EARLY PUEBLO RESPONSES TO CLIMATE VARIABILITY: FARMING TRADITIONS, LAND TENURE, AND SOCIAL POWER IN THE EASTERN MESA VERDE REGION

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ABSTRACT

Maize agriculture is dependent on two primary environmental factors, precipitation and temperature. Throughout the Eastern Mesa Verde region, fluctuations of these factors dramatically influenced demographic shifts, land use patterns, and social and religious transformations of farming populations during several key points in prehistory. While many studies have looked at the influence climate played in the depopulation of the northern Southwest after A.D. 1000, the role that climate played in the late Basketmaker III through the Pueblo I period remains unclear. This article demonstrates how fluctuations in precipitation patterns interlaced with micro- and macro- regional temperature fluctuations may have pushed and pulled human settlement and subsistence patterns across the region. Specifically, we infer that preferences for certain types of farmlands dictated whether a community used alluvial fan verses dryland farming practices, with the variable success of each type determined by shifting climate patterns. We further investigate how dramatic responses to environmental stress, such as migration and massacres, may be the result of inherited social structures of land tenure and leadership, and that such responses persist in the Eastern Mesa Verde area throughout the Pueblo I period.

RESUMEN

La agricultura de maíz depende de dos factores ambientales primarios: precipitación y temperatura. A lo largo de la región oriental de Mesa Verde las fluctuaciones de estos factores influyeron dramáticamente en cambios demográficos, patrones de uso de la tierra así como transformaciones sociales y religiosas en las poblaciones agrícolas durante varios momentos clave en la prehistoria. Mientras que varios estudios han tratado la influencia que tuvo el clima en el despoblamiento del norte del Suroeste después de 1000 D.C., el rol que el clima jugó en la parte tardía de Basketmaker III y a lo largo del periodo Pueblo I permanece poco claro. Este artículo demuestra cómo las fluctuaciones en los patrones de precipitación entrelazadas con fluctuaciones micro- y macro-regionales de temperatura pudieron haber afectado asentamientos humanos y patrones de subsistencia a lo largo de la región. Específicamente, inferimos que las preferencias por cierto tipo de tierras de cultivo definieron si una comunidad usaba prácticas de abanico aluvial en oposición a prácticas de cultivo en tierra seca. Además, investigamos como respuestas dramáticas a

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estrés ambiental, tales como migraciones y masacres, pudieron haber sido el resultado de estructuras sociales heredadas respecto a la tenencia de la tierra y liderazgo, y que tales respuestas persistieron en el área oriental de Mesa verde a lo largo de periodo Pueblo I

INTRODUCTION

In this paper, we investigate how early Puebloan cultures in the Upper and Middle San Juan drainages, hereafter referred to as the Eastern Mesa Verde (EMV) area, responded to climatic variability based largely on the historical foundations of their communities. Specifically we evaluate how agricultural adaptations and social organization may have influenced decision-making responses to climatic stress. The responses to the challenges presented by climatic variability seem to depend on the cultural filter of each group studied. It appears that whatever the response of the individual society, it left traces on the cultural landscape of modern Puebloan societies in the northern Southwest. These traces, illustrated through ethnographic comparisons, also inform our interpretations. We focus our lens primarily on the controlling parameters of agricultural adaptations to investigate the dynamics of demographic shifts between the late seventh through middle ninth centuries. In an area where patchy moisture regimes and shifting temperature marginality define the ecosystem, what were the limits that farmers would accept before they were compelled to make a drastic reaction—including migration, adaptation, or violence? In addition, what landscape characteristics were people looking for when they moved into a new area? We investigate how changes in temperature and drought severity significantly influenced movements of farming societies (Figure 1a), to better understand some of the complex social processes that uniquely shaped Ancestral Puebloan cultures through time.

