SOUTHWESTERN INTERLUDES

PAPERS IN HONOR

Charlotte J. and Theodore R. Frisbie

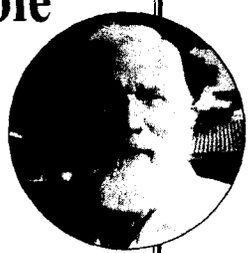

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TABLE OF CONTENTS

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THE CHANGING CONTEXTS OF WARFARE IN THE NORTH AMERICAN SOUTHWEST, A. D. 1200-1700

Since the nineteenth century, observers of the archaeological record in the North American Southwest have repeatedly and persistently postulated one or another kind of warfare to account for the relationships they have seen, but until recently such hypotheses have been met with general skepticism. The accumulation of data over the last 150 years, however, has now reached a stage where it is possible to demonstrate patterns in the archaeological record that are not so easily dismissed. A recent book by Steven LeBlanc (1999) proposes three broad periods during which the contexts and nature of warfare in the Southwest were different, and offers environmentally based explanations for violence or the lack of it. This model is critically examined here, and new ways to model prehistoric warfare are proposed, together with new ways to test hypotheses derived from alternative models. The changing contexts of Southwestern warfare are examined using the newly constructed Coalescent Communities Database, which includes all known sites greater than 12 rooms in the North American Southwest for the period A.D. 1200 to 1700.

How do things come to be as they are? Why are some archaeologists persuaded that warfare was an important process in the past and others not? One answer may be methodological, a matter of different standards of proof, or different conceptions of explanation. Nearly 30 years ago, after being elected as graduate-student representative to the Arizona Archaeological and Historical Society (AAHS), Wilcox found himself in a situation that changed his mind about warfare in the Southwest. The then President of AAHS, Stephen Larson, had published a paper (Larson 1972) about a site in Tucson called Tumamoc Hill, arguing that it was a defensive refuge. Owned by the University of Arizona, the site was threatened by further development of various facilities. It was decided to organize an all volunteer AAHS committee to conduct a systematic study of cultural resources on or near Tumamoc Hill and to publish the results. This did indeed happen, and, after every Sunday morning for two academic years was spent collecting data, the results of the Tumamoc Hill survey were compiled and published (in a whole issue of *Kiva*, 1979, 45[1-2]).

While others chose as their focus rock art, agricultural features, trails, or the stone circles on top, Wilcox decided to examine the dry-laid walls known as trincheras and to attempt a test Larson's warfare hypothesis. His approach was empirical and hypothetical-deductive, but also historical and comparative with a considerable respect for R. G. Collingwood's (1939) emphasis on the difference between questions and answers, and T. C. Chamberlin's (1965) cautions about using "multiple working hypotheses." For example, why were they present where we found them (and not elsewhere), and how had they come to be "deposited" as we found them (see Clarke 1973)? Wilcox systematically measured relational attributes of the walls, finding that they generally were crude revet-

ments only about 50 cm high or less at the top. His conclusion was not that the walls had been built high and then fallen down, but that their revetment character was an original design feature. This is in contrast to the standing walls at the nearby Black Mountain site (Fontana et al. 1959). After postulating all the alternative hypotheses he could imagine, Wilcox (1979) systematically tested them against the data and concluded that the warfare hypothesis best fit the facts as we then knew them.

Since then further research on Tumamoc Hill by Paul and Suzanne Fish and their students has produced new data that show, for example, that the stone circles on top are habitations dating to the Early Ceramic period (Wallace et al. 1995), and that the trincheras walls probably were built at that time as well (Fish et al. 1986; Paul Fish, personal communication 2002). Arguments that the trincheras were built to form agricultural terraces, however (Downum 1993; Downum et al. 1994; Fish et al. 1984), are weak, and the walls' defensive properties still seem the most likely reason for their construction (Wilcox et al. 2001a). Just as the walls are still in place today, in the A.D. 1100s and 1200s they would have been available to villagers living near the foot of the hill as the boundary walls of a defensive refuge, the logical implications of which Wilcox (1979) discussed. Those warfare implications were intended to show that if the hypothesis was to stand, the claim made about an individual site also needed to be examined in larger local and regional contexts where, if it were true, other supporting facts should be forthcoming.

The Tumamoc Hill episode fit well into Wilcox's larger research agenda for Southwestern archaeology. He wanted to study it as a whole (Wilcox 2005a). His first gambit was to survey what was known about the entry of Athapaskan speakers into the Southwest (Wilcox 1981a). He found that the structure of discourse about this issue defined a matrix of alternative routes and times of entry in which the probabilities of each matrix position could be evaluated by assembling (in the ideal) all data discovered in the 150 years since William Turner (1852) first initiated this avenue of anthropological inquiry. Working on the scale of the whole American Far West, Wilcox (1981a) proceeded to argue that the then current data best supported a late time of entry and a high Plains route (Kehoe 1973). On that foundation he erected a cultural-ecological model that included a series of testable hypotheses about the historical process of Athapaskan migrations to the southern Plains and then the Southwest.[1] Once they were in the southern Plains as dog-nomads having exchange relations with the Plains-edge Pueblos (see also Wilcox 1984, 1988), he proposed that it was by making other arrangements with interior Pueblos that the early Apacheans entered the Southwest where they provided hinterland products to the Pueblos in exchange for maize and textiles—just as the Querecho near Acoma were described as doing by the Spaniard Espejo in 1583 (Hammond and Rey 1966). Once the Spanish colony was established in New Mexico, and the Spaniards began manipulating all Pueblo economic and political systems, the early Apacheans living near the Pueblos, Wilcox (1981a) argued, found it expedient to move westward into what were then wilderness zones beyond the reach of the Spanish state. This may have happened, he thought (Wilcox 1981a:230), as early as the 1620s or later (but see Schaafsma 1981, 1999).[2]

Wilcox's Athapaskan model portrays the people that A. V. Kidder (1924) and others saw as "enemy peoples" responsible for causing Puebloan aggregation or abandonment in an alternative manner: they moved peacefully into the Southwest via negotiation with the Pueblos. Recent research in the northern San Juan in or near the Dinetah area of Navajo ethnogenesis in the eighteenth century now has established several dates in the 1620s, and

one excellent tree-ring cluster dating to the spring of 1541 (Hancock 1997). The latter date from LA55979 anchors the concept of an "early Dinetah phase" dating from A.D. 1450 to 1620 (Dykeman 2003; Marshall 1995). While more work is needed, Wilcox is now inclined to think that these data blow a big hole in his peaceful-entry model and require rethinking of the economic and political impacts on local populations where and when the early Apacheans came into the Southwest (see Aschmann 1970).

Wilcox's second gambit to study Southwestern archaeology as a whole was to define the Protohistoric Period from A.D. 1450 to 1700, arguing that it was a time of fundamental changes in Southwestern society and culture that intervened between the "ethnographic present" and the prehistoric past (Wilcox and Masse 1981). Thus nearly all use of ethnographic analogy as a means of inferring past behavior was suspect. What was required was a serious effort to construct "independent archaeological theory" whose propositions were testable using observations of the archaeological record. Relations observable in that record were key in this research program, a point he has repeatedly illustrated and reiterated in subsequent work (e.g., Gregory and Wilcox, in press; Wilcox 1991, 1999, 2005a; Wilcox et al. 1981; Wilcox and Shenk 1977; Wilcox and Sternberg 1983). The Tumamoc Hill study can be seen as a case study in this project. So, too, the study of Athapaskan entry to the Southwest.

When George Gumerman (1994) invited Wilcox and Jonathan Haas to prepare a paper on Southwestern warfare for an SAR advanced seminar, he was attracted to the scale of the assignment—the whole Southwest. Jonathan quickly pointed out that they probably would not agree about theoretical interpretations and he recommended an empirical approach, an idea Wilcox immediately embraced. They thus set forth to assemble all the data they could find that document violent behavior or warfare in the [illegible]th American Southwest, which were summarized in a paper poetically titled "The Scream of the Butterfly" (Wilcox and Haas 1994). Architectural data (towers, palisades, forts, hill-slope retreats, fortified villages and hamlets, and guard villages) and five other classes of data (artifacts, burned sites, skeletal evidence, rock art, and no man's lands) were presented to support a simple plea: "on a methodological level, surveys, room counts, populations estimations, and settlement pattern models all have to take explicit account of the possible impact of warfare and defensive settlement strategies" (Wilcox and Haas 1994:236).[3]

Elaborating on the foundations laid by Wilcox and Haas (1994; see also Wilcox 1979, 1989, 1991), Steven LeBlanc (1999) soon took the discussion of Southwestern warfare to another level in a book-length treatment and related essays (LeBlanc 1997, 1998, 2001). Dividing the data into three broad periods, LeBlanc (1999) sketched a general anthropological theory to explain the patterns he identified. While this theory served well as a vehicle for a coherent presentation of the data, he clearly and aptly recognized that "evidence for [the] existence [of warfare] should not be judged in terms of this model" (LeBlanc 1999:311). More recently, he has further developed his theory (Read and LeBlanc 2003) and has applied it very broadly to interpret hominid and chimpanzee ecology and history in a book called Constant Battles (LeBlanc and Register 2003). As did Haas, however, LeBlanc (1999:x) clearly recognizes that his and Wilcox's interpretations of Southwestern warfare, while congruent "in places" also "significantly differ." It is to those differences that we now turn.

