservative figures, reasonable adjustments could be made that would increase the population-size estimates and make immigration even less likely to have been a factor in population growth.

Material Culture and Cultural Identity

Material indicators of cultural identity have been both invoked and rejected in prevailing interpretations of the San Juan migrations. In some instances, the obvious presence of material-culture markers is used to identify northern San Juan site-unit intrusions in the southernmost part of the southern San Juan region and central New Mexico (e.g., Davis 1964; Lekson et al. 2002). On the other hand, the absence of such markers in the northern Rio Grande is explained, in part, by the "cascade of events" (Kohler et al. 2008:153) that led to overt San Juan material-culture traits being abandoned or lost through assimilation (Cordell 1979:103; Cordell 1995; Lipe, this vol.; Roney 1995:179). The former position suggests that we know where northern San Juan migrants went because we can see their material remains: the presence of evidence is the evidence of presence. The latter position suggests that even without material remains, we still know where they went, so the important question is why they looked so different when they got there: the absence of evidence is the evidence of presence, but in unpredictably changed form.

Clark (2007b) suggests that, rather than examining showy aspects of material culture that might express ethnicity, evidence of group membership should be sought in more mundane aspects of life, such as those that represent enculturation through behavioral training. These are deeply embedded characteristics that carry canonical information (*sensu* Rappaport 1979) about who you are and to what group you belong. In a study of Pueblo movement into the Hohokam area, Clark (2001) defined data sets that help distinguish immigrants from the indigenous population, including "domestic spatial organization, foodways, and embedded technological styles reflected in the nondecorative production steps of ceramic vessels, textiles, walls, domestic installations, and other nonutilitarian items" (Clark 2001:18). Domestic spatial organization was the most useful indicator, because "it reflects culturally specific aspects of social organization . . . and cosmology" (Clark 2001:41). By looking at how people built their houses, how they made pottery and textiles, what they ate, and how they organized their villages and homes, a better picture of similarities and differences between populations can be drawn. In many ways, this is what Lipe (2006) has done in defining "the San Juan pattern."

Architecture

Shared knowledge regarding architectural form, function, and construction practices—as well as the significance of objects and their spatial relationship—develops in the context of a particular cultural setting. Built space provides order to the world and serves as a medium for disseminating important information about social behavior, cultural identity, and worldview. Using built space to communicate, manipulate, and maintain social behavior is a well-documented worldwide phenomenon (Adler 1993; Eliade 1987, 1991; Hendon 2000; Ortiz 1972; Rapoport 1969). If we assume that the nonrandom distribution of architectural patterns is the result of continuous cultural processes disseminated through descent or residence, then long-term patterning combined with limited spatial extent is considered a traditional, cultural, or ethnic practice (Allison 1999; Hill 1970). Given its important role in society, architecture is an ideal artifact for examining cultural interaction, influence, and continuity (Gilman 1987).

Although intraregional variation is present, changing suites of architecture, settlement patterns, and ceramic styles within a broad San Juan tradition characterize the roughly two-hundred-year periods of the Pecos Classification (Kidder [1924] 1962). Aided by increasingly refined dating and environmental studies, changes in San Juan material remains are well ordered and reflect coherent patterns of adaptation. Northern Rio Grande patterns, although equally well ordered and coherent, are quite different. For instance, synchronic comparisons of northern Rio Grande and San Juan pit structures show that northern Rio Grande structures were unlike contemporaneous San Juan structures (Lakatos 2009, 2006; Moore 2009). Further, diachronic trends are distinct within each region, demonstrating continuities in architecture indicative of different cultural traditions.

The complex cultural trajectories defining the Basketmaker III period through the Pueblo II period in the San Juan regions are only superficially similar to those of the Developmental period in the northern Rio Grande. By AD 600, the familiar triad of pithouse architecture, pottery, and agriculture appeared in the Albuquerque area. This triad manifested itself differently in the northern Rio Grande than in the San Juan regions, however. The near-absence of surface architecture; the

absence of pit-structure antechambers and benches; the low frequencies of locally produced ceramics with high ratios of utility-to-decorated wares, each represented by a narrow range of vessel forms; and the low storage capacities reflecting relatively low levels of agricultural production define a distinct, incipient cultural trajectory in the northern Rio Grande (Lakatos and Post, in press).

In the late ninth and early tenth centuries, the northern Rio Grande population expanded north into the Santo Domingo basin, and then further north above La Bajada Mesa and into the Tewa basin (Lakatos 2007, this chapter). As population increased and expanded, surface architecture became more common and pit-structure form and orientation became more formalized, while remaining distinct from San Juan patterns (Lipe 2006). The northern Rio Grande hearth-ash pit-ventilator complex was frequently enhanced using an adobe collar and an unshaped stone, often categorized as a deflector. By the late eleventh century, this core feature complex was incorporated into some surface rooms and sometimes included an ash grinding stone or anvil (e.g., Boyer, Moore, and Lakatos 2001; Creamer and Haas 2003; Green 1976; Loose 1974). In addition to perpetuating the core feature complex, northern Rio Grande pit structures were consistently oriented to the east and southeast (Lakatos 2006), contrasting with the southern orientation of San Juan pit structures. By the late twelfth century, as regional climatic events coincided with population movements, settlement expanded north to the Taos Valley (Boyer 1997), still expressing the same regional architectural patterns (Lakatos 2007).

In each of these circumstances, northern Rio Grande populations expanded into new areas and maintained intrinsic architectural patterns, including ritual facilities (Lakatos 2007). By the late thirteenth century, enhancements to the core feature complex included prominent deflectors, sometimes decorated, and loom or screen supports. Other common patterns include east-facing kivas and surface roomblocks, and kiva features—including ventilators and roof supports—in some surface rooms (cf. Adler and Dick 1999; Allen 1971; Bussey 1968; Carlson, Linse, and Kohler 1990; Jeançon 1929; Kidder 1958; Schmidt 2007; Stubbs and Stallings 1953; Vickery 1969; Wetherington 1968; Worman 1967). Expression of these core features continued through the early twentieth century in Tewa villages, as shown by the presence of east-oriented

kivas with prominent hearth-ash pit-deflector complexes, which are sometimes incorporated into roomblocks (Arnon and Hill 1979:297; Edelman 1979:309; Edelman and Ortiz 1979; HABS/HAER 1934; Ortiz 1979:279; Speirs 1979:318; Stubbs 1950).

Two deviations from this long-term trajectory of northern Rio Grande continuity might reflect San Juan immigration or influence. First, pit structures in two Pajarito Plateau sites—Saltbush Pueblo and LA 12199 (Snow 1971; Zier 1982)—are reported to possess southern keyhole recesses and benches, which are iconic San Juan features. Although these features are evident in plan drawings, profiles show that the keyhole floors were well above pit-structure floors, at or near the elevations of nearby surface rooms. They also show that the benches were, in fact, narrow sills near the tops of pit-structure walls. If these architectural details indeed express San Juan cultural connections, they are rare, subtle, and not at all typical of such expressions in the San Juan regions. The two structures also contained ash pits, which are persistent northern Rio Grande features but are uncommon in San Juan structures after AD 1100. Interestingly, these same two sites also had higher frequencies of nonlocal white-ware types, such as Socorro Black-on-white (a middle Rio Grande type), and higher diversities in white-ware decoration motifs when compared to contemporaneous local sites of the same size (Kohler, VanBuskirk, and Ruscavage-Barz 2004). This supports the results of an earlier investigation in which Ruscavage-Barz (2002) found that paste differences in Santa Fe Black-on-white reflect household-level production, while design-element homogeneity suggests an inclusive social fabric with no evidence for ethnic or group differentiation.