The EMV area is divided into the Upper and Middle San Juan regions. The Upper San Juan area includes the upper Animas, Pine, Piedra, and San Juan rivers, and Largo and Gobernador washes (Figure 1a) (also see Bellorado, this issue). The Middle San Juan area includes the lower reaches of these same rivers centered around the modern town of Farmington, New Mexico. Early agriculturalists moved up and down elevational gradients in response to temperature and precipitation in search of suitable locations to reliably grow their crops. This appears to be a long-standing and fairly reliable subsistence strategy from Basketmaker II (400 B.C.–A.D.400) times onward (Bellorado 2011b; Berry 1982; Hovezak and Sesler 2006) into the late Pueblo I period (Bellorado 2007; Toll and Wilson 2000).

Our premise throughout this paper is that climate and ancient Pueblo peoples interacted most intimately on the landscape through their farming practices. Therefore, we first discuss the context of agricultural systems used in the EMV area, specifically alluvial fan verses dryland farming, to provide a

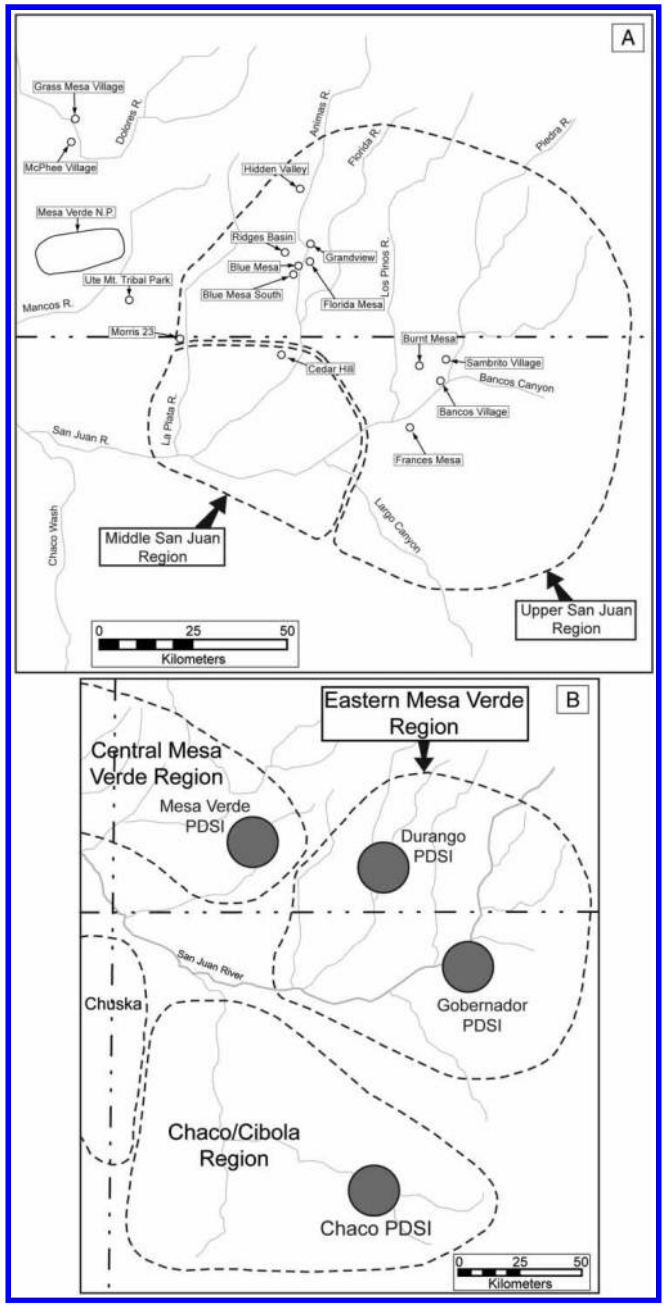

FIGURE 1. (A) The Upper and Middle San Juan portions of the Eastern Mesa Verde area with the locations of sites and areas mentioned in text; and (B) general locations of the sub-regional climatic tree-ring chronologies used to reconstruct the Palmer Drought Severity Indices (PDSI) stations used in our analyses in relation to the cultural areas of the northern Southwest discussed in text.

framework for our investigations. We next briefly discuss several ethnographic examples that inform our understanding of how some Puebloan groups may have responded to climatically induced stress and conflict. We then present how we use the paleoclimate data, dividing it into important time periods of the archaeological record in the EMV region. Finally, we attempt to integrate the complexly related entities of climate-land-people into some semblance of a cultural history of responses to climate fluctuations for the EMV. We begin, however, with a few assumptions.