Immanuel Wallerstein (2003:455) has recently identified three different "camps" that he thinks would coalesce if the current disciplinary bound-

aries dividing social sciences were dissolved: those who cling to the classic nomothetic vision of general laws; the heirs to the idiographic tradition; and others who "wish to construct grand narratives in order to deal with what they think of as complex social phenomena." Haas and LeBlanc, we think, are both in the nomothetic camp. Haas (2002) succinctly asserts that "Power-hungry rulers and ethnic or religious differences are not the root causes of war; rather, economic disparities, environmental conditions, and threat to one's family and physical well-being are the variables that lead people to take up arms against one another." LeBlanc (1999; LeBlanc and Register 2003), too, invokes stress, but attributes it to population growth exceeding "carrying capacity." When he asks, "[b]ut, how could ... local factors have pan-regional consequences?" (LeBlanc 1999:312), we see an attitude about the nature of explanation that fails to reckon with the claim that the flapping of a butterfly's wings in China can affect earth climate. Less poetically, Wallerstein (2003:459) puts this point as follows: "The whole lesson of the sciences of complexity is that if one changes the initial conditions ever so minutely the outcome may be radically different, whatever the truth of the equations we are using." [4]

Although we have certain sympathies for some of the ideas of both the nomothetic and idiographic "camps," intuitively we are drawn most strongly to the camp of those who believe in the contextual necessity of "grand narratives" and who insist that we "consider what our reality looks like within each of its possible temporalities and spatialities" (Wallerstein 2003:459; see also Blanton et al. 1981; Butzer 1982; Gregory and Wilcox, in press). It is in the interaction of processes acting on multiple temporal and spatial scales that enduring explanations are most likely to be found; agency is important but alone is insufficient; and so are explanations that would reduce human actions to a black box. Neither human nor animals are "hard-wired" (see Kuo 1967; Lewontin 1991; Maier and Schneirla 1964; Oyama 1985; Schneirla 1972). Ontogeny and history, and the constant change in initial conditions that they generate must be reckoned with. So must chance.

Whence, then, the study of Southwestern warfare? Is there any hope of finding common ground between those who see red at the very idea of Southwestern warfare, and those persuaded that it existed? Or even among the latter? Ever among the optimists, we think so, but all sides will have to be willing to examine critically their philosophical and epistemological premises with a "[v]igorous analysis in a climate of tolerant and skeptical debate"—as Wallerstein (2003:458, 560) has so well said. In the remainder of this essay we set forth a basis for transforming the empirical context for such debates and point new directions in which such debates should move.

A NEW APPROACH TO SOUTHWESTERN WARFARE

Let it be admitted that our knowledge of warfare comes from reading books (e. g., Boulding 1963; Eckstein 1965; Waltz 1965). True, we did play "cowboys and Indians" with cap pistols as children. Early in the 1990s, however, Wilcox met Gerald Robertson Jr., an avocational archaeologist who had been a captain in the 101st Airborne in Vietnam. Becoming friends, they began to talk about how Robertson looked at archaeological sites with his "military eye." Though his memories of Vietnam were extremely painful, he agreed to do this in the hope that something positive might result from his terrible experiences of war. On Perry Mesa, about 50 miles north of Phoenix, AZ, they collaborated with J. Scott Wood, the Tonto Forest Archaeologist, in a study of the Pueblo IV Perry Mesa settlement system, which

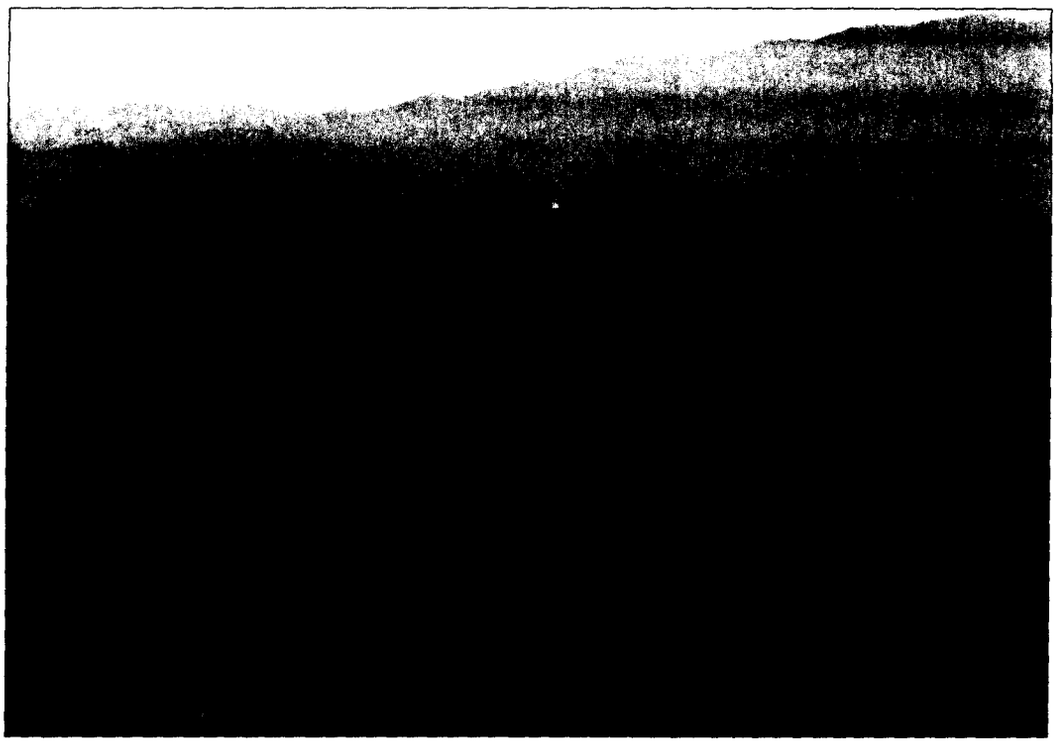

Figure 1.
Smoke Signal on Copper Mountain, NA25,979, During Smoke-Signal Experiment, 2002 (Photo by Joe Vogel).

they argued was organized for war (Wilcox et al. 1999, 2001a; see also Wilcox 2005b). It soon became apparent that the way Jerry thought about how to defend a place involved concepts of the potentiality of interaction, knowing one's enemy, and anticipating his actions. Early warning was vital, and line-of-sight relationships were a way to study the potentials of such communication that used smoke signals or fire (Figure 1).

They quickly wanted to know who the neighbors of Perry Mesa were (with an interest in who were their friends and who their enemies), and what the antecedent defensive systems had been (Wilcox et al. 2001a, 2001b). This led Wilcox to assemble a database and maps of all known sites with 13 or more rooms in all of west-central Arizona for the Pueblo IV period (A.D. 1300-1450). Extending this effort, he then added all of east-central Arizona, which provided the basis for a more abstract examination of the spatial structure of site clusters and buffer zones (aka no-man's lands) between them (Figure 2). A separate inquiry into Zuni origins (Gregory and Wilcox, in press) led him to construct what we call the "Coalescent Communities Database" (CCD) for the whole North American Southwest in the period A.D. 1200 to 1600. Again, the ideal is to include all known sites with 13 or more rooms—which is to say sites larger than a farmstead (Wilcox et al., in press; see also Wilcox 1978). We are working now to extend our coverage to A.D. 1700. The Center for Desert Archaeology (CDA) and Geomap, Inc. (now called Western Mapping Company) were partners in this effort with the Museum of Northern Arizona (MNA), with CDA now acting as the database manager. After 150 years of data collection, we feel it is time to have a look at what is now known on this macro-regional scale, taking advantage of the decades of service by numerous repositories, the statewide New Mexico database (NMCRIS), and the technology of geographic information systems (GIS). With these data in hand, a new basis for examining a great many problems in Southwestern archaeology is established, including many issues regarding Southwestern warfare (see also Adams and Duff 2004).

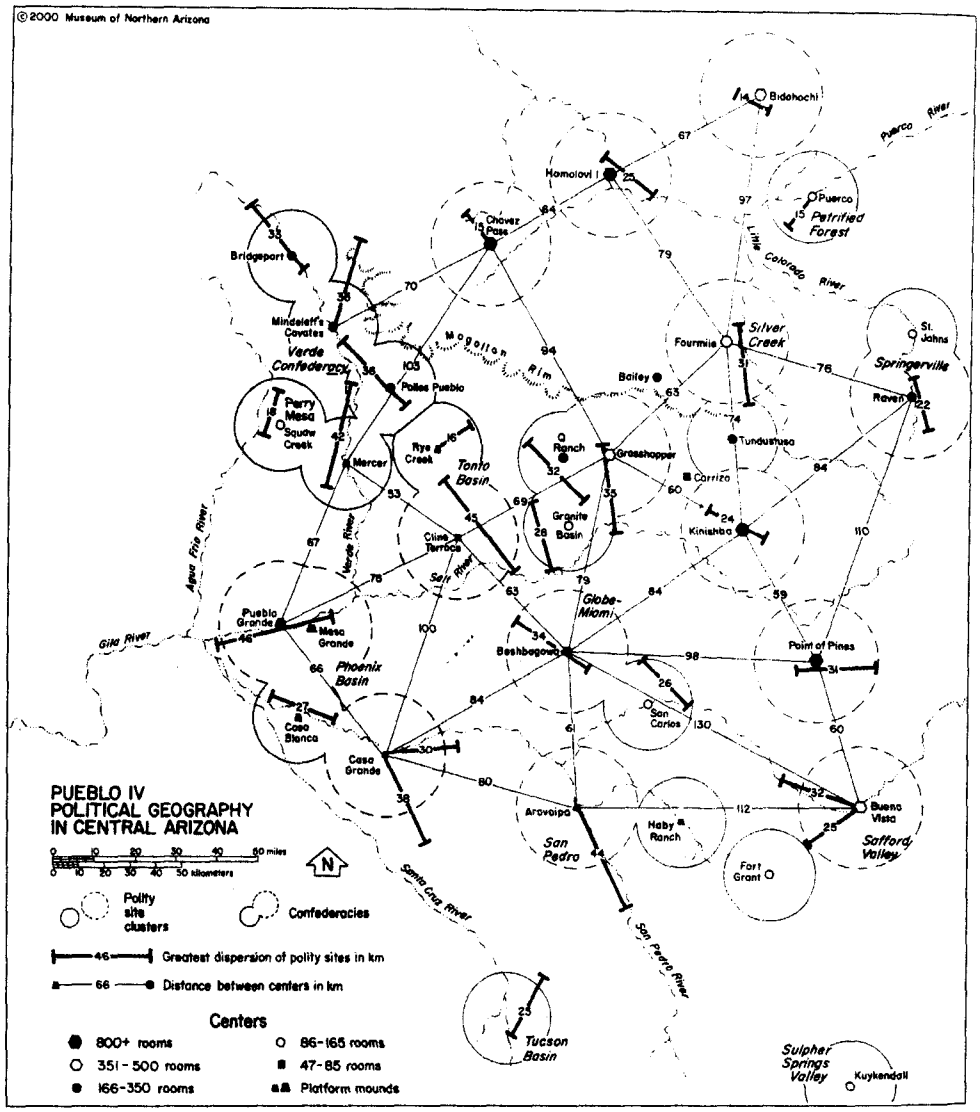

Figure 2.
Pueblo IV Political Geography in Central Arizona (from Wilcox et al. 2001a: Figure 7.15).