The second deviation is that some Coalition- and Classic-period hamlets and villages have both south- and east-oriented pit structures (Adler 2007; Creamer 1993; Lange 1968; Smith 1998; Snow 1971, 1976; Zier 1982). Examples occur on the Pajarito Plateau and in the Rio Chama area, but most south-oriented structures appear in sites below La Bajada Mesa. The presence of south-oriented structures, standard at San Juan sites, persists in Keres village kivas today, and contrasts with the eastern orientations of northern Tiwa and Tewa kivas.

The significance of the prehistoric deviations from the dominant northern Rio Grande pattern is uncertain. They could represent accommodation of immigrants bearing San Juan concepts into larger indigenous

communities. If so, the influence was inconsistently expressed and temporally short lived, with the strongest expression in areas where sites are considered antecedent to historical Keres communities.

The architectural history of the northern Rio Grande reflects little direct evidence for the incorporation of San Juan immigrants, either during the early tenth century (Duff and Wilshusen 2000) or during the later depopulation of the San Juan regions (Smith 1998). The exception, based on population trends and architectural manifestations, is within the region occupied by historical Keres villages in the Rio Jemez and Rio Grande valleys south of La Bajada Mesa.

Community Organization

The late twelfth and early thirteenth centuries in the northern Rio Grande are marked by colonization of nonriverine uplands that were previously only lightly occupied, such as the Pajarito Plateau and the Galisteo basin. Changes in settlement pattern toward more nucleated communities are easily visible and documented in these areas; consequently, community studies have concentrated on sites dating to the Coalition and Classic periods (e.g., Kohler, ed., 2004; Ruscavage-Barz 1999; Snead 2008a). Definitive research on Developmental-period community development is harder to find (Adler 1993; Boyer 1994, 1995, 2000, 2002), leading to an implied linkage of northern Rio Grande community formation with archaeological concepts of aggregation and the timing of large-scale San Juan immigration. Yet, considering the persistent cultural patterning and population growth evident in the northern Rio Grande, we argue that understanding the trajectory of community organization in the late Developmental period is an essential prerequisite to interpreting later patterns of settlement and land use.

In fact, community studies in nonriverine or upland areas like the Pajarito Plateau and Galisteo basin are really examining communities that appeared "suddenly" in those areas. These bursts of Pueblo colonization have traditionally been considered a hallmark of wholesale San Juan immigration into the northern Rio Grande. Rarely are these aggregated communities considered to be the result of indigenous population growth, expansion, and occupation of previously unoccupied—though not unused—areas, a pattern characteristic of the preceding Developmental period (Lakatos 2003). Focusing studies on these

Coalition-period colony sites exaggerates evidence for the appearance of aggregated communities and marginalizes evidence for *in situ* processes of aggregated community development that actually began in lowland, riverine settings during the late Developmental period (e.g., Creamer and Haas 2003:35–36).

Excavated late Developmental-period sites typically include one or two pit structures, sometimes associated with a small surface structure, and a shallow midden (Boyer 1994; Lakatos 2006; and references therein). These units do not have the organizational regularity of San Juan Prudden Units, considered to be the fundamental component of larger Pueblo III communities in those regions (Lipe 2006; Lipe and Ortman 2000). Instead, Developmental-period residential sites might well be described as unpredictable in layout, and habitations occur as single units or in loose clusters of units sometimes referred to as communities (Anschuetz, Acklen, and Hill 1997; Cordell 1979; Wendorf and Reed 1955).

An oft-cited example of a site in the northern Rio Grande thought to resemble early San Juan communities is LA 835 in the southern Tewa basin (e.g., Anschuetz, Acklen, and Hill 1997; Ellis 1975). This site contains more than twenty "house groups" consisting of ten- to twenty-room surface units with associated pit structures, and a large pit structure sometimes referred to as a "great kiva" (Stubbs 1954; Wiseman 1995). Ceramic and tree-ring dates reflect occupation between about AD 900 and 1150, with overlapping or sequential rather than contemporary house-group occupations and probably only a small population associated with the "great kiva" (Wiseman 1995). This does not disqualify LA 835 as a community, but it does reinforce the notion that Developmental-period communities were dispersed even in cases where a possible integrative structure is present.

Although it can be difficult to establish actual contemporaneity within groups of late Developmental-period sites, evidence points to the existence of community integration before population aggregation and the construction of substantial villages (Lakatos 2007). For instance, studies of excavated pit structures in the Taos Valley show that about 20 to 25 percent contained unusual features and were treated atypically during construction, use, and abandonment (Adler 1993; Boyer 1995, 2000). Subsequent unpublished investigations in the Taos Valley

indicate that such structures could comprise as much as one-third of pit structures. The different forms and treatments were present during the entire 175-year length of the Developmental period in the Taos Valley (ca. AD 1050–1225), so the different forms and treatments are not temporal trends. Rather, Adler (1993) and Boyer (2000) suggest, these structures represent low-level integration (Adler's term) of small communities or subcommunity groups commonly referred to as hamlets.

Kosse's (1989), Kintigh's (1994), and Adler's (1994) research, following Johnson's (1979, 1982) model for social responses to scalar stress from population increase, suggest that hamlets typically contain six to twenty households. Using the preliminary population data (table 12.1), we can project the presence of eight to twenty-seven hamlets in the northern Rio Grande by AD 800, all located south of La Bajada Mesa. By AD 1000, the projected number of hamlets increased to 45 to 151, as the population expanded north to the Santa Fe River drainage and into the Tewa basin. Continued expansion pushed into the Taos Valley in the late eleventh century, and by AD 1200, the projected number of hamlets, now mostly north of La Bajada Mesa, was 88 to 294.

Based on population estimates and projected numbers of hamlets, we can suggest that northern Rio Grande households and hamlets were integrated into larger community groups. Adler's (1989:37) research suggests that villages whose residential and integrative structures are comparable in size to those of the Developmental period typically contain one hundred to two hundred people. Using these figures, we can project that the 88 to 294 hamlets in the northern Rio Grande by AD 1200 could have been further integrated into 53 to 106 village-level communities (table 12.1), reflecting 1.7 to 2.8 hamlets per village. Using that range, we can also project that pre–AD 800 hamlets were integrated into 4.7 to 9.5 (i.e., 5 to 10) villages, and AD 800–1000 hamlets into 26 to 54 villages. Combining conservative Developmental-period population numbers and archaeological models of structure and feature function with cross-cultural figures for community integration levels allows us to assert that numerous communities, integrated at different levels, existed throughout the northern Rio Grande well before the San Juan regions were depopulated. Since most northern Rio Grande communities were located north of La Bajada Mesa by AD 1200, they would have

presented social and physical impediments to large-group immigration into the northern subregions like the Tewa basin.