A CONTEXT FOR EARLY AGRICULTURAL SYSTEMS: ASSUMPTIONS ABOUT AGRICULTURAL LIFEWAYS IN PREHISTORY

To begin our analysis, we needed to address several basic assumptions about the nature of Ancestral Puebloan lifeways, particularly as they relate to agriculture and maize farming. First, we assume the production and processing of maize yields were the central focus of energy expended by many Ancestral Puebloan groups. Coltrain et al. (2006, 2007) documented that maize likely provided up to 80 percent of annual diets in the northern Southwest since the Basketmaker II period. This long dependence on maize farming shaped the nature of agricultural strategies and crop varieties, and had profound influences on the ways Ancestral Puebloans' interpreted the world around them. As is common worldwide, secular life was inextricably tied to religious life, resulting in religious ceremonies and behavior focused on controlling weather conditions to aid the production of maize (Bunzel 1992; Ford 1972; Malotki 2000; Parsons 1966a, 1966b; Tyler 1964).

Second, we assume that prehistoric peoples had an extensive knowledge of both local and regional ecological zones and processes (Charles et al. 2006; Sesler and Hovezak 2002). That said, there were many ways to farm, and the nuances of agricultural production in particular regions varied greatly. For example, some Ancestral Puebloan groups focused on floodwater farming on alluvial fans or floodplains while others focused on dryland farming of uplands in deep loess soils and sand dunes. So while farmers in the northern Southwest undoubtedly shared many basic agricultural techniques, individual farming communities developed their own character of agricultural lifeways according to their particular ecological and social requirements. Crop varieties were developed to specific environmental niches over time with the result of enhancing the productivity of particular varieties and efficacy of specific sets of agricultural technologies, creating a dependence on these particular farming systems and crop varieties. Thus, the spatial variation of specific suites of agricultural technologies (e.g. floodplain verses dryland) should be viewed as an accumulation of culturally specific traits adapted to specific suites of environmental conditions. Tracking the temporal and spatial extent of suites of

agricultural technologies may be as useful to the studies of ancient identities and ethnicities as tracking the spatial and temporal distributions of other artifact and feature classes in the archaeological record.

Indeed, agricultural investments into landscapes represent human responses to the affects that specific environmental and climatic conditions had on their primary subsistence base. That is, the interaction of environment and climate with the at times limited parameters of social landscapes and mobility patterns, provides researchers with attributes of agricultural technologies to shed light on adaptive behaviors. Thus agricultural investments are identity markers and likely took a prominent role in shaping the identities of individual communities and their social interaction spheres. This idea, that the interaction of climate, landscape, and culture determines and forges agricultural technologies, while at the same time the limits of these agricultural technologies in turn determine societal responses to stress, forms the basis of our interpretations.

Finally, we assume that interaction among groups of people in the northern Southwest was extensive and continuous through time, and that people generally knew how much better or worse neighboring farming communities were fairing at any given time, much as Toll (2008) outlines for the Totah area specifically. Among historic Pueblo groups the perception of relative prosperity (or adversity) of a community was based on historically and religiously rooted mechanisms for viewing human's place in the world (Ford 1972, 1992; Titiev 1943).