As of this writing, we now have over 2780 useable sites in the CCD. By modeling the "living history" of each where appropriate ceramic cross-dating is available, over 6,380 components have been defined that include estimates of the number of rooms present in each of eight successive 50-year periods (A.D. 1200-1600). Construction of a database of the metadata used to construct the CCD is underway, and critical assessment of all size and temporal assignments is on-going. What we present here should thus be understood as a "work in progress." As data quality is increased, and new sites are added, many particulars will change, but we believe that the general trends apparent in our current approximations will hold. We draw on our initial analysis of these data here, conducted when the CCD was somewhat smaller (Wilcox et al., in press; see also Wilcox 2005a).

Construction of a histogram of the sizes of all communities in the database resulted in recognition of four size classes: hamlets of 13-99 rooms; small villages of 100-250 rooms; medium villages of 251-999 rooms; and large villages of 1,000 or more rooms (Wilcox et al., in press). Table 1 summarizes the quantitative data for the eight successive 50-year periods from A.D. 1200 to 1600. These data show that the number of communities was reduced tenfold over this interval, from about

Table 1.

Summary Statistics for the Eight Cost-Surface Maps, A.D. 1200-1599 (from Wilcox et al., in press).

Period	1200-1249 (1)	1250-1299 (2)	1300-1349 (3)	1350-1399 (4)	1400-1449 (5)	1450-1499 (6)	1500-1549 (7)	1550-1599 (8)
Number of settlements	1263	1433	1136	906	476	177	163	124
Total rooms	123,339	174,717	184,383	172,418	133,891	95,990	87,108	64,750
Median size	50	63	92	100	137	338	307	300
Mean size	98	122	162	190	281	542	534	522
% rooms in settlements of 13-99 rooms	25.2	19.4	13.4	10.4	5.6	2.0	1.8	1.6
% rooms in settlements of 100-249 rooms	51.2	45.1	39.7	37.0	26.9	8.8	10.1	12.4
% rooms in settlements of 250-999 rooms	21.7	28.9	34.6	33.7	29.4	34.9	35.2	35.4
% rooms in settlements of 1000 or more rooms	1.9	6.6	12.3	19.0	38.1	54.3	52.9	50.6

1,263 to 124. Hamlets and small villages account for over 75 percent of all rooms in the early 1200s, but from 1450 on, half of all rooms are in large villages of 1,000 rooms or more.

J. Brett Hill, database manager of the CCD for CDA, has used GIS to group all neighboring sites within 300 m of one another into single communities. He then has surrounded each of these communities with four measures of interaction, derived as follows: we assume farmers will go only up to 2 km to farm, 7 km to collect other resources, 18 km to go and come back in a day, and 36 km to go outward in a day (see Varien 1999). Hill conducted a cost-surface analysis that measures the energy costs of crossing slopes of different steepness for each of the interaction measures, thus generating a nested set of site clusters.

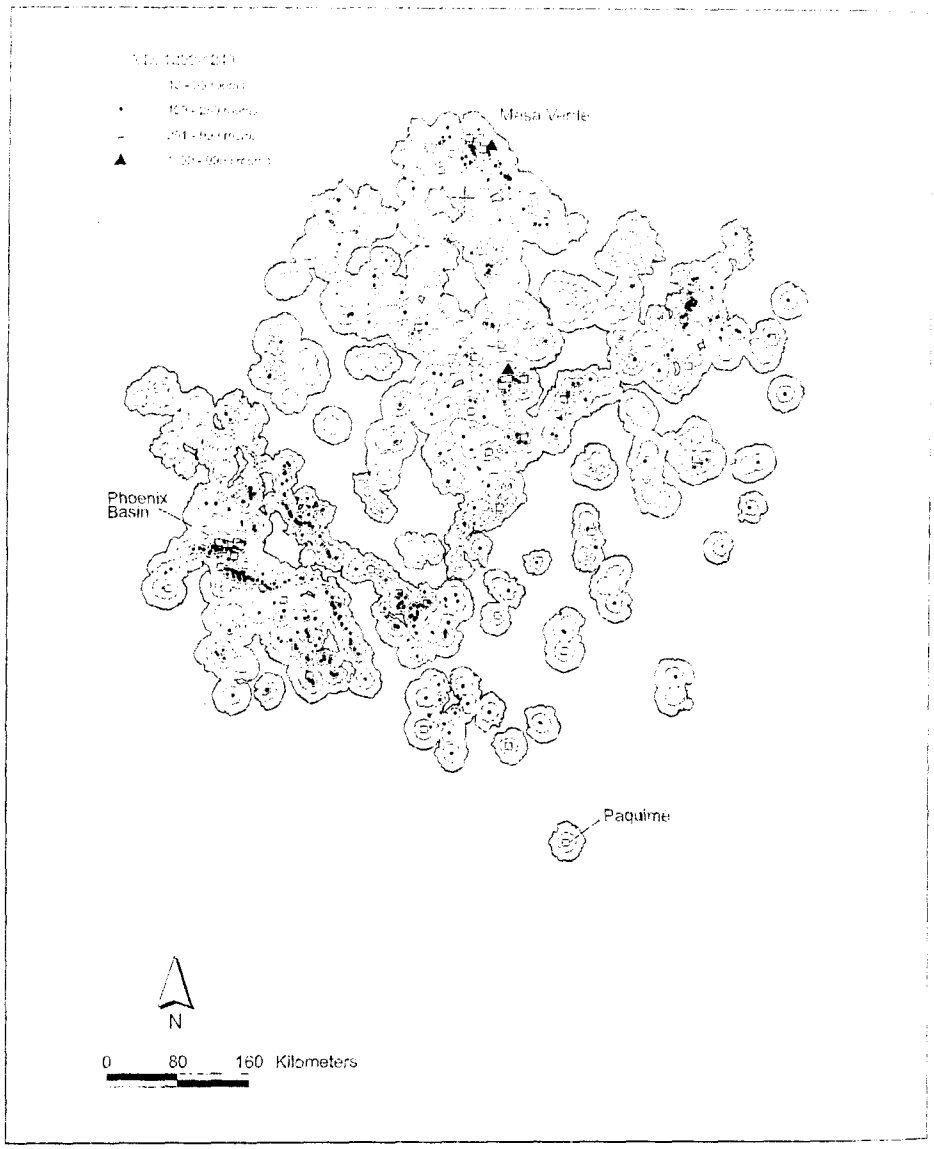

Figure 3. *Cost-Surface Analysis of Southwestern Sites, A.D. 1200-1249 (from Wilcox et al., in press: Figure 14.7).*

Because the first measure (of 2 km) did not produce results significantly different from the community site clusters, we drop further consideration of that measure.

Looking at the interaction map for Period 1, A.D. 1200-1249 (Figure 3), several generalizations are at once obvious. First, virtually the whole North American Southwest was a single contiguous settlement system at that time during which it was possible to walk a path from one community to another throughout almost the whole area without having to go more than one day between neighboring sites. Second, the clusters of sites whose resource catchments overlap may be described as a large series of "islands" or "patches" on the Southwestern landscape that we call "population aggregates" (Wilcox et al., in press). Using GIS analyses, it should now be possible to study the environmental properties of these patches and thus to define quite precisely the environmental and social niches occupied by Southwestern population aggregates, how they compare to one another, and how the overall niche structure changed through time.

By the early 1400s (Figure 4), profound changes had occurred, and we can see clearly a basic dis-

tinction between the northern Southwest of the Puebloan world and the southern Southwest which is composed of what is left of the Hohokam and Casas Grandes worlds, and some settlement systems in between. Glancing back at the Period 1 map, however, we can also see that this structural divide is already apparent in the early 1200s. At that time, these two divisions were linked by a series on north-south settlement systems, all of which disintegrate and are depopulated by about A.D. 1400. Fast forwarding to the late 1500s (Figure 5), we see that the northern Southwest was even more reduced in size by the moment in 1598 when a Spanish colony was established, subordinating these populations as support communities for the silver-mining enterprises in northern New Spain (Kessell 1979). These findings support the reports of Spanish observers (Hammond and Rey 1953) that the Pueblo population ca. A.D. 1600 was about 60,000 people (see Wilcox et al., in press). The possibility that the Casas Grandes populations redeployed into Sonora to become Opata villages (Riley 1982, 1987), and the Hohokam into Pima Bajo villages (Wilcox et al., in press), is shown in Figure 5 using data digitized from Carl Sauer's (1934) map.[5]