Integration of dispersed households, hamlets, and villages can be difficult to recognize by residential proximity because of problems with establishing site and structure contemporaneity. It can, however, be identified through the presence of facilities that reflect multihousehold integrative mechanisms (Adler 1993; Boyer 1995, 2000, 2002; Lakatos 2007). For instance, while Adler (1993) contends that no specialized ritual facilities existed in the Taos Valley during the Developmental period, Boyer (2000) disagrees, pointing to several sites having unusually large pit structures with anomalous features and treatments, and one site with a facility described as a "dance floor" (Loose 1974) Boyer's position is that these facilities represent integration of community groups that included multiple hamlets.

Boyer (2002) also argues that integrative facilities associated with northern Rio Grande groups are not represented exclusively by pit structures with unique suites of features. Instead, such structures may indicate, but do not define, extramural areas that served as integrative spaces. These "plazas without walls" (Boyer 2002) are consistent with the traditional Pueblo focus on center or middle places and the notion that structural locations are selected by the presence of the center place rather than vice versa (Swentzell 1988). In this light, kivas or proto-kivas are potential, but not necessary, features of center places. The important integrative feature is the space itself, since architecture does not define the plaza space (Swentzell 1988:16). Archaeologically, we may see this situation as groups of residential and other sites that represent either contemporaneous or, more likely, overlapping occupation of an area around or near that space. Recent investigations at one such complex in the southern Tewa basin (LA 388, LA 390, LA 391, and LA 3119) identified residential pit structures and surface architecture set around an area used repeatedly for human burial and other activities (Akins, Lakatos, and Boyer 2003; Boyer 2001, 2002; Boyer, Akins, and Badner 2002). We suspect that the LA 835 complex, discussed earlier, involves a similar situation, and that many such complexes of residential and community-center features characterize the Developmental period. Focusing investigation on architectural features, a common practice in the past, has likely hampered our ability to identify integrative space.

As the indigenous population of the northern Rio Grande grew during the Developmental period, community integrative mechanisms were established well before aggregation began in the Coalition period. The inception of plazas (center places), part-time ritual structures (residences/proto-kivas), and specialized ritual structures (kivas) occurred while residence patterns remained dispersed and relatively mobile. Population growth and integration set the context within which people began to aggregate during the late Developmental and Coalition periods in order to balance population and landscape resources, effectively creating more available landscape space by coalescing people. Over time, communities took the form of surface roomblocks adjacent to or surrounding a plaza (e.g., Hibben 1937; Kohler and Root 2004a, 2004b; Stubbs and Stallings 1953; Wetherington 1968; among many others). This form is not unique if we recognize that plazas—center places—were present within dispersed Developmental-period communities. Even in late Coalition and Classic-period aggregated communities, plazas were still not exclusively defined by surrounding architecture; rather, architecture was placed near and around the selected plaza space (Swentzell 1988).

Through integration of place, and perhaps social and economic management, numerous Pueblo communities existed in the northern Rio Grande before AD 1200, and their form and organization contrasts with San Juan communities. While archaeologists (most recently Moore 2009; see also Lipe and Ortman 2000; Ortman et al. 2000; Windes 2007) have noted that San Juan communities are often arranged in a street-like pattern, this is not the case for Developmental communities in the northern Rio Grande, which seem to be arranged around central, open spaces. San Juan communities are also often focused on monumental public architecture, which is clearly missing in the northern Rio Grande. While the large pit structure at LA 835 is sometimes cited as an example of monumental architecture, it is the only known feature of its type in the northern Rio Grande during the Developmental period, it is poorly described, and one example does not make a pattern. This structure may simply represent a short-lived experiment with new forms of community integration. Similar, later experiments may be represented by the large kivas at Arroyo Hondo Pueblo (Creamer 1993); at Pot Creek Pueblo, where the experiment was probably unsuccessful (Crown 1991; Wetherington 1968); and at Picuris Pueblo (Adler and Dick 1999).

Assemblage Structure

Technological aspects of artifact assemblages can provide information on cultural identity (Clark 2001, 2007). In addition to how things are made, the ways in which assemblages are structured—how new items or styles are added to an existing repertoire and what happens to older items and styles when new items or styles are added—may also be indicative of cultural identity. Differences between the structures of San Juan and northern Rio Grande pottery and projectile-point assemblages may contribute to definitions of cultural identity.

Wilson (2003) points out important differences between San Juan and northern Rio Grande ceramic traditions. These differences are reflected in assemblage composition and the acceptance of innovation in technology and style. The differences are well defined in each region through the twelfth century, and the unique qualities of the northern Rio Grande tradition persist well into the Classic period. San Juan pottery assemblages are structured and sequential; pottery types succeed and mostly replace one another, and pots were built in the same way at any one time. In contrast, northern Rio Grande assemblages are cumulative, with several styles and methods of vessel construction in use at any given time. San Juan assemblages from the tenth through thirteenth centuries generally contain 25 to 40 percent decorated wares and 60 to 75 percent utility wares. Contemporary northern Rio Grande collections contain only 5 to 6 percent decorated wares and 94 to 95 percent utility wares, with the decorated proportion increasing only to about 10 percent through the Coalition period.

The adoption of organic paint for white wares occurred differently in the two areas (Wilson 2003). This shift was gradual in the San Juan regions, beginning in the late eleventh century, but it was more abrupt in the northern Rio Grande, supplanting the use of mineral paint in most areas about AD 1150–1200. While that shift in the northern Rio Grande coincided with the initial occupation of new geographic areas and potters' exposure to new material resources, concurrent changes in decorative style are not apparent.

One type in particular, Galisteo Black-on-white, has been described as a Mesa Verde Black-on-white analog that indicates immigration from the northern San Juan (Cordell 1995; Roney 1995), despite contrary

indication from style and technology (Dutton 1964). Wilson's (2008) detailed study of pottery from Galisteo basin sites concluded that Galisteo Black-on-white is, in fact, an adaptation to locally available marine or geological clays rather than the riverine clays that were more commonly used in other parts of the northern Rio Grande. Consequently, its superficial resemblance to Mesa Verde Black-on-white is due to resource similarities rather than the cultural identity of the potters. In that context, the significance of similarities in decorative elements, such as rim ticking, cannot simply be ascribed to cultural identity, and Wilson (2008) contends that, stylistically, Galisteo Black-on-white is derived from Santa Fe Black-on-white. Other pottery types, such as Pindi and Rowe Black-on-white, have design styles similar to those of Santa Fe Black-on-white but differ in paste compositions. These types have simply been categorized as varieties of Santa Fe Black-on-white, with no reference to ethnic differences. There is, then, no clear reason to infer ethnic or cultural differences to the makers of Galisteo Black-on-white.

Moore's (in press) comparison of northern Rio Grande projectile-point assemblages with San Juan assemblages from Dolores (Phagan 1988), Salmon Ruin (Moore 1981), and Chaco Canyon (Lekson 1997) suggests differences equivalent to those observed in pottery: projectile-point styles in Developmental- and early Coalition-period assemblages were cumulative, while San Juan styles were essentially successional. That is, older styles in the northern Rio Grande were not abandoned, although they did decrease in use over time. In contrast, one or two styles generally dominate San Juan assemblages at any given time, with older styles occurring infrequently. This was particularly true at Salmon Ruin, where two types dominated during the early occupation. Although these types continued to be used into the later occupation, they were clearly being replaced by two other types (Moore 1981). Too few data are yet available to assess whether the cumulative northern Rio Grande pattern extends into the Classic period, but it does hold for the Coalition period in the Tewa basin (Moore 2009a).