LANDUSE BEFORE PUEBLO I

Groups that moved into the uplands of the EMV (Upper San Juan) could have originated from a variety of places including the La Plata Valley, the Central Mesa Verde area, Southern Utah, the Middle San Juan, and possibly Chaco/Cibola and the Chuska Slope areas (Dykeman 2004; Hovezak and Sesler 2006; Kearns et al. 2000; Reed 2000; Reed and Wilcox 2000). People who moved into the upper Animas River weren't carrying matching sets of cultural tool kits. For example, each group had its own ideas of how to design and build pithouses (Chuipka and Potter 2007; Potter and Yoder 2008), had different access to traded commodities such as red wares (Alison 2008), and maintained specific ethnicities, identities, and languages (Potter 2010c, 2010d). People from different areas also brought knowledge of specialized subsistence strategies including different agricultural practices (floodplain verses dryland farming), crop varieties, and differing religious traditions.

Toll and Wilson (2000, 2009) identify the Basketmaker III communities of the lower La Plata Valley as one of the primary donor populations to the Pueblo I people of the upper La Plata and Animas Valleys, based primarily on similarities in ceramic technologies and pithouse construction layout. Indeed,

there is a link between the types of environments used by the Basketmaker III communities in the lower La Plata Valley and the Durango area, namely farming of large alluvial fans. Alternatively, recent research in the Durango area documented a small but established Basketmaker III population (Bellorado 2007: 34; Charles 2011) with ties to the Fruitland area on the Colorado/New Mexico border (Sesler and Hovezak 2002). The material culture of these 'local' upper Animas Basketmaker III populations suggests they were descendants of the earlier Basketmaker II populations (Bellorado 2011a, 2011b; Charles 2011; Matson 2006; Sesler and Hovezak 2002). Sesler and Hovezak (2002), Charles et al. (2006), and Bellorado (2007) suggest that in the Upper San Juan, Basketmaker III people utilized landscapes in largely the same ways and intensities that their Basketmaker II ancestors had, but perhaps relocating more frequently and on larger tracks of the landscape.

THE ETHNOGRAPHIC RECORD AND A CAUSAL VIEW OF HUMAN-NATURE INTERACTIONS

Technological innovations and mobility were not the only tools the ancient Puebloans had to influence success or failure. Ancient peoples relied extensively on religious practices, and perhaps other more direct ways to set things right, just as many modern Puebloan groups today. The ethnographic record is rife with examples of how Pueblo peoples responded to both short- and long-term climatic and ecosystem changes historically. In many cases climate change on small and large scales were viewed causally. That is to say, changes in climate are caused primarily by direct intervention on the part of animals and humans, and ultimately ritual specialists within Pueblo communities have the ability to control many aspects of the natural world.

This causal view often conflicts with the views of the scientific community. For example, Malotki (2000) describes the Hopi association with *maahu*, the cicada (Family Cicadidae) and its power to control heat, especially during the late summer when agricultural crops need increased heat to facilitate the development and maturation of fruiting bodies. Malotki (2000: 65) notes that from the viewpoint of modern western entomology, the frequency of sound production by cicadas are directly related to temperature, as mature cicadas are especially vocal on hot days. However, "in the eyes of the Hopi, this causal relationship works exactly in the other way around: It is the insect's music that is held responsible for hot weather" (Malotki 2000: 65). Thus the cicadas' sound production causes the climate to get warmer, as opposed to the western scientific view that the increasing warmth of summer facilitates cicada growth cycles and vocalization behaviors.

For many Puebloan societies, this type of causal view of climate change and interactions in nature hold true and form the basis through which the

natural world, and human being's place within it, are viewed. Richard Ford notes that:

> San Juan [Pueblo] inhabitants do not passively witness the unfolding of natural events in chronological succession throughout the year. Instead, they believe that their actions can influence the rhythm of nature, both beneficially and adversely. They are philosophical about this; they have expectation as to what the best natural events are; and they have certain persons who can control certain natural forces. (1992: 144)

Throughout this article we use ethnographic examples like these as analogies for how prehistoric people may have viewed their role in the face of changing climates and ecosystems. We compare these analogies from the ethnographic record to models of climate change, settlement patterns, and demographic shifts in the prehistoric record of the Eastern Mesa Verde area to further our understanding of how and why people lived where they did. Having set the foundations for our discussion of the human-landscape systems, we now turn our attention towards the climate record.