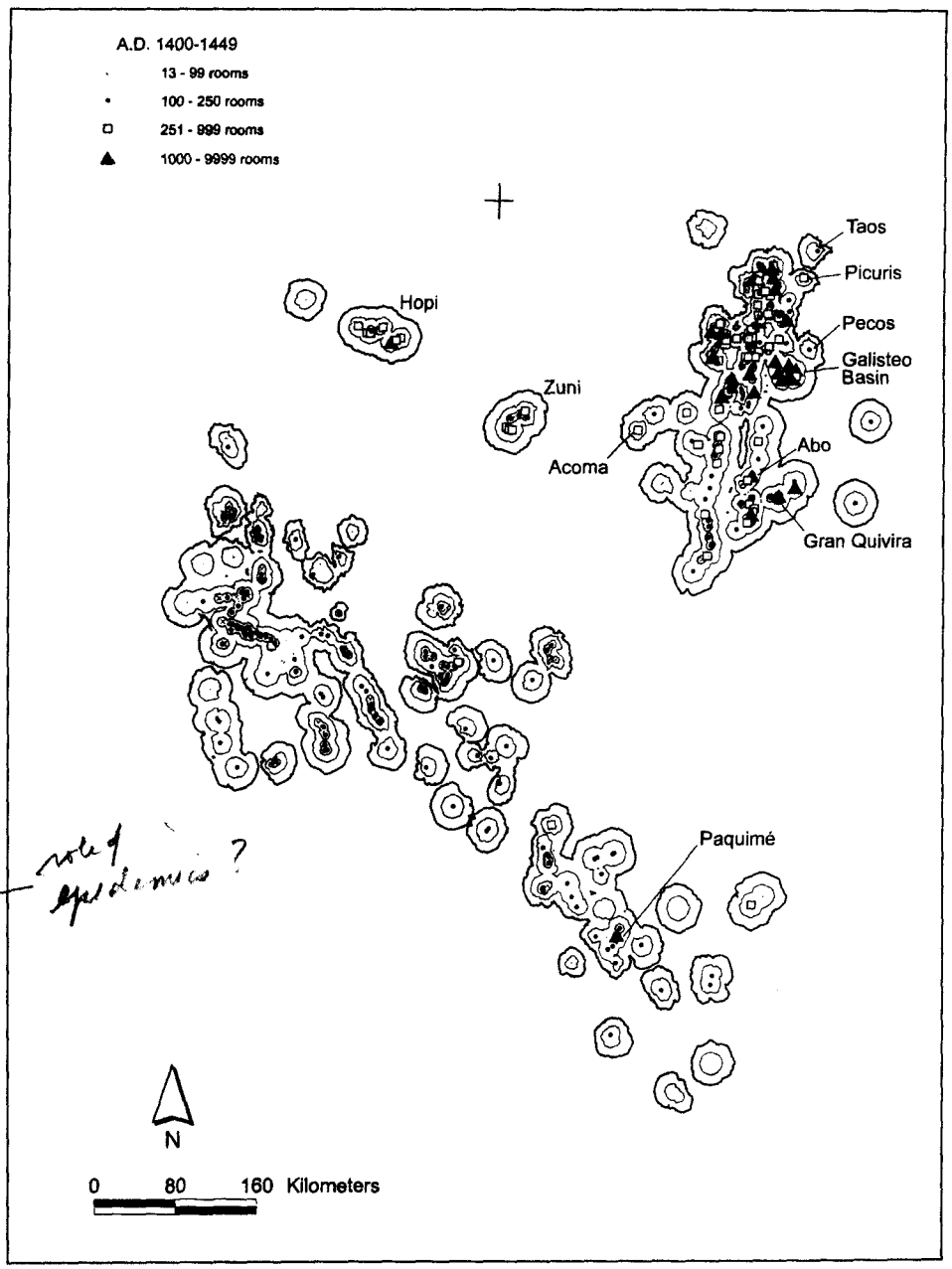

Figure 4.
Cost-Surface Analysis of Southwestern Sites, A.D. 1400-1449 (from Wilcox et al., in press: Figure 14.11).

From a histogram of population aggregates we defined eight size classes, the two largest being over 10,000 rooms, and 3500-10,000 rooms (Wilcox et al., in press). By assigning map symbols to these classes, we can construct a series of maps of the distribution and abundance of popula-

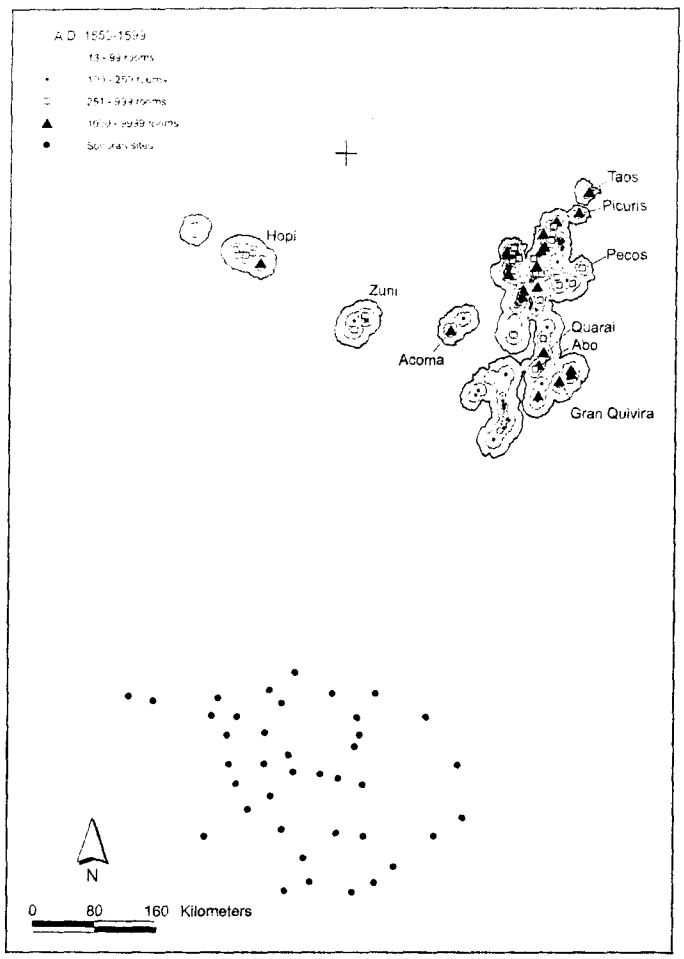

Figure 5.
Cost-Surface Analysis of Southwestern Sites, A.D. 1550-1599 (from Wilcox et al., in press: Figure 14.14).

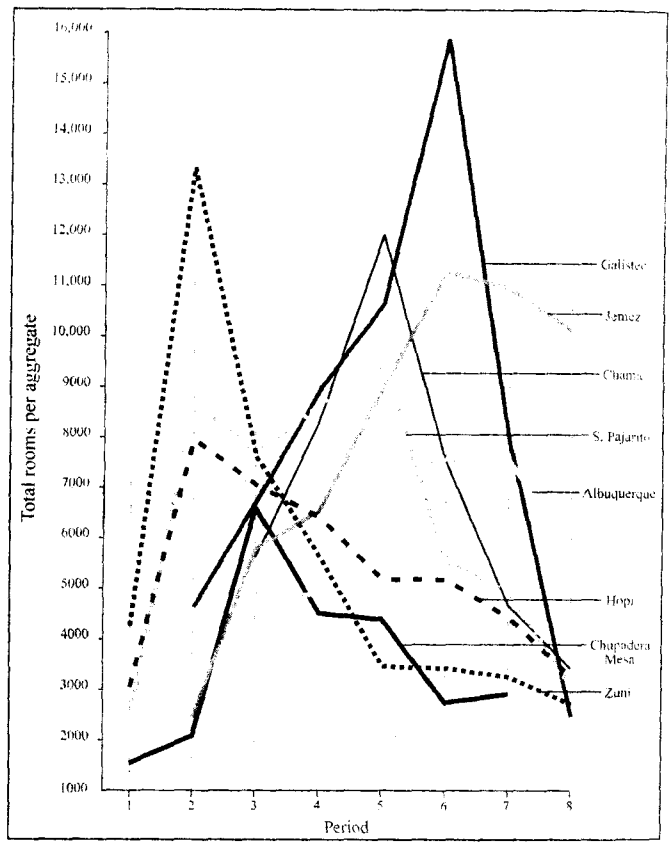

Figure 6.
Graphic Comparison of Total Rooms per Selected Population Aggregates, A.D. 1200-1600 (from Wilcox et al., in press: Figure 14.23).

tion aggregates in the whole Southwest from A.D. 1200 to 1600 (see Wilcox et al., in press). These symbols mark all the places on the South-western landscape where people were living during this interval. We find from these results that Hopi and Zuni, for example, and the Galisteo Basin are places with multiple "population aggregates, and are not simple unitary "site clusters" as previous efforts have assumed (LeBlanc 1999; Upham 1982; Wilcox 1981b, 1991). What the political relations among neighboring or clustered population aggregates were is a matter whose resolution requires new kinds of data (see Habiche-Mauche 1993).

Next, we construct a demographic data table for the northern Southwest and combine selected population aggregates into "clusters of clusters" (such as those at Hopi and Zuni) to examine the comparative rank order of Puebloan groups so we can see how those relationships changed through time (Table 2). These data are presented graphically in Figure 6. The data show that in the late 1200s population surges at Hopi, Zuni, and in the southern Pajarito Plateau, probably due to migration out of the southern Chacoan world (see Wilcox 2005c). In the early 1300s, when the results of migration out of the northern Chacoan (Mesa Verde) world are measured, we see a remarkable pattern in

Table 2.

Rank Order of Grouped Population Aggregates in the Northern Southwest, A.D. 1200-1599 (from Wilcox et al., in press).

Age:	1 1200-1249	2 1250-1299	3 1300-1349	4 1350-1399	5 1400-1449	6 1450-1499	7 1500-1549	8 1550-1599
Total Pop:	71263	110760	107782	103582	102323	95990	87108	64750
Rank								
1	Zuni 4222	Zuni 13278	S. Pajarito 7643	Galisteo 8900	Chama 12020	Galisteo 15834	Jemez 10953	Jemez 10128
2	Mesa Verde 3340	S. Pajarito 8650	Zuni 7554	S. Pajarito 8600	Galisteo 10583	Jemez 11283	Galisteo 7864	Albuq. 5720
3	Hopi 2995	Hopi 7905	Hopi 7000	Chama 8317	S. Pajarito 9378	Albuq. 7560	Albuq. 7560	Hopi 3205
4	Montezu. Valley 2573	Galisteo 4576	Galisteo 6673	Jemez 6532	Jemez 8958	Chama 7522	Tyuoni 4891	Tonque 3070
5	S. Pajarito 2369	Puye 3098	Chup Mesa 6596	Hopi 6355	Albuquerque 7174	Tyuoni 5491	Chama 4678	Tyuoni 3000
6	Mariana Mesa 2340-	Aztec 2799	Jemez 5783	Nambe 5848	Nambe 5200	Hopi 5130	Hopi 4380	Zia 2750
7	Cochiti 1794	Jemez 2442	Chama 5617	Zuni 5570	Hopi 5130	Nambe 5200	Zuni 3204	Zuni 2660
8	Aztec 1738	Mariana Mesa 2212	Albuquer. 4942	Albuquer. 4864	Chup Mesa 4398	Cochiti 4718	Tonque 3070	Tabira 2575
9	Chuska South 1708	Chup Mesa 2085	Nambe 4903	Chup Mesa 4511	Tonque 3415	Tonque 3415	Chup Mesa 2915	Galisteo 2419
10	Chup Mesa 1550	Mesa Verde S. 1995	Puye 3732	Homolovis 3055	Zuni 3411	Zuni 3372	Zia 2800	Espanola 2400
11	Mesa Verde S. 1301	Albuque. 1797	Los Lunes 2938	Los Lunes 2888	Zia 3125	Chup Mesa 2749	Espanola Valley 2675	Acoma 2250

which all groupings considered are about the same size, having between 4,500 and 7,500 rooms. However, each group was on a different demographic trajectory, some surging to levels of 8,000-15,000 rooms, while others were declining. Different regions achieved the first rank in successive periods: first the Galisteo Basin in the late 1300s, then the Chama Basin in the early 1400s, the Galisteo Basin again in the late 1400s, and then the Jemez region after that. Except for the Galisteo Basin, once each region reached its highest peak, it rapidly declined to the same level the other regions had reached, about 2,500-3,500 rooms. This also happened to the Galisteo Basin in the early 1500s, and presumably to the Jemez region in the 1620s. Fray Alonzo de Benavides (Ayer 1916) reported for the Jemez that their decline was due to wars and famine; significantly, he makes no mention of disease.