The lack of any strong material-culture evidence for intrusive northern San Juan sites in the northern Rio Grande casts doubt on models that propose direct migration, especially since relatively clear evidence for thirteenth-century northern San Juan intrusions has been found along the Rio Puerco of the east, near Acoma, west of Mount Taylor,

and in central New Mexico near Magdalena and Truth or Consequences (Davis 1964; Lekson et al. 2002; Roney 1995). The intrusive nature of these sites is suggested by the dominant presence of northern San Juan ceramic assemblages in areas where those types were not formerly produced. The absence of similar cases in the northern Rio Grande suggests that northern San Juan movement into that region either did not occur or took different forms from those seen elsewhere.

Assertions of pre-existing, long-distance ties that established social pathways between northern San Juan and northern Rio Grande peoples in advance of migration (e.g., Cordell et al. 2007) need to be corrected. They rest first on general, panregional similarities in ceramic design styles. However, framed, banded, and geometric styles were widely distributed in the northern Southwest, and their presence in the northern Rio Grande was a horizon-style derivation from earlier local styles or, at most, was influenced by interaction with the southern San Juan pottery traditions during the Developmental period (Wilson 2008). The assertions also rest on the misperception that Galisteo Black-on-white was an analog of Mesa Verde Black-on-white. As Wilson (2003) has shown, however, Galisteo Black-on-white is best viewed as a late variety or derivative of Santa Fe Black-on-white. Although there is abundant evidence of pottery exchange connecting northern Rio Grande communities with populations in the middle Rio Grande Valley, Mogollon, Cibola, and southern San Juan regions (Frisbie 1967; Wiseman and Olinger 1991), there is little evidence for direct social or economic ties with the northern San Juan. Similarly, materials like turquoise and obsidian that almost certainly originated in the northern Rio Grande are rare on thirteenth-century northern San Juan sites (Lipe 1995:158) and probably reached those sites through down-the-line exchange, perhaps with southern San Juan communities serving as middlemen. Proposed direct socioeconomic connections between the northern San Juan and the northern Rio Grande populations also tend to ignore the presence of people in intermediate areas. For instance, the Gallina region, whose occupants were arguably ancestral Towa (Ford, Schroeder, and Peckham 1972; Reiter 1938; Wiseman 2007; but see Kulischek 2006; Simpson 2008), is characterized by minimal evidence for socioeconomic interactions with adjacent regions: "The stagnation of Gallina ceramic traits may be attributed to the low level of outside contacts, an idea supported

by the near absence of trade ceramics from neighboring regions in all but the southern Cuba district" (Simpson 2008:21; see also Cordell 1979:46).

Faunal and Human Indicators of Subsistence Practices

Subsistence practices in the northern Rio Grande differ from those in the San Juan, and these differences persist across the Developmental/Coalition threshold. For instance, although turkeys were domesticated early in all areas, they appear to have played a less significant role in the northern Rio Grande, where they were kept but probably not bred in the early Developmental-period (AD 600–900) sites at Peña Blanca. A large sample from early Developmental contexts yielded only 3.1 percent turkey bone and a single piece of egg shell, while turkey contributed 25.9 percent of a small Coalition-period sample that had no egg shell (Akins 2008a). Both bones and eggshell are rare in Pojoaque-area assemblages until late in the Developmental period, when the total is just more than 10 percent (Akins 2009). Even Coalition- and Classic-period Arroyo Hondo assemblages have relatively few turkey bones; only 8.6 percent of the overall minimum number of individuals (MNI) and 2.8 to 13.5 percent of the counts by time period were turkey (Lang and Harris 1984:154–176). Turkey makes up only 2.5 percent of late Coalition-period assemblages recovered from recent excavations at the Pueblo de Santa Fe (LA 1051), and only 3.6 percent of early Classic assemblages. These figures from sites compare to a range of 22.5 to 73.6 percent at Pueblo III sites in Montezuma Valley and Mesa Verde (Muir and Driver 2002:189), suggesting the northern Rio Grande—with a few exceptions, such as the late Coalition Burnt Mesa Pueblo Area 1 (Kohler and Root 2004b)—did not have the same level of turkey use as the northern San Juan into the Classic period.

While reliance on turkey was apparently minor, northern Rio Grande populations relied heavily on artiodactyls for animal protein, and more on wild resources in general (Akins 2009). Artiodactyl indices (a relative measure of artiodactyl to lagomorph counts) are consistently high in the northern Rio Grande. Late Developmental-period assemblages from the Pojoaque area have indices between 0.62 and 0.73; early Coalition-period LA 3333, in the eastern Galisteo basin, has an index of 0.86; and at Arroyo Hondo Pueblo, the index for the Coalition period

is 0.59, while the peak for the Classic period is 0.57. At the Pueblo de Santa Fe, the late Coalition index is 0.61, while the early Classic index is 0.65. These figures compare with indices between 0.20 and 0.48 from sites near Dolores, Colorado, and between 0.10 and 0.42 from sites in Chaco Canyon (Akins 2008a).

Differences between the northern Rio Grande and northern San Juan should be expected, regardless of population affiliation, given adaptations to differing environmental conditions and the influences of human population density on resource mix. Greater individual mobility within northern Rio Grande human populations is indicated by consistently more robust femur development than is seen in San Juan populations (Akins 1995, 2008b, 2008c), which suggests considerable travel, presumably to acquire wild resources, and may reflect subsistence adaptation to northern Rio Grande environmental diversity. Additionally, differences in female upper-body development (the muscles and bones used in corn grinding) indicate that northern Rio Grande populations were less involved in corn processing, supporting the possibility that they were also less reliant on intensive agriculture. Maximum humerus midshaft diameters among females from the La Plata area of northwestern New Mexico are larger than those of males from the same area, as well as those of females and males in the northern Rio Grande, regardless of time period (Akins 2008b, 2008c). While remains of agricultural plants—particularly corn—are consistently found at Pueblo sites in the northern Rio Grande, data from faunal assemblages and human skeletal remains suggest that the indigenous population was less reliant on agricultural production than were earlier and contemporaneous people in the San Juan regions.

Assessing Human Biometric Data

Immigration of significant numbers of people to the northern Rio Grande should be reflected by genetic differences in human skeletal remains, assuming populations in the donating and receiving regions remained sufficiently isolated from each other until immigration began. Cranial measurements have long been used to investigate relationships between Pueblo groups (e.g., Akins 1986; Corruccini 1972; Mackey 1977; Schillaci, Ozolins, and Windes 2001). In this volume, Ortman provides a cranial biometric argument that people from the central Mesa Verde

region were the genetic progenitors of the Tewa. In addition to genetic relatedness, Ortman argues, the Tewa population—which he believes to be derived from the northern San Juan—shows little significant mixture with other contemporary populations, while an earlier Tewa basin population and a Galisteo basin population show evidence of significant in-migration and genetic mixture.