FINE-GRAINED DROUGHT SEVERITY INDICES AND TEMPERATURE PROXIES FOR THE NORTHERN SOUTHWEST

Following Richard Ford's ethnoecological models of the San Juan Pueblo, we have chosen to use fine-grained annual Palmer Drought Severity Index (PDSI) (Laboratory of Tree-ring Research 2008) and temperature (Salzer and Kipfmueller 2005) reconstructions to compare 150-year periods between the described subregions, bracketing key periods of demographic change. Anderson (2008a, 2008b) has shown how regional PDSI and drought severity indices can mask important fine-grained climatic changes that affect cultural processes, processes that can be more specifically depicted in reconstructions for the subregions. For this article, we evaluate the various ways that Ancestral Puebloan cultures responded to climatic shifts for the overlapping 150 year periods: A.D. 700–850 and A.D. 800–950.

Overall, we approach Ancestral Puebloan responses to climatic change mirroring what Richard Ford discussed for San Juan Pueblo: "For each pueblo available moisture from precipitation and irrigation fluctuates unpredictably. The system must adapt to these extreme conditions and not to the deceptive mean values which are usually presented" (Ford 1972: 5). He later adds that "if we continue to merely describe the environment in terms of mean climatic factors and neglect their extremes and other vicissitudes … we miss the functions of many cultural institutions at different levels that a thorough ecological study can reveal" (Ford 1972: 17). Further, Ford also suggests that:

> One cannot understand San Juan's social organization if one merely examines the mean of each environmental factor; that is, the mean date of the first frost and last frost, the mean daily temperatures or the mean annual rainfall. These are meaningless for the people. It is the ranges and oscillations that are important. (Ford 1992: 154)

Consequently we use regional paleoclimatic reconstructions and high resolution, fine-grained annual data, and five-year moving-averages. This approach allows us to keep from missing the extremes that greater smoothing can obscure, as well as including coarse-grained smoothing for broader regional trends.

Many researchers have discussed modes of depopulation utilizing various climatic reconstructions to address questions of population movements, often using tree-ring indices that may suggest megadroughts (Benson and Berry 2009), increased climatic variability (McVickar 2004), changes in precipitation patterns (Cordell et al. 2007), arroyo down cutting (Force 2004; Force et al. 2002: Vivian et al. 2006), increased soil salination (Benson and Berry 2009), and game depletion (Potter 2009; Potter and Edwards 2008) as factors that caused Ancestal Puebloan peoples to move to other areas.

We draw upon Palmer Drought Severity Index (PDSI) data for several subregions of the northern Southwest, specifically for the Durango, Gobernador, Mesa Verde, and Chaco areas (Figure 1b). The PDSI values were calculated by the Southwest Regional Paleoclimate Project and provided by Jeff Dean (Laboratory of Tree-Ring Research 2008). We look primarily at PDSI reconstructions for the Durango and Gobernador areas compared to the Mesa Verde and Chaco subregions. We have converted PDSI values into z-scores to standardize the reconstructed values within shorter datasets of 150 year periods from A.D. 700–950. In these reconstructions, the 5-year moving averages of the PDSI z-scores that approach one standard deviation from the mean translate into significant impacts on the agricultural cycle; however, even smaller shifts in moisture levels could have had significant affects on both subsistence practices and cultural processes.

We also draw upon Salzer and Kipfmueller's (2005) temperature reconstructions from living bristlecone pine trees in the San Francisco Peaks of northern Arizona as a proxy for temperatures on the larger Colorado Plateau. We have standardized these reconstructed values by converting them into z-scores such that fluctuations of 0.5 to 1.0 standard deviation from the 150-year mean represent significant changes in the climate that would have influenced agricultural production (Salzer and Kipfmueller 2004). In these reconstructions, temperatures scores greater than one standard deviation from the 150-year mean mark extreme departures from normal temperatures and likely significantly affected agricultural production in the EMV.