In the southern Southwest, the Phoenix Basin remained at room-population levels above 13,800 for about 200 years, until the late 1300s when devastating floods apparently irretrievably destroyed canal heads along the lower Salt River (but not the Gila—Graybill et al., in press). Thus the boom-and-bust pattern seen in the northern Southwest can be contrasted with a more stable high level of population over several centuries within a single population aggregate in the Phoenix Basin, which probably has political implications that have yet to be fully appreciated or explained (but see Wilcox 2005b; Wood and Wilcox 2000; for a different evaluation of the demographic data in southern Arizona, see Hill et al. 2004).

The range of 2,500-3,500 rooms appears to represent an equilibrium level in the north that we also found in our earlier Perry Mesa study of central Arizona (Wilcox et al. 2001a).[6] Falling below that threshold seemingly resulted in a whole population aggregate (or "cluster of clusters" of them) to become completely depopulated (see Dobyns 1963; Wilcox et al. 2001a). These findings support LeBlanc's (1999:265) argument that "[k]ey to the understanding [of] the evolution of both villages and the clusters of villages was the need to keep the size of the group large." What the exact sequence was as clusters became depopulated, however, remains uncertain because we still lack temporal resolution sufficient to measure it (cf. LeBlanc 1999:267). Was there a domino effect with a cascading pattern of regional depopulation?

A CRITIQUE OF LEBLANC'S THEORY

A theoretical assumption inherent in LeBlanc's (1999) three-period classification is that common warfare patterns are present throughout the Southwest in each, a condition he attributes to environmental processes he assumes are uniformly felt throughout the region, and even on a worldwide basis. He uses concepts of carrying capacity and stress to link the variables of environment and demography. To critique this theory, we show (1) that environmental conditions were not homogeneous throughout the Southwest; (2) that previous demographic assumptions about Southwestern populations growth and decline need significant revision; (3) that the notion of carrying capacity has yet to be adequately measured; (4) and that, once environmental variability is identified, demographic changes do not correlate with it in the way predicted by the theory.

Southwestern Environment

Beginning with the classic studies by Ellsworth Huntington (1914), Harold Colton (1918), and A. E. Douglass (1935), the idea that "the environment made them do it" has dominated discussions of the explanation for the trajectories of Southwestern archaeology (Wilcox 2004). The theories of Haas (2002; Haas and Creamer 1993) and LeBlanc (1999) fit comfortably into that tradition. The most sophisticated and detailed of such theories, however, is that formulated by Jeffery S. Dean and colleagues (Dean 1988, 1996; Dean et al. 1985, 1994; Gumerman 1988). They also use concepts of carrying capacity and adaptive stress. A principal components analysis of Southwestern tree growth Dean (1996:39) reveals that the American Southwest in general is divided into two environmental regions which Dean (1996:40) interprets in terms of the distribution pattern of summer-dominant versus bimodal precipitation. In the period A.D. 1250-1450, Dean (1996:44) finds a pattern of "chaos," although the southeastern (summer-dominant) sector remains in place. We see, then, that the Southwest was not homogeneous environmentally.

Southwestern Demography and Carrying Capacity

In the early 1990s, Dean, William Doelle, and Jan Orcutt (1994) began the attempt to synthesize what is now known about human demography in the American Southwest. The decline they portray (Dean et al. 1994:74) beginning about A.D. 1000 they assume "may indicate that population had reached or—given the decline immediately thereafter—even exceeded a regional carrying capacity boundary" (Dean et al. 1994:75). Please notice here that they provide no independent measurement of carrying capacity, any more than LeBlanc (1999) does. Creation of the Coalescent Communities Database now allows us to revisit the issue of Southwestern demography at a scale that includes northern Mexico (Figure 7; Wilcox et al., in press). Comparing the early effort of Dean et al. (1994) and a later, upward revision by Doelle (2000), we see that our method "by enumeration" has produced a peak population estimate nearly twice what Dean et al. (1994) found, but in a later period, the early 1300s, and that this is without counting farmstead-scale room blocks that were still quite common in the 1200s. If the Opata and Pima Bajo populations of Sonora after A.D. 1450 are estimated using Sauer's (1935) findings,[7] we see, too, that the general decline was perhaps nowhere as precipitous as Dean et al. (1994) and Doelle (2000) have supposed. We conclude from this only that (1) we need to take heed of Wallerstein's (2003:459) caution about the dangers of premature quantification;[8] and (2) the notion of carrying capacity badly needs to be operationalized in measurable terms lest arguments invoking it become tautologies.

Correlating Demography and Environment: A Rio Grande Case Stu

We saw above in Figure 6 the pattern of boom-a bust cycles experienced in the northern Southw in the 1200-1600 period. One of the factors th may explain this differential rise and fall is the onset of the dog-nomad trade ca. A.D. 1450. Table 3 presents data pertinent to this issue. All the sites or site clusters selected are in the summer-dominant precipitation zone. Examining these data, we see that the Plains-border Pueblos of Taos, Picuris, Pecos, and Gran Quivira grew very large in the middle 1400s, just the moment that the dog-nomad trade began (Spielmann 1994).[9]

Three economic zones involving these large Plains-border pueblos can be defined along a north to south axis, each of which exhibit similarities and differences from one another which we now discuss in some detail. First, however, let us notice that ceramic distributions documented by H. P. Mera

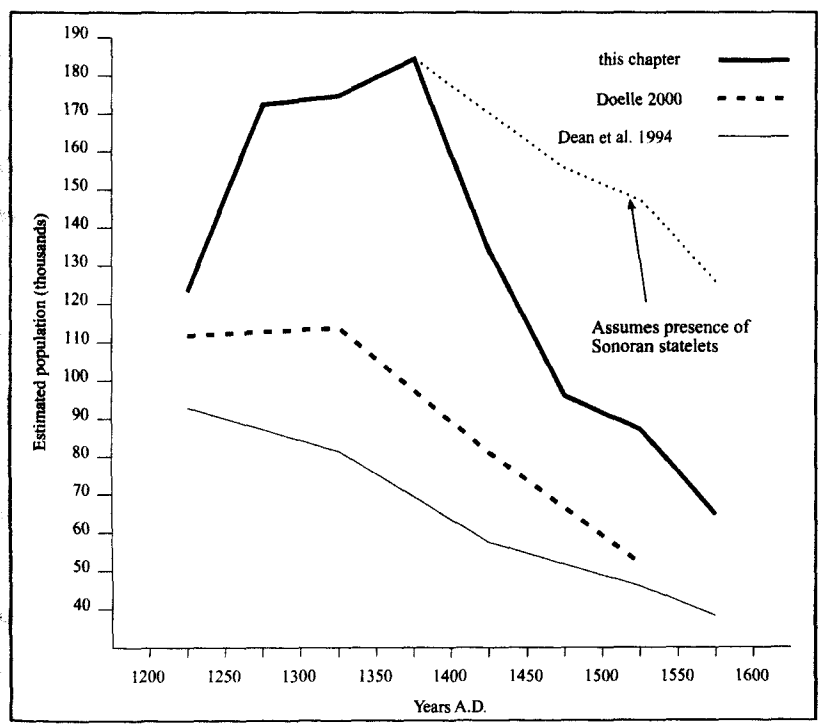

Figure 7.
Comparison of Population Estimates for the Entire Southwest, A.D. 1200-1599 (from Wilcox et al., in press: Figure 14.25).

Table 3. *Selected Room-Count Data, New Mexico Pueblos or Pueblo Clusters, A.D. 1200-1649 (data from Coalescent Communities Database and Wilcox et al., in press).*

Site/ Site Cluster	1200-1249	1250-1299	1300-1349	1350-1399	1400-1449	1450-1499	1500-1549	1550-1599	1600-1649
Taos	0	250	250	250	250	1000	2000	2000	2000
Picuris	0	200	500	500	1000	1000	2000	2000	2000
Pecos	50	50	250	250	250	660	825	825	1020
Galisteo Basin	565	4576	6673	8900	10583	15834	7864 (2575)	2575	2575
San Marcos	0	250	250	3000	3000	3000	750	750	750
Quarai	0	250	250	250	250	0	(1500)	1500	1500
Abo	0	0	500	500	1600	1600	1600	1600	750
Gran Quivira	0	250	250	250	1000	1000	1000	1000	1000
Tabirá	0	250	250	250	250	1125	1125	1125	750
Pueblo Colorado	0	0	250	1200	1200	1200	1200	1200	750
Chupadera Arroyo	1550	2085	6596	4511	4398	2749	2915 (1705)	1497	175
Quivirans	1550	3532	8071	6931	7508	6774	6940	5522	3375
Corona/ Gallo River	215	1000	850	425	0	0	0	0	0
Rio Hondo/ Roswell	0	425	530	230	200	0	0	0	0
Chama			5617	8317	12020	7522	4678	0	0
Jemez		2442	5783	6532	8958	11283	10953	10128	

( ): figures for the second quarter of the 1500s.