Our review of the biometric data, however, suggests several potential problems with interpretations that link central Mesa Verde and historical Tewa populations. Our major concern is for the reliability, sensitivity, and appropriateness of the biometric data for this purpose. The data were generated by a number of people, from early researchers (e.g., Ernest A. Hooton, Alex Hrdlicka, and Erik K. Reed) to current researchers (e.g., Nancy J. Akins, Maria O. Smith, and Michael A. Schillaci). Analysts often view cranial landmarks differently, and even the same analyst using the same calipers will not always record the same measurement twice. Consequently, comparability and variability problems are inherent, and individual analyst procedures can create both false clustering and false differentiation of clusters. Grouping data from multiple sites and analysts to create larger data sets may be necessary for the regional scale of this endeavor, but the grouping process does not necessarily compensate for inherent comparability problems. We have more specific reservations about the use of estimates to compensate for missing data and the standardization of raw data to control for sexual dimorphism. None of these issues necessarily invalidates the results of the biometric analyses, but without explicit consideration of the variability of each population characterization, we are hesitant to embrace the conclusions of this analysis.

Small sample sizes almost always characterize Southwest craniometric studies. This is particularly true in the northern Rio Grande, where clayey soils often result in poor bone preservation. Crania that are complete enough for biometric studies often comprise a small portion of those recovered from specific contexts and, therefore, may or may not be representative of the population as a whole. For example, of the ninety-nine adults excavated from late Coalition-early Classic period Pindi and Arroyo Hondo Pueblos, only twenty-seven (27 percent) could be used in Ortman's study. The Galisteo basin sample (LA 3333) of six came from an early Coalition population of thirty-five adults

(17 percent) found in a frontier cultural setting in which associated material culture suggests the possibility of a heterogeneous community. Only three of eleven adults from LA 391 (27 percent), a late Developmental site that is most likely ancestral Tewa, could contribute to the Tewa basin sample. Small sample sizes coupled with variation in the number of complete crania in each sample raise the possibility of clustering effects in which a population may be inaccurately characterized because of an aberrant sample from a single component. This problem can be compounded by failing to account for temporal variation within and between samples.

Differences in the amount of missing data between samples may also influence the outcome of the biometric analyses. In Ortman's data set, one-third of the potential measurements are missing. Some populations have large numbers of individuals with valid measurements (less than 10 percent missing), while other data sets have up to 38 percent missing data. Ortman's derivation of substitute values through multivariate analyses within the combined sample is explicit and defensible, but the effects of value substitution on perceptions of similarity and difference are unknown. For the variables used in the *R* matrix principal-coordinates analysis (Ortman, this vol., fig. 10.1), substitute data characterize 10 percent or less of the northern Pajarito population, the two Galisteo basin populations, and the two Taos Valley populations. On the other hand, substitute data comprise 30 to 38 percent of the values for the southeastern Utah, McElmo, Mesa Verde, Navajo Reservoir (upper San Juan), Cibola, Chama, Cochiti, Albuquerque, and El Morro populations (the data discussed here were provided by Scott Ortman, personal communication, 2008). The impacts of the substitution procedure are unknown without demonstration that data sets with no missing values are statistically identical to data sets with substitute values. In any case, we expect that any effect will be differentially expressed, especially where large samples coincide with large frequencies of missing values and small samples coincide with few missing values.

Even if our misgivings about the data quality and multivariate procedures can be dispelled, we explicitly question the final interpretation that central Mesa Verde people genetically overwhelmed or displaced pre-existing populations of the Tewa and Galisteo basins. While we expect that genetic similarity and continuity would result in biometric

similarity, biometric similarity alone need not reflect genetic relatedness and must be assessed in light of other evidence. Biometric analyses of this sort actually measure statistical closeness of populations—however they are defined—rather than genetic relatedness per se. Therefore, the way in which populations are defined for analytical purposes becomes a critical point, since it creates the bridging argument for correlating statistical closeness with genetic relatedness. For instance, table 10.1 in this volume suggests that the Mesa Verde sample is closer to Jemez than to the northern Pajarito or Galisteo groups, and that the northern Pajarito and Chama populations are closest to Cibola (Zuni). Strong or exclusive relationships between these particular populations are improbable in a cultural-historical sense, despite the proposed biometric similarity. Given the scarcity of supporting archaeological data and ethnohistorical information, we likewise suspect that the proposed biometric similarity between Mesa Verde and Tewa-basin populations has no underlying genetic basis. While we are somewhat surprised that the Taos Valley, Tewa basin, and Galisteo basin populations all look distinct in the biometric analyses, we note that these populations are represented by the smallest sample sizes and have unusually low numbers of missing data values. These circumstances may also be influencing the perception of similarity and dissimilarity.

In keeping with other data presented in this chapter, our perspective emphasizes *in situ* development, with selected and restricted genetic admixture from multiple outside populations (principally southern San Juan, middle Rio Grande, Plains, and perhaps some northern San Juan). We point out, as well, that we are not the first to suggest in situ development of the Tewa Pueblos based on biometric evidence. Schillaci and others' biometric analysis concluded, "The Mesa Verde sample . . . appeared as an outlier in all of our analyses and there is no direct evidence of a site unit intrusion into the Rio Grande area by San Juan/Four Corners groups" (2001:143). Despite Ortman's reliance on much of Schillaci's data, the substantial differences in analytical results and conclusions probably reflect differences in how the data were grouped and analyzed, as well as the much larger scope of Ortman's study. The data and analytic issues must be resolved before we can comfortably accept biometric arguments for direct genetic connections between northern San Juan and Tewa populations.

Pathways to the Northern Rio Grande

Although we have argued for a strong, indigenous Pueblo cultural trajectory and a lack of evidence favoring conventional models of substantial, direct northern San Juan migration into the northern Rio Grande, we believe that immigration did occur as corporate groups or communities moved in from the southern San Juan. Following the disruption of southern San Juan communities in the late twelfth century, these groups—arguably ancestral Keres—moved through the Rio Puerco and Rio Jemez valleys onto the southern Pajarito Plateau and into the Santo Domingo basin in the thirteenth century. Support for this model includes evidence for continuous contact between inhabitants of the southern San Juan and northern Rio Grande, as well as an archaeological record of site-unit intrusions, adaptations, and assimilation in the middle Rio Puerco and Rio Jemez valleys (Moore 2008; Roney 1995), and by the distribution of historical northern Rio Grande language and culture groups.

Moore (2008) presents a model suggesting that southern San Juan migration to the northern Rio Grande was punctuated rather than direct, using communities along the southeast edge of the San Juan basin as springboards. Socioeconomic ties, evidenced by movement of pottery and turquoise, existed between the southern San Juan and northern Rio Grande regions from the early Developmental to the Coalition period and may have established familiarity that prepared the way for later population movement. It is worth noting that these ties stopped short of the embrace of Chacoan architectural (religious) styles by Rio Grande populations.