ALLUVIAL FAN FARMING: THE CONTEXT OF LOCAL SUBSISTENCE STRATEGIES FOR EARLY FARMERS IN THE EASTERN MESA VERDE REGION

Leading up to the eighth century, a diversity of agricultural systems used during the Basketmaker III period likely developed throughout the northern Southwest out of a general focus on floodwater farming-based systems widespread since the Basketmaker II era (Bellorado 2011a, 2011b; Matson 1991, 2006; Vierra 2008). In the uplands of the EMV area, farming populations appear to have adapted to a specific type of floodwater farming system (similar to ak'chin farming systems), namely focusing on floodwater farming of the alluvial fans found extensively throughout the region (Bellorado 2011b). In contrast, in the Western Mesa Verde (WMV) region we see evidence that farming practices were focused on different portions of the landscape by the Basketmaker II period, with the use of dryland agriculture on mesa tops (Matson 1991; Varien 2009). Varien and others have argued that by the Basketmaker III period, populations from the WMV area moved into the Central Mesa Verde (CMV) area (Kohler et al. 2008; Varien 2008), bringing dryland farming techniques and corn varieties with them. In the CMV and WMV regions, farmers adapted and improved agricultural systems on mesa tops over the centuries leading up to the mid-700s, while in the Chaco area contemporaneous farmers were primarily using floodwater farming of alluvial fans and floodplains in the Chaco Wash drainage area (Vivian et al. 2006).

Elsewhere Bellorado (2007: 61, 2009, 2011a, 2011b) has documented that the alluvial fan focused maize farming systems in use in the uplands of the EMV (Upper San Juan) region had been developed over time to be highly adapted to the precise conditions of these environments and that the use of these specific types of agricultural landscapes could have promoted both regional cultural isolation and the development of specific social identities of peoples in these areas. Generally speaking, in the EMV area there appears to be a pattern of demographic shifts from the Basketmaker II through the Pueblo I periods, where populations moved to higher elevations during warm dry periods and to lower elevations during cooler periods (Bellorado 2011b; Sesler and Hovezak 2002). While this pattern appears focused on the distribution of alluvial fans in the EMV area, the periods in which different portions of the region would have been farmable presents a similar situation as Petersen (1988) projected for the dry farming belt, which extended across the Central and Western Mesa Verde regions. Therefore, we can surmise that dryland farmers in the WMV and CMV regions were more susceptible to changing climatic conditions that affected upland locations, whereas alluvial fan farmers in the EMV region would have been more susceptible to changing climatic conditions affecting alluvial fan agriculture. We discuss this in more detail below.

DURANGO'S CLIMATIC REFUGIA IN THE EARLY A.D. 700S

At the end of the A.D. 600s, Basketmaker peoples lived in a variety of locations in the northern Southwest. Basketmaker III populations in these diverse areas lived in communities ranging from single family hamlets to small proto-villages (Kearns et al. 2000; Reed and Wilcox 2000; Toll and Wilson 2000). Dependency on maize agriculture was widespread among all of these groups and their ability to maintain adequate subsistence levels depended directly on climatic conditions in their respective homelands. Beginning in the end of the 600s, temperatures began to fluctuate at higher frequencies then they had previously and did not stabilize until after A.D. 740. However, there were brief stints when the Durango area and other locations in the uplands of the EMV area would have been favorable to farming populations followed by extremely poor periods. Indeed, the area would have been favorable for farming between roughly A.D. 710–725 during a warm and wet spell followed by 10 to 15 years during which the region experienced the second most severe cold spell (a wet one) in the A.D. 700–850 period. During this time, observations of the five-year moving averages of PDSI levels suggest regional precipitation levels oscillated through similar patterns of mild drought to incipient wet spells in all of the Mesa Verde, Chaco, Durango, and the Gobernador subregions. Looking at the climatic reconstructions more closely (Figure 2) we see that in the early 700s the Durango area, and by extension the uplands of the larger EMV, were consistently one of the wettest in the northern Southwest even during the driest periods, while the lowland areas of the Gobernador and Chaco areas were often the driest. However, in the early half of the 740s regional temperatures increased and stabilized above the one hundred and fifty year mean until about the mid 780s. The 740s also marked a mild but pervasive drought period seen in all of the subregions of the larger Mesa Verde region during which time the uplands around what is now Durango remained wetter than the surrounding areas.