(1935:Map 1) for the 1000s reveal a Plains-border social network at the far edge or "fringe" of the Puebloan world that appears to have linked the Taos/Picuris area to the Albuquerque area. Its disintegration may be what separated northern from southern Tiwa speakers, initiating the differentiation into the Northern and Southern Tiwa languages. An east-west network of Towa speakers may have linked the Pecos area to Jemez, the middle of which dropped out with the depopulation of the Santa Fe River corridor (see Habiche-Mauche 1993) and the intrusion of Keresans along the Rio Grande and northward into the southern Pajarito Plateau as they bailed out of the southern Chacoan world, forming a "wedge" into a Tanoan world (LeBlanc 1999). Most of the Galisteo Basin Pueblos spoke Southern Tewa (Reed 1943). Chilili, Tajique, and Quarai spoke Tiwa (Wilson 1973), while the Pueblos further south spoke languages thought to be related to Piro and generally in the Tanoan family (Harrington 1909). This linguistic diversity must be reckoned with in constructing explanatory models of changing demographic, economic, and political relationships.

The Northern Tiwa. Taos and Picuris became distinct population aggregates with the depopulation—and burning—of Pot Creek Pueblo in the 1320s (Crown 1991; Fowles 2004). Both became 1,000 to 2,000 room pueblos by the mid 1400s, just at the moment the dog-nomad trade system with Plains foragers began. Prior to that we need

to reexamine the pueblo-like settlement systems in southern Colorado to see if they were a "fringe" population interacting with the Puebloan world via Taos or Picuris.[10] The exchange linkages between Taos and Picuris with the Northern Tewa Biscuitware settlement systems in the Nambe, Española, and Chama regions also need to be investigated using sourcing studies.

Pecos and the Galisteo Basin. The contrast between the huge Galisteo pueblos first built in the late 1300s and early 1400s, and an eastern "fringe" of small Plains-border pueblos that at first included Pecos (see Figure 3), is transformed with the depopulation of the outer fringe and the reorganization of Pecos in early Glaze III (ca. A.D. 1450-1475; see Kidder 1958:63, 107) into a defensively structured 4-story quadrangle located just east of Glorieta Pass, a gateway to the Galisteo Basin.[11] We emphasize that before A.D. 1600, Pecos was only a medium-sized village, much smaller than the large Galisteo villages. Kidder (1958:44) reports that at Pecos, beginning "in late Glaze IV [ca. 1500] and reaching its height in Glaze V there was an influx of snub-nosed scrapers, two-edged knives, and side-scrapers made, for the most part, of the already mentioned pink-veined gray [Alibates] dolomite." Gunnerson (1956) classically used this evidence to argue that Plains people were wintering at Pecos. Although bison bones were found in all levels at Pecos, they were most numerous in the upper deposits (Kidder 1958:196). Compared to the large Galisteo villages, the importance of Pecos in the dog nomad trade clearly significantly increased after A.D. 1500, as the frequency distribution of Plains artifacts in the Pecos middens documents, and the shift from Glaze C and D pottery in Plains sites derived from Tonque and the Galisteo sites to Glaze E and F in them derived from Pecos (see Spielmann 1982). The sudden depopulation and destruction of many of the Galisteo villages ca. A.D. 1525 (Hammond and Rey 1940; Mera 1940) further consolidated the position of Pecos; they told members of the Coronado party that they dominated anyone they wished (Hammond and Rey 1940:257)!

Estancia Basin and South. Here also there was a Plains-border "fringe" network that was depopulated by the early 1400s (Kelley 1984; Speth 2003), and, to the west, a demographically dominant pueblo cluster (Chupadera Arroyo; Montgomery and Bowman 1989). There was also an intermediate zone that was small at first but became much larger demographically by the middle 1400s, while the western end of the axis (in Chupadera Arroyo) shrank in size. North-south, however, this network was further differentiated into three east-west groups. In the south, Gran Quivira and three neighboring medium-to-large villages (Pueblo Pardo, Tabira, and Pueblo Colorado) constituted a group of what we will call "Quiviran" Pueblos.[12] The Tompiro Pueblos of Abo and Tenabo sat astride the Abo Pass, a gateway to the Piro and Southern Tiwa village clusters along the Rio Grande where high levels of cotton production are indicated (Hill 1998). Along the western edge of the Estancia Basin, Chilili, Tajique, and Quarai were occupied predominantly (at least by the 1500s) by Tiwa speakers (Wilson 1973). As a north-south network they linked the Tompiro and Quiviran Pueblos to the Galisteo Basin and Tonque, facilitating a flow of glazeware ceramics and probably other goods in a north-south social corridor east of the Manzano Mountains (Graves 2004). Noting that Hell Canyon created a pass though the Manzano Mountains (Walter 1916:20), we suggest that the eastern Tiwa settlements may have been supplying Plains products to Isleta and other Southern Tiwa settlements on the Rio Grande.[13]

Before it became a large village in the early 1500s, Quarai was a small village in a circular arrangement like Tyuoni (Walter 1916:35),[14] and like the

Table 4.

Comparison of Population Trends with Spring Drought Data from the Arroyo Hondo Area (data from Rose et al. 1981:95-97 and Wilcox et al., in press).

Period A. D.	No. of Rooms	Number of Droughts of 1-5 Years Duration						Worst Years [comments]
	in N. SW	1	2	3	4	5	Total	
1200-1249	71,263*	3	2	2	0	0	13	1215-1217, 1246-1248
1250-1299	110,760	7	3	1	1	0	20	1250-1252, 1284-1287, 1291-1294 [Mesa Verde migration; conflict]
1300-1349	107,782	2	6	1	0	0	17	1340-1342 [conflict]
1350-1399	103582	4	4	3	1	0	25	1362-1364, 1367-1369, 1375-1377, 1390-1393
1400-1449	102,323	1	2	2	1	1	20	1415-1419 [famine], 1422-1424, 1429-1432, 1436-1438 [conflict]
1450-1499	95,990	4	7	1	0	0	19	1495-1497 [conflict]
1500-1549	87108	6	2	1	0	0	13	1500-1503, 1522-1524 [conflict; Spanish oppression]
1550-1599	64,750	5	2	1	1	0	16	1583-1585, 1598-1601 [Spanish oppression]
1600-1649	45,114**	5	3	1	0	0	14	1606-1608, 1648-1650 [epidemic: 1635-1637]
1650-1699	30,695	3	2	0	0	1	12	1666-1670 [famine]; [Pueblo Revolt, 1680-1696]

* This number is probably an underestimate because the least well-represented class of sites in the database are hamlets and small villages, which are the most common sites during this period.

** There are indications that in the period A. D. 1600-1630, the Pueblo population rebounded to about 65,000-80,000 people (Wilcox 1992). The first serious disease epidemic recorded among the Pueblos occurred between 1635 and 1638, killing many people (Reff 1992:270; Stodder and Martin 1992:66).

circular component underneath Gran Quivira reported by Hayes (1981). Chuperdero B/w pottery manufactured at Quarai (Creel et al. 2002) was exchanged eastward to the "fringe" populations in the Corona/Gallo Mountains area and on to the middle Pecos where Jelinek (1967) documented the onset of bison hunting by small-scale puebloan agriculturists in the late 1200s. Small pueblo populations in the Rio Hondo/Roswell area in the 1200s and 1300s also apparently engaged in direct procurement of bison (Speth 1991:28; 2003) and they also were tied into western exchange connections that were centered on Casas Grandes (Di Peso et al. 1974; Vokes and Gregory 2005; Wilcox 1991). By the middle 1400s, these fringe populations were gone, the macroregional center of Casas Grandes was depopulated, and a radically new exchange structure had emerged, the dog-nomad

trade in which a stationary boundary between foragers and agriculturists (Dennell 1985) was structured sociologically into an inter-societal division of labor that involved the transference of bulk goods (food) between foragers and farmers (Baugh 1984; Wilcox 1984, 1991). From a biological perspective, these relations are seen as a form of mutualism (Spielmann 1982, 1983, 1991).

The Changing Environmental and Cultural Contexts of the Dog-Nomad Trade. The reconstruction by Martin Rose and others (1981) of spring rainfall for the Arroyo Hondo area just northwest of Pecos (using the Santa Fe tree-ring station) provides a way to evaluate the changing environmental context of the kaleidoscopic changes in settlement pattern along the Plains border (Table 4). As is well known, the Pueblos typically stored enough food to sustain themselves through 2-3 years of drought conditions (Spielmann 1982). In Table 4 we illustrate the sequential occurrence of years with below average spring rainfall (1-5 years) for each of the 50-year periods represented in our settlement distribution maps (data from Rose et al. 1981), as well as the total number of rooms for each period. During the period of interest, A.D. 1200 to 1700, there were only two times when there were five years in a row of below average spring rainfall: A.D. 1415-1419 and 1666-1670. Spanish records show that the latter interval was a time of severe famine, and we infer that the earlier interval was too. Intervals with below average spring rainfall 4 years in a row are A.D. 1284-1287, 1390-1393, 1429-1432, 1500-1503, 1583-1585, and 1598-1601. Interestingly, the last two were times of Spanish oppression, the first during the Espejo entrada (Hammond and Rey 1966), and the second during the first years of the Spanish colony (Hammond and Rey 1953). During both of those times the Spaniards demanded maize from the Pueblos, and often took it by force.