Ceramic assemblages from the Rio Puerco Valley along the southeast edge of the southern San Juan show considerable influence from the northern Rio Grande after the mid-twelfth century. The result was ceramic styles that were technologically southern San Juan but stylistically northern Rio Grande (Bice 1994; Bice, Davis, and Sundt 1998; Hurst 2003). People moved east from the Rio Puerco into the Rio Jemez drainage by the late twelfth century, and they eventually spread to the lower Rio Jemez Valley and onto the southern Pajarito Plateau. Three southern Pajarito sites—Casa del Rito (LA 3852; Kohler and Root 2004a), Saltbush Pueblo (LA 4997; Snow 1971), and LA 12199 (Zier 1982)—exhibit

characteristics indicative of this movement. As noted earlier, northern Rio Grande and nonlocal pottery types (interestingly, mostly from the middle Rio Grande rather than the southern San Juan) are present and exhibit a wider range of design styles than those at indigenous sites (Kohler, VanBuskirk, and Ruscavage-Barz 2004), while village layouts and kiva forms appear to exhibit some southern San Juan characteristics.

The role of northern San Juan immigrants in this model is unclear. The late thirteenth-century period of northern San Juan depopulation (Varien et al. 2007) postdates the initiation of southern San Juan movement into the Rio Jemez Valley, so northern San Juan immigrants would have moved into or through southern San Juan communities—a scenario that would have promoted assimilation rather than site-unit intrusion. Probable northern San Juan site-unit intrusions in the Rio Puerco Valley, such as that at Guadalupe Ruin (Pippin 1987), are often defensive in location and form, with evidence suggesting conflict with Gallina populations and with Rio Puerco-Jemez southern San Juan communities. Some northern San Juan communities clearly moved to the south as corporate groups, bypassing the northern Rio Grande altogether (Davis 1964; Lekson et al. 2002; Roney 1995). Other northern San Juan communities may have become fragmented into family groups. If these groups eventually entered the northern Rio Grande, they did so by assimilating into southern San Juan or northern Rio Grande communities and have not been identified archaeologically.

Sharp contrasts between Moore's model and conventional models for thirteenth-century population movements lie in their differing implications for the linguistic history of Puebloan peoples. Ortman (2007, this vol.) explicitly links northern San Juan populations with the Tewa speech community. Moore's model accommodates the likelihood that both northern and southern San Juan populations were ancestral Keres speakers. If northern San Juan migrants were part of the Keres speech community (as is assumed for the southern San Juan peoples), it would have facilitated their thirteenth-century integration into already established and acculturated Keres communities in the Rio Puerco and Rio Jemez drainages, on the southern Pajarito Plateau, and in the Santo Domingo basin. Northern San Juan migrants who overshot access through the Rio Jemez corridor would have found themselves in a culturally and linguistically distinct landscape, resulting in a high degree of

visibility for as long as they persisted as distinct communities (e.g., Lekson et al. 2002). Such northern San Juan migrant communities would have become analogous in visibility and cultural status to the Kayenta migrant communities in southern Arizona (Lyons 2003). To date, none have been found in the northern Rio Grande.

What Next? Directions for Further Research

The perspective on indigenous development in the northern Rio Grande presented in this chapter is an effort to shift the focus of research on immigration into the northern Rio Grande from the donating to the presumed receiving side. The need for that shift is great, since existing migration models do not involve accurate characterizations of northern Rio Grande archaeological and ethnohistorical records. We are not proposing a specific receiving-side model (e.g., Cordell 1995) with which to view immigration to the northern Rio Grande (although see Moore 2008). Instead, we are confident that additional work will validate the perspective presented in this chapter, and will allow researchers to develop and assess a variety of models for northern Rio Grande cultural development, the deep origins of the distinct ethnic identities of Tanoan and Keres peoples, and patterns of interaction between the people who held and still hold those deeply distinct identities.

Anthony (1990:895) states that archaeological examinations of migration are often unproductive because of inappropriate assumptions and inadequately defined concepts regarding the conditions under which migrations occur. We assert this to be the case in most models alleging substantial, direct movement from the northern San Juan into the northern Rio Grande. We are particularly concerned that those models do not give significant consideration to the archaeological records of regions between the northern San Juan and the northern Rio Grande, which is necessary to identify the directions of migratory movement, the sizes and natures of migrating groups, and the potential formal variety of migratory movement—short- versus long-distance movement, leapfrogging, migration streams, short-term return migration, etc. (Anthony 1990). Equally as important, they do not consider existing conditions in the northern Rio Grande that would have been impacted by significant immigration, what those impacts might have been, and how they would

have been expressed archaeologically and ethnohistorically (Cordell 1995). It is with this perspective in mind that we can ask what the archaeological records of the presumed donating side, the intermediate areas, and the potential receiving sides tell us about issues of site-unit intrusion, socioeconomic ripples, family vs. village-coordinated movement, punctuated movement, and other possible scenarios (Cordell 1995; Duff and Wilshusen 2000; Haury 1958; Moore 2008; Roney 1995).

Identifying migration archaeologically relies on chronological correlations between donating and receiving sides (Haury 1958), and modeling the northern Rio Grande role in Southwest-wide migrations requires a more precise chronometric framework for both intraregional and interregional comparisons. Although a goal should be to characterize the archaeological record in the northern Rio Grande during periods of regional population movements, such as the tenth, late twelfth, and late thirteenth-early fourteenth centuries, we hope we have made the point that understanding social and demographic dynamics in the preceding, intervening, and subsequent periods is just as important.

Systematic development of a conservative, comprehensive population reconstruction provides a demographic context against which to assess the implications of immigration. The reconstruction presented here is a first step in that process. Like reconstructions produced by Dean, Doelle, and Orcutt (1994), Crown, Orcutt, and Kohler (1996), and Duff and Wilshusen (2000), our effort lacks the finer detail emerging from the northern San Juan (Ortman Varien, and Gripp 2007; Varien et al. 2007). This situation is attributable to the pervasive use of period- and phase-based chronologies in the northern Rio Grande, and better demographic reconstructions will require both new chronological tools and a reassessment of chronological goals. Nonetheless, our reconstruction provides a vastly improved baseline for assessing intraregional population trends during the Developmental period and for projecting them into the Coalition and Classic periods. Those trends provide the backdrop for identifying and assessing population influxes from other regions.

Additional studies of human remains from the northern Rio Grande are needed to assess health, fecundity and morbidity, patterns of movement/settlement, and dietary reliance on domestic versus collected food. Those data can then be compared with similar data from

the San Juan regions to evaluate biological, dietary, and settlement similarities and differences. Although we question the validity of aggregated craniometric studies, we affirm that biometric analyses, discrete traits, tooth morphology, adaptive physiological responses, and isotope analyses have much to contribute to questions of population affiliations and migration models.

Paleoenvironmental reconstructions for the northern Rio Grande do not always agree on the nature and timing of climatic events and trends (cf. Allen 2004; Cordell et al. 2007; Dean, Doelle, and Orcutt 1994; Maxwell 2000; Orcutt 1999; Rose, Dean, and Robinson 1981). A carefully constructed synthesis of northern Rio Grande paleoenvironmental records, including subregional variation, is therefore necessary, and will place us in a much stronger position to assess push-pull factors involved in both intra- and interregional population movements. It appears, for instance, that subregional climatic variation allowed population expansion into nonriverine and upland settings, and may subsequently have made those same areas untenable for large populations dependent on intensive agriculture (Blinman 2007). We note, however, that Anthony (1990:898) questions the utility of push-pull notions for several reasons, not the least of which is that "the causes of migratory movement can be extremely complex, so that in many prehistoric cases it is likely that the proximate causes can no longer be identified." It may be, then, that even if reconstructions of conditions in presumed donating and receiving regions suggest complementary paleoenvironmental circumstances (Ahlstrom, Van West, and Dean 1995; Cordell et al. 2007), they do not reveal the actual causes of migration or the locations and conditions of resettlement.