These dramatic swings in the climate in the late 600s and early 700s appear to have spurred a major demographic shift of peoples throughout the northern Southwest and pushed peoples out of areas that had been occupied for hundreds of years. These demographic shifts are evident throughout the northern Southwest but are seen in the EMV region most discernibly by the occupation hiatus between the densely occupied communities of Basketmaker III and Pueblo II period occupations of the lower La Plata River valley when the people of the area likely moved into the uplands above 6,000 ft (Wilson and Toll 2009). Indeed, throughout the northern Southwest, beginning in the early to middle 700s, populations moved into several areas that had little or no previous occupation prior to the early Pueblo I period (Wilshusen 1995).

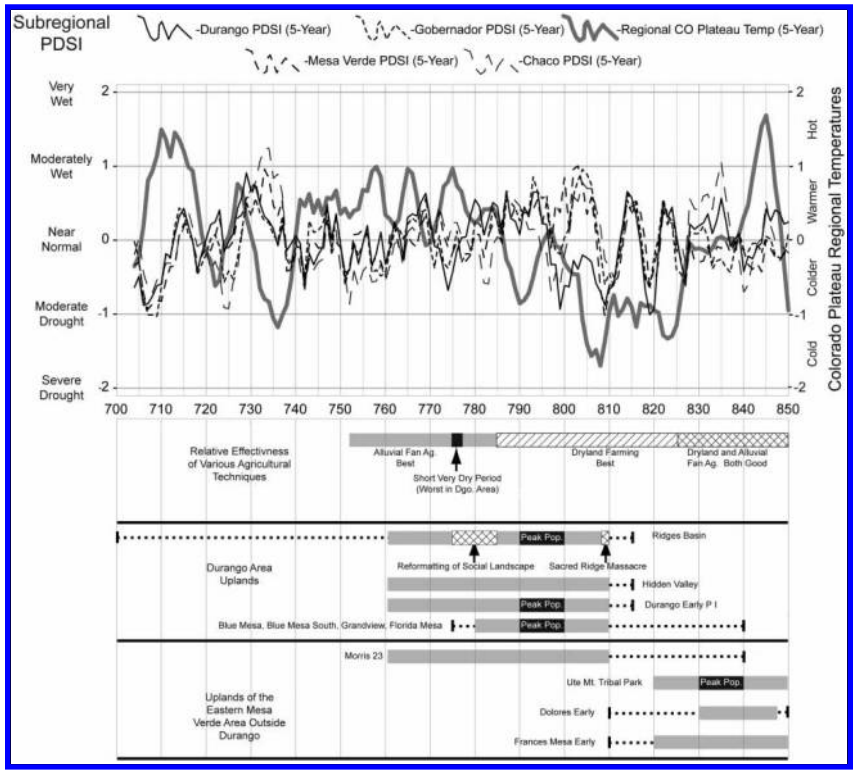

FIGURE 2. Paleoclimatic reconstructions for the A.D. 700–850 period and date ranges for select sites in Eastern and Central Mesa Verde and Chaco Subregions.