The general trajectory of decline in pueblo room counts in the northern Southwest (Table 4) from a peak in the late 1200s above 110,000 to a little more than half that number in the late 1500s, and a further reduction by over half by the late 1600s, is only partly correlated with drought stresses. Conflict, Spanish oppression, and the first well-documented disease epidemic of 1635-1637 (Reff 1992) also were apparently significant factors. Following the decline in the late 1500s, population estimates provided by Fray Alonzo de Benevides indicate that the Pueblo population rebounded in the first quarter of the 1600s (Wilcox 1992). At the onset of the Plains dog nomad trade, ca. A.D. 1450, Pueblo population was still over 86 percent of what it had been at its peak, and fell only 10 percent by the next period. However, following the entrada of Vazquez de Coronado and before the establishment of the Spanish colony by Juan de Oñate, population apparently fell by another 25 percent. A significant part of this change, however, occurred in the second quarter of the 1500s when the Chama and much of the Galisteo basins were depopulated, in part due to violent events. The basic conclusion to be drawn from these patterns is that the Puebloan macroeconomies and the larger world systems (see Chase-Dunn and Hall 1997) in which they were embedded were highly volatile in the five centuries from A.D. 1200 to 1700. But how much is this volatility correlated with environmental changes?

To evaluate this question, we can compare the population data in Table 3 with patterns observed in four precipitation-sensitive residual tree-ring chronologies: Santa Fe, (RIO), Chupadera Mesa (CHM), Chama Valley (CHV), and Jemez (JEM).[15] Figure 8 compares the Santa Fe and Chupadera Mesa tree-ring data. In general, variability in Santa Fe precipitation was quite similar to that on Chupadera Mesa from A.D. 1350 to 1600. From 1600 to 1700 they were dramatically different, Santa Fe precipitation first being much

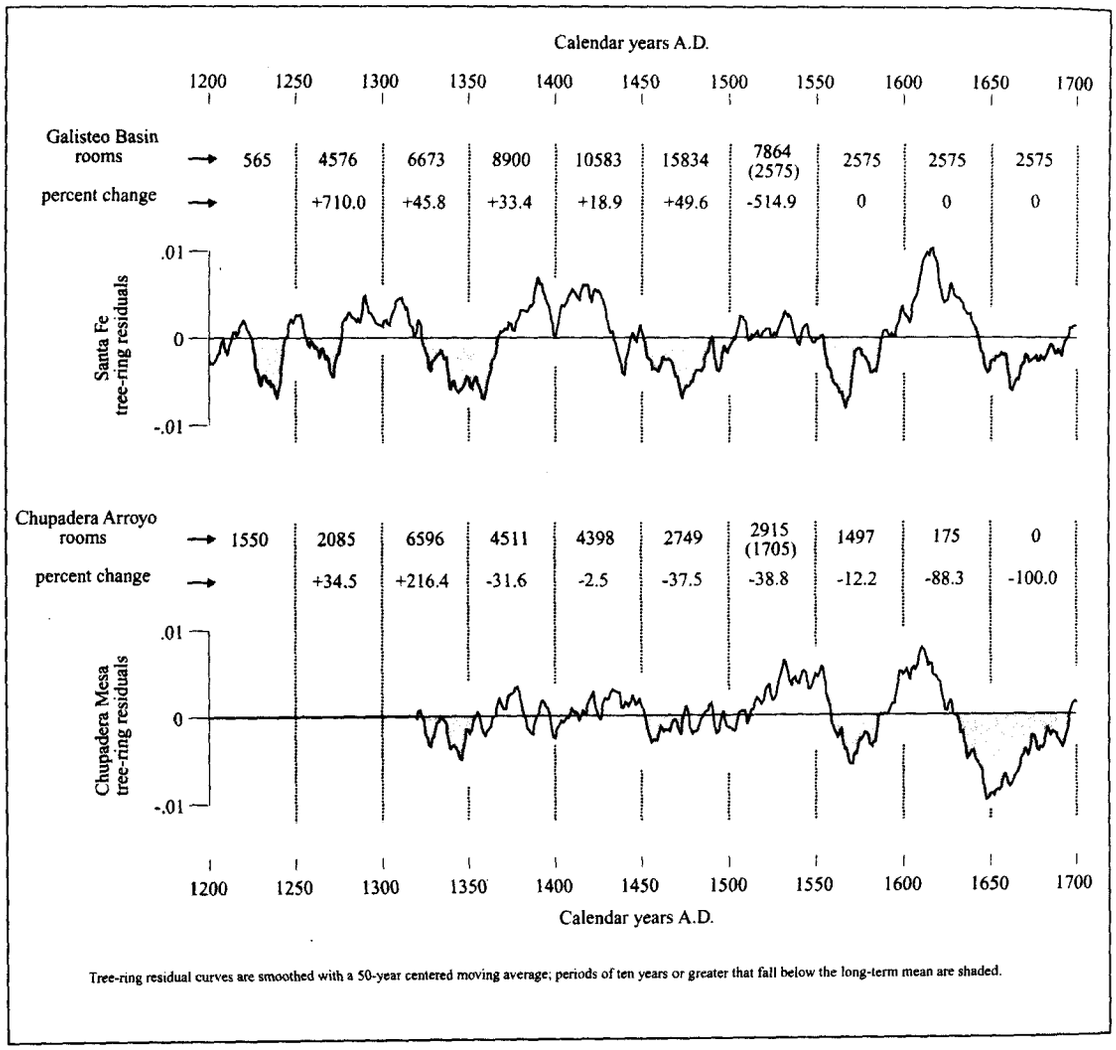

Figure 8. *Comparison of 50-Year Running Averages of Tree-Ring Residuals between the Santa Fe and Chupadera Mesa Stations.*

less and then much more than that on Chupadera Mesa. The demographic takeoff in the Galisteo Basin during the late 1200s occurred during a time of declining precipitation, the continuing rise in the early 1300s occurred during a period of rising precipitation, and the further population increase in the late 1300s was during another decline in precipitation. The decline of population in the Chupadera Arroyo region in the late 1300s and the more precipitous drop in population ca. A.D. 1450 both occurred during periods of average or close-to-average precipitation. The rapid drop in Galisteo Basin population ca. A.D. 1525 was also a time of close to average or increasing precipitation. The rising trend in precipitation in the Chupadera Arroyo area during this interval was not paralleled by increased population in that region.

Figure 9 shows a similar comparison of the Chama Valley with the Jemez area. The doubling of population in the Jemez region in the 1300s correlates with a marked increase in precipitation in the Chama during the late 1300s. A major reorganization of the Chama settlement system into a "cluster of clusters" occurred in the middle 1400s (cf. Wilcox 1991; Fowles 2004). At this time, social distance increased between population aggregates occupying independent irrigation zones by virtue of the depopulation of the defensive sites of Cerro Colorado and Leafwater, and the redesign of Tsama as a large quadrangle. These events may correlate

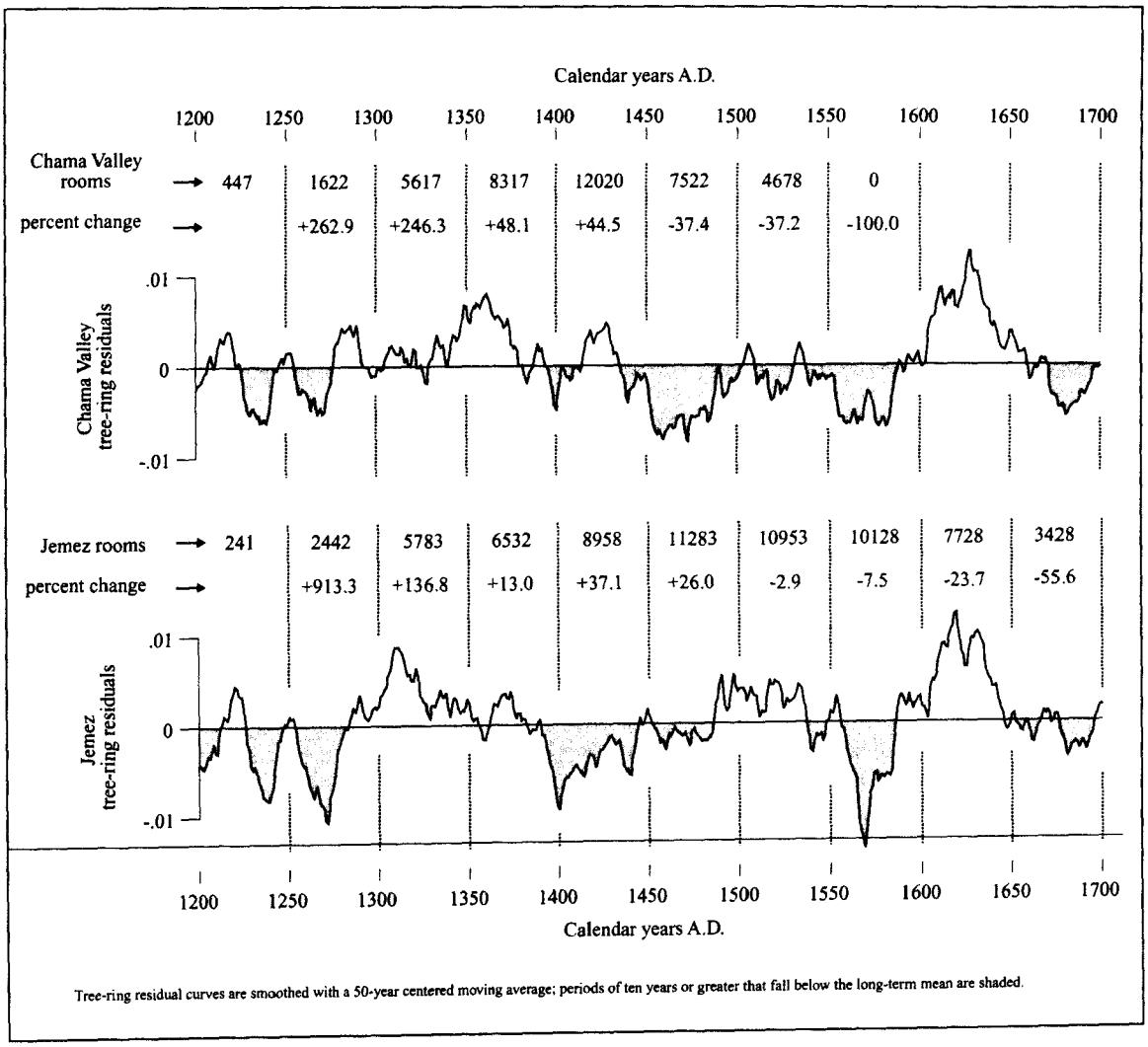

Figure 9. *Comparison of 50-Year Running Averages of Tree-Ring Residuals between the Chama Valley and Jemez Stations.*

with a sharp drop in precipitation in the 1420s or a deeper decline in the third quarter of the 1400s. Meanwhile, in the Jemez region, precipitation was on an upward trajectory between 1430 and 1560, and Jemez population peaked during that period. The total depopulation of the Chama by about 1530-1540 (Schaafsma 2002) correlates with above average precipitation. The crash of Jemez populations in the 1620s came on the heels of several decades of below average precipitation, although conditions had improved sharply by the 1620s.