A critical aspect of modeling immigration is the ethnic characterization of proposed immigrants and indigenous peoples. This is perhaps the most difficult problem to address archaeologically. Recent advances in the theory and method of ethnic assessments (Clark 2001, 2007a) are only now being applied, and Wilson's systematic assessment of Galisteo Black-on-white is a positive example. We expect to find more regionally unique connections between the formal, informal, and technological aspects of indigenous Pueblo culture in the northern Rio Grande (Lakatos and Post, in press), which should allow stronger comparisons with immigrant families, communities, and populations.

Relationships between archaeology, ethnohistory, and ethnography need to be critically examined. Recognizing the problems inherent in historical linguistics, glottochronology, and lexicostatistics, it nonetheless remains imperative that Tanoan language histories be compared with events represented in the archaeological record of the northern Rio Grande in order to address different models for the origins and divergences of the Tanoan languages. The possibility that Tewa diverged from Tiwa around AD 1000, an idea posited by Davis (1959) and Trager (1967) and supported by Ortman (this vol.), appears to us to fit well with patterns of indigenous population growth and expansion in the late Developmental period (contra Ortman, this vol.). Additionally, we suspect that in situ development of Tewa language and culture from the indigenous Tanoan base encouraged the divergence of Tiwa language groups by forming an impediment, reinforced by Keresan immigration beginning in the thirteenth century, to maintaining continuity in Tiwa language and culture. This is Peckham's position in Ford, Schroeder, and Peckham (1972), and it contrasts with Ford's and Schroeder's positions in that paper, which argue for what one might call a "parting of the Tiwa sea" by immigrating Tewa speakers. These potential relationships need to be rigorously examined chronologically and in comparison with paleoenvironmental conditions.

A related example of exploring relationships between archaeology, ethnography, and ethnohistory involves the interplay between trajectories of social organizational change and population growth. Moore and Boyer (2009) have shown how the Tewa seasonal moieties could have developed as an in situ Tanoan social organizational response to internal population growth and a combination of natural and sociocultural limits on population expansion and community fissioning. Importantly, Moore and Boyer's model acknowledges the effects of Keresan immigration into the northern Rio Grande in the thirteenth century. The presence of Keresans on the southern Pajarito Plateau, in the Rio Jemez Valley, and in the Rio Grande Valley south of La Bajada Mesa enhanced the inability of Tewa-basin occupants to really expand their growing population and thereby relieve resource stress. One result was the formation of very large villages and the restructuring of integration mechanisms, including the formation of the seasonal moieties. We suggest that this process was but one manifestation of diversifying trajectories within

in situ Tanoan cultural development that began in the late Developmental period—the emerging Tiwa-Tewa split—and were reinforced in subsequent centuries.

While we are confident in our "indigenous perspective" on northern Rio Grande Tanoan cultural development, we are also mindful that continuing research will reveal more evidence of the impacts of panregional Puebloan "turbulence" (*sensu* Lipe 1995) in the region. Cordell's (1995) argument for rippling socioeconomic change is important in this regard, as is Ware and Blinman's (2000) consideration of ritual exchange dynamics between Keres and Tanoan communities.

Finally, recorded Pueblo origin stories must be studied within the contexts of relationships between worldview, history, and mythology. Uncritical or narrowly selective references to origin stories or anthropological interpretations of those stories encourage their inappropriate use. Acknowledging Cordell's (1995:204) warning against using such stories as "unambiguous guides" for interpreting the archaeological record, they can, nonetheless, provide important information about the development of cultural similarity and diversity, intra- and interregional presence and movement of peoples, and perceptions and even definitions of cultural and ethnic identity. That potential will only be realized if we understand that these stories embody different lessons for us than they do for Pueblo peoples, and if we apply methodologies that appropriately relate myth to critical observation (e.g., Barber and Barber 2004; Basso 1996; Boyer 2008).

Conclusions

The archaeology of the northern Rio Grande has traditionally played a passive role in modeling the depopulation of the San Juan regions. While historical clustering of Pueblo peoples suggests an end point for migration, details of northern Rio Grande archaeology, both before and after the migration period, have been underutilized or ignored when developing conventional, donation-side models.

The long tradition of Pueblo cultural development in the northern Rio Grande was quite different from that of the Four Corners. We assert that these trajectories show that the groups living in these areas developed and maintained different cultural identities that were not masked by events in the late thirteenth century.

Historically proffered evidence for direct movement from the northern San Juan is unsupported in light of the material evidence and the weight of data showing northern Rio Grande cultural continuity from the Developmental period through the present. Rather than a nearly empty landscape, the northern Rio Grande was home to a substantial, growing, and expanding indigenous population before the fourteenth century. Occupied by people with distinct material culture, subsistence patterns, and organizational structures, dispersed late Developmental-period villages approached the transition to aggregated communities well before the San Juan regions were abandoned. These patterns represented a response to local conditions and pressures rather than a reaction to immigrants.

Our population reconstruction suggests that immigration was not an essential element of pre–AD 1300 population trends in the northern Rio Grande. This is particularly true for the subregions north of La Bajada Mesa that had substantial and growing populations, while the subregion to the south was the only area available to accommodate substantial immigrant groups. Continuity in architectural forms and features and community organization make it likely that modern Tewa and Tiwa peoples are descended from the indigenous northern Rio Grande population present since at least the Developmental period. Climate change, the oft-considered motivating context for twelfth- and thirteenth-century population movements from the San Juan regions, appears to have encouraged internal movements within the northern Rio Grande as new areas were opened for agricultural settlement (Blinman 2007; Kohler, ed., 2004). Galisteo Black-on-white pottery, frequently cited as evidence for northern San Juan immigration, actually represents a local response to resources in a newly occupied area. Finally, recently proposed human craniometric evidence equating northern San Juan people with the Tewa is problematic because of weaknesses in sampling methodology and the lack of corroborating archaeological and ethnohistorical data.

We do not assert that people from the northern San Juan did not find their way to the northern Rio Grande. Rather, the archaeological evidence suggests that, if northern San Juan immigrants did enter the northern Rio Grande, they did so in groups, probably small in size, that were quickly assimilated and disappeared into existing communities. We suspect that assimilation was made easier because people leaving the

northern San Juan were ancestral Keres and entered southern San Juan Keres communities.

While we see no evidence for direct northern San Juan immigration, there is strong evidence for sustained southern San Juan interaction and punctuated immigration along the western fringe of the northern Rio Grande beginning in the late twelfth century. Archaeological evidence from that area reflects transitional cultural and settlement patterns for southern San Juan peoples, and their entry into the northern Rio Grande began well before the northern San Juan was abandoned. Movement through the Rio Puerco and Rio Jemez led to the region between Albuquerque and Cochiti, which coincidentally held the lowest indigenous population and the most available land around AD 1200 and therefore presented the greatest opportunity for successful establishment of immigrant villages. It is also the location of the eastern Keres Pueblos, which retain street-like layouts and southern-oriented kivas (Stubbs 1950) strikingly similar to late Pueblo III villages in the San Juan regions (Lipe and Ortman 2000; Ortman et al. 2000; Windes 2007).