In the late 600s and early 700s the upper reaches of the Animas River drainage became a refugia for Ancestral Puebloan peoples during a region-wide drought in much the way that Berry (1982) has suggested. Bellorado (2007, 2011b) and Hovezak and Sesler (2006) have demonstrated that initially the peoples who moved into these areas maintained a similar type of settlement selection criteria as they had used in their homelands for generations previous to their movement into the Durango area. Thus, the basic layout of each habitation unit appears little changed from the earlier Basketmaker II period, with families living in single household residential units centering on one to two pithouses with an assortment of small surface storage features. That being said, the population levels of the migrants of people into the Durango area took place on a scale previously unknown in both the uplands of the EMV area and within the larger northern Southwest. So while individual families set up hamlets in the same way they had in their previous homelands, they did so in larger

numbers, clustering single-family household settlements in the patchy agricultural zones of the upland environments of the EMV region.

THE EARLIEST VILLAGES IN THE EASTERN MESA VERDE AND THE BASIS OF LEADERSHIP AND LAND TENURE IN THE DURANGO AREA

The initial arrivals to a place often establish what Potter (2010d) calls a primocracy, where the first pioneers into an area maintain a certain prestige and control of natural resources around a community. As other groups join, they are assigned certain roles in the society and access to resources, but the first comers maintain the control of the most sought after resources:

> As other groups came to settle in the village, the *kikmongwi* assigned them farmlands, in return for which they contributed a ceremony or some ceremonial function that benefited the village as a whole. The earliest arrivals received some of the best lands and also "owned" the most important ceremonies. The last arrivals received no land at all; nor were their contributions to the ceremonial cycle very great. If tradition reflects reality, the rank of any given clan ought to be based both on the quality of the land and on the ceremony it controlled. (Levy 1992: 33)

In the Durango area, it appears that some of the first comers who migrated into the area in the mid-700s may have derived from a local stock of peoples familiar with the best wild plant and animal resource areas and farmlands, and with the knowledge of the settlement patterns appropriate to the local area (Bellorado 2007, 2011b). Indeed, some of these groups may have been the descendants of the local Los Pinos and Sambrito phase Basketmaker II and III (see Bellorado, this issue Table 1) farming populations that had moved in and out of the Durango and the Upper and Middle San Juan areas for over a millennia (Sesler and Hovezak 2002, 2009, 2011). Continuities in house layout and construction technique (Potter 2010c; Potter and Yoder 2008), proximity to earlier Basketmaker II farmsteads (Potter and Chuipka 2007), sandal constructions style (Webster 2009), and site selection criteria for specific agricultural settings (Bellorado 2007: 261, 2009, 2011a, 2011b); suggest that at least some of the first peoples to migrate into the larger Durango area in the mid-700s identified, asserted, and maintained themselves as the peoples "local" to the larger Durango area. This allowed them to assert a tenured, historically rooted claim to the control of the prime agricultural lands and other resources through an ancestral tie to the place. Indeed, Potter and Yoder note that:

> One of the most effective ways to legitimize one's claim to a landscape and create an identity that is rooted in tradition is to reference the remote past through

> architectural style, effectively signaling a historical connection—whether real or fictive—to place. (Potter and Yoder 2008: 29)

Ridges Basin and Hidden Valley are two important sites in the Durango area that feature prominently in our discussions (Figure 1a). At both Ridges Basin (Figure 3) and Hidden Valley the earliest Ancestral Puebloan occupations occurred at several Basketmaker II habitation sites (Charles et al. 2006; Fuller 1988; Potter 2010a) set on ridges or in alcoves above large alluvial fans (Figure 1a). Potter (2010b) notes that the earliest Pueblo I constructions in Ridges Basin likely occurred between A.D. 700–750 at Sacred Ridge and 5LP185, in the North-Central cluster. Within this 50-year span, climatic data suggests that the decade surrounding the 730s would have been the most favorable for maize farming. This brief wet and warm period likely pulled occupants into these favorable settings (Figure 2).

The migrants who staked their claim to the land around the North-Central site cluster in Ridges Basin (Figure 3b) settled on one of the large alluvial fans