The conclusion we draw from these comparisons is that increases in population do sometimes correlate with average or improving precipitation, but that the sharp decline of population does not always correlate with lesser or decreasing precipitation. If there was warfare during the later times, as Spanish documents confirm (Hammond and Rey 1966; Ayer 1916), then the explanation for it probably lies in other factors than carrying capacity or environmentally induced stress. Competition for control of the Plains trade may thus be a much more important factor than has been generally recognized (see Wilcox 1991, 2005a).

FUTURE DIRECTIONS

The economic historian Niall Ferguson (2002:89) in his book *Empire* points out that Americans before the Revolution were "the best-off of all

colonial subjects." The war was fought, he argues, on principle: no taxation without representation. Can we not imagine that the peoples of the ancient Southwest also acted on principle, politically defining what they thought their interests were, and thus sometimes finding themselves in conflict either internally or externally with their neighbors (see Waltz 1965)? Why should we doubt that they could flexibly unify social segments politically, even at the level of a macroregional scale (as happened in the Pueblo Revolt of 1680) into confederacies (Spielmann 1994)? The logic of segmentary organizations such as are found among the Pueblos (Eggan 1950) may be manipulated universally in this way (Rice 2000; Sahlins 1961; Wilcox 2003b). Whether they ever formed some version of a "segmentary state" (Southall 1988) is a further issue (see Wilcox 1999 and 2005c on the Chacoan political system). Lacking as we do the evidence provided in some archaeological regions of written language or complex sculpture, we have to look to other classes of data to understand Southwestern conceptual worlds. In *Warrior, Shield, and Star* Polly Schaafsma (2000) has shown that kiva mural art, rock art, and ceramic iconography can be combined in a comparative analysis to shed considerable light onto the Puebloan conceptual world and the role warfare played in it.

We still have far to go to construct a "grand narrative" of Southwestern archaeology. The books by LeBlanc (1999) and P. Schaafsma (2000) have made great strides in that direction, however, and the construction of the Coalescent Communities Database (Wilcox 2005a; Wilcox et al., in press) moves us another step forward. New research designs on multiple scales of analysis are now possible (see Gregory and Wilcox, in press); and the technology of GIS should greatly facilitate this process. In Wyoming, Francis and Loendorf (2002) have shown that on either side of the Wind River there are two distinct rock art styles that face off against one another in long lines of "fearsome" rock art figures. No comparable study has yet been made in the Southwest (but see Wilcox and Haas [1994:230] where the potential of such studies was recognized). By creating new classes of relational data, we can continue to enlarge the body of independent archaeological theory with which we can comprehend the past with more and more clarity, thus drawing closer and closer to an understanding of the humanity of Southwestern peoples. The study of warfare is a vehicle to archaeological insights into past political worlds.

ACKNOWLEDGMENTS

First let us thank Richard Chacon for inviting Wilcox to participate in what proved to be two stimulating symposia on warfare in the Americas at the 102nd annual meetings of the American Anthropological Association in Chicago, November 2003. Three of us initially collaborated in analyses of the Coalescent Communities Database; we are grateful to the Museum of Northern Arizona, the Center for Desert Archaeology, and Geomap, Inc. (now Western Mapping Company), for support in its construction. The late Gerald Robertson Jr. and J. Scott Wood contributed immensely to Wilcox's understanding of Southwestern warfare, as have Jonathan Haas and Steven LeBlanc. Curtis and Polly Schaafsma's unfailing hospitality and friendship have made it possible for Wilcox to see many sites in New Mexico and to understand their archaeology better than may otherwise have been possible. Tim Seaman and his staff at ARMS, Laboratory of Anthropology, Museum of New Mexico, repeatedly made his research trips there cordial and productive, as did personnel at the Arizona State Museum, University of Arizona, Tucson, and the Department of Anthropology, Arizona State University, Tempe. Numerous people have also shared site data with us, among

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ENDNOTES

1. Wilcox's model (Wilcox 1981a, 1988, 2003a) adopted the thesis of Kehoe (1973) that the Avonlea populations were proto-Athapaskan speakers, a hypothesis that remains controversial (see Ives 1990; Perry 1991; Walde 2003). However, the discovery of a site south of Denver, with late Avonlea points dating A.D. 1260-1400 (Gilmore 2003) raises the stakes in the Avonlea-as-Athapaskans hypothesis. If this and other such assemblages can be linked to the Tierra Blanca assemblages of the Texas panhandle that date post 1400 and are thought to be Querecho/early Apachean sites (Habiche-Mauche 1992; Spielmann 1982), a new basis would be established for looking further in western Alberta and British Columbia for Avonlea antecedents.

2. The ethnic categories of Ute and Navajo did not crystallize in a modern sense until the eighteenth century. Ceramics ("Dinetah Gray") and architecture ("forked-stick hogans") in the sixteenth century exhibit variability that was possibly part of polythetic horizon styles that may not be easily partitioned along "ethnic" lines. Schaafsma's (1996, 2002) suggestion that the populations involved were proto-Ute, not Navajo, can only be fully addressed once we have a much clearer delineation of Ute archaeology and its antecedents (in this regard, see A. Reed 2001). Lori Reed and Kathy Hensler's (2000) findings that early Dinetah Gray was made using wide coils and was thinned using a the fingers in a distinctive way is provocative, but a similar technique has been reported for Southern Paiute pottery, though from a much later period (Lyneis 1996). Schaafsma (personal communication 2003), however, believes the so-called Dinetah Gray from LA55979 is proto-Ute pottery.

3. LeBlanc (1999) more elegantly calls for a "security analysis" of all sites and settlement systems. Interestingly, Adolph Bandelier (1892) in his classic "Final Report" on his Southwestern survey for the Archaeological Institute of America did just that, noting that sites were often located on higher elevations suitable for observing the approach of any enemy, giving the inhabitants time to prepare to defend themselves.

4. It is interesting to find that this kind of logic was not unknown in nineteenth century America: Charles Sumner concluded his famous "Freedom National" speech before the U. S. Senate in 1852 with this thought: "Beware of the groans of the wounded souls. Oppress not to the utmost a single heart; for a solitary sigh has power to overset a whole world" (Donald 1961:236).

5. Such redeployments are admittedly speculative as there is as yet no archaeological signature for them, a point criticized by McGuire and Villalpando (1991). However, no archaeological investigations under the modern towns in Sonora has yet been made, leaving the issue moot. The scale of this proposed redeployment within the southern Southwest is no greater than the widely accepted migration out of the greater Mesa Verde country to the Rio Grande, and even there the evidence for this movement does not take the form of "site-unit intrusions" (Cameron 1995; Lipe 1995). Reff's (1992) study of disease impacts on Sonoran populations supports Riley's (1982, 1987) contention that the sixteenth Spanish accounts of population size in Sonora are credible. New archaeological research on this important matter is needed.

6. In general we would argue (Wilcox et al., in press) that estimates of 1-2 persons/room are reasonable. Room sizes in the southern Southwest after 1200 are generally larger than in the northern Southwest (Bandelier 1892). In the Perry Mesa study (Wilcox et al. 2001a) a multiplier of 1.6-2.0 was used to estimate human populations from room counts, while in the Rio Grande we used 1 person/room (Wilcox et al., in press).

7. Sauer (1935) estimated a total population in central Sonora of about 80,000 people, assuming there were 7 persons/household; we assume only 5 persons/household, and so have adjusted Sauer's findings in Figure 7 accordingly.

8. This caution applies equally to our own preliminary data from the CCD, which we have said is a "work in progress" and that it is the trends, not necessarily the particular numbers, that we think are reliable.

9. Many questions about the dogs used in this trade remain. Where did the large dogs used as beasts of transport come from? Were they long present in the Northwestern Plains where they were used in a dog-nomad trade with the Middle Missouri villages? Was a version of this adaptation introduced to the Southwest/Southern Plains ca. A.D. 1450 (Spielmann 1983), and diffused to indigenous Southern Plains groups (Spielmann 1991:16; Wilcox 1988)? A comprehensive study of dog bones in Plains sites would go far to clarify these issues. Speth (2003), however, now reports large dogs in his Roswell sites that date to the late 1200s.

10. For a recent consideration of this issue, see Mitchell 1997, where close ties between Valdez phase settlement systems in the Taos area and Sopris phase ones in southeastern Colorado are attested.

11. Direct connections between the Plains and the Galisteo Basin were also possible, by-passing Pecos to the south, such as a route via the Cañon Blanco (Curtis Schaafsma, personal communication, 2003).

12. Thus distinguishing Abo and Tenabo from Gran Quivira and the other southern pueblos under the rubric of Quiviran follows, in part, a suggestion made to Wilcox at the 2002 Pecos Conference by Patrick Beckett (see also Mera 1940). Reggie Wiseman (personal communication 2005) points out that the site structure of Pueblo Colorado contrasts with that at the other three sites, possibly implying that it did not speak the same language as the others. Multiethnic alliances at this time would not be surprising.

13. It is interesting that the eastern entrance to Hell Canyon is flanked by Chilili on the north and Tajique on the south. New investigations of this possible exchange route through Hell Canyon are needed.

14. The presence of this early component was noted by Bandelier (1892; cited in Walter 1916:40) and excavations into it were made by Hewett in 1913 (Walter 1916:35). Later stratigraphic excavations by Baker (1936) better documented the age of this component, which we bracket between A.D. 1250 and 1449.

15. These graphs were created by David A. Gregory from data provided by the Laboratory of Tree-Ring Research, University of Arizona, Tucson, in consultation with Gary Funkhouser.

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