We applaud efforts to solve the problems of northern San Juan depopulation. But the lack of evidence supporting large-scale, direct movement from the northern San Juan to the northern Rio Grande is rarely addressed substantively by models that simply assume this movement occurred. Explaining this lack of evidence should be a major consideration in such models. We contend that framing relevant questions about northern San Juan migrations involves accurately describing the sizes and constituents of northern San Juan groups as they left that region (e.g., assessing the implications of Kuckelman's research presented in this vol.). It also entails identifying the circumstances in which such groups could move into new regions with unfamiliar resource structures and with substantial existing populations, some perhaps culturally related and others probably not (e.g., Anthony 1990:902–905). More rigorous models that accurately incorporate the archaeological and ethnohistorical records of proposed receiving regions, and that formulate and test relevant criteria for identifying immigrant population groups of varying sizes in different regions and circumstances, must be developed. Finally, we suggest that studies of this phenomenon must look closely at intermediate areas that would have been traversed by immigrants as the foci of initial immigration.

Tracking where Pueblo people went as they left the Four Corners is important for understanding events and processes occurring throughout the northern Southwest after AD 1250. Archaeologists have long found intellectual comfort in knowing that those people went to the areas most heavily occupied after AD 1300. Nonetheless, continuing research does not support most models that make the northern Rio Grande receive this thirteenth-century immigration. We need to examine the whole picture, including intermediate regions and the donating and presumed receiving sides, to better understand the dynamics of prehistoric population movements.

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NANCY J. AKINS is an archaeologist and director of the osteological laboratory for the Office of Archaeological Studies in Santa Fe. Her work has primarily been in the middle and upper Rio Grande and Chaco Canyon and includes both field investigations and laboratory analysis. Her interests include applying bioarchaeological and zooarchaeological data to broader issues relating to social organization, mobility, and subsistence.

JAMES R. ALLISON is an assistant professor in the Department of Anthropology at Brigham Young University. He received his PhD from Arizona State University in 2000. His primary research interests are the small-scale societies of the northern Southwest, quantitative methods, ceramic analysis, and archaeological theory, and he has conducted archaeological research in northern Utah, the Virgin region, and the Four Corners area.

LARRY V. BENSON is a senior scientist with the National Research Program of the U.S. Geological Survey and is chief of the Arid Regions Climate Project. Much of his research is focused on the creation of records of past climate change, including lake-sediment-based records of change in the hydrologic balances of Great Basin surface-water systems. His research also includes cosmogenic dating of glacial features

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MICHAEL S. BERRY completed the requirements for a PhD in anthropology from the University of Utah in 1980. Throughout the 1980s and 1990s, he held positions as a database programmer and network-systems engineer, working primarily with Fortune 500 companies. He is currently regional archeologist for the Bureau of Reclamation in Salt Lake City, Utah.

ERIC BLINMAN is director of the Office of Archaeological Studies at the Museum of New Mexico, New Mexico Department of Cultural Affairs. He received his MA and PhD in anthropology from Washington State University after completing his undergraduate degree at the University of California, Berkeley. His interests include ceramic and textile technologies of the Southwest, archaeomagnetic dating, past environmental change, and the social history of Puebloan peoples. Eric has authored or coauthored more than 150 articles, book chapters, reviews, contract reports, and professional papers. In 2007, he participated in a colloquium on Past Climate Change: Human Survival Strategies that was convened by King Carl XVI Gustaf of Sweden in Narsaq, Greenland. He serves as an outside member of several graduate committees at the University of New Mexico, and he is an instructor in Native American studies for Colgate University's Santa Fe Study Group. He has also authored or coauthored nine popular articles and delivers between fifteen and twenty-five public presentations or demonstrations each year as part of the Education Outreach Program of the Office of Archaeological Studies.

JEFFREY L. BOYER grew up with an historian in Taos, New Mexico, and had little choice but to go into some profession that studies the past. Between 1982 and 1987, he was curator of anthropology and director of the Contract Archaeology Program for what was then the Kit Carson Memorial Foundation, an historic preservation institution and public museum in north-central New Mexico. Since 1987, he has been

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CATHERINE M. CAMERON is professor in the Department of Anthropology at the University of Colorado. She works in the northern American Southwest, especially on the Chaco and post-Chaco eras (AD 900–1300). Her research interests include migration, understanding the evolution of complex societies through the study of regional social and political systems, methods for identifying social boundaries in the past, and prehistoric architecture. Since 1995, she has worked in southeastern Utah at the Bluff Great House, a Chacoan site, and in nearby Comb Wash, publishing a monograph on this research in 2009 (*Chaco and After in the Northern San Juan*, University of Arizona Press). She also studies captives in prehistory, especially their role in cultural transmission. She published an edited volume on this topic in 2008 (*Invisible Citizens, Captives and Their Consequences*, University of Utah Press). She has coedited the *Journal of Archaeological Method and Theory* since 2000.

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ANDREW I. DUFF is an associate professor of anthropology at Washington State University. He earned his MA (1993) and PhD (1999) in anthropology at Arizona State University, pursuing interests in transitions in southwestern social and community organization. He served as project director for the Shields Pueblo excavation project from 1998 to 2001 while at Crow Canyon Archaeological Center. This project sought to better understand the nature and timing of aggregation into community centers and the impact populations had on their surrounding natural environment, the topic of his coauthored contribution to this volume. Since 2002, he has been exploring many of these same questions in the context of Chacoan-period communities along the southern frontier of the Chacoan regional system. Recent publications include "Becoming Central, Organizational Transformations in the Emergence of Zuni" (with Gregson Schachner, in *Hinterlands and Regional Dynamics in the Ancient Southwest*, edited by Alan Sullivan and James Bayman, University of Arizona Press, 2007) and "History and Process in Village Formation: Context and Contrasts from the Northern Southwest" (with Catherine Cameron, *American Antiquity* vol. 73, 2008).

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J. BRETT HILL received his PhD from Arizona State University in 2002 and is currently a research associate at the Center for Desert Archaeology and assistant professor at Hendrix College in Conway, Arkansas. He has participated in research projects in the American Southwest, the Near East, and Europe; and his current interests focus on human ecology in desert environments since the transition to agricultural economies. He is involved with multiple ongoing projects in Arizona, New Mexico, and Jordan using large archaeological databases and geographic information systems to study demography and human impacts on ancient environments at regional scales.

TIMOTHY A. KOHLER is a regents' professor in the Department of Anthropology at Washington State University, Pullman, and the senior principle investigator on the Village Ecodynamics Project. Although he started his professional career as a southeasternist after receiving his PhD from the University of Florida in 1978, for the past thirty years he has been working on problems of historical ecology, cooperation, and conflict, often with a modeling bent, in the U.S. Southwest. He is an external professor at the Santa Fe Institute, a research associate at Crow Canyon Archaeological Center, and edited *American Antiquity* from 2000 to 2004. He is interested in socionatural processes in Neolithic societies around the world.

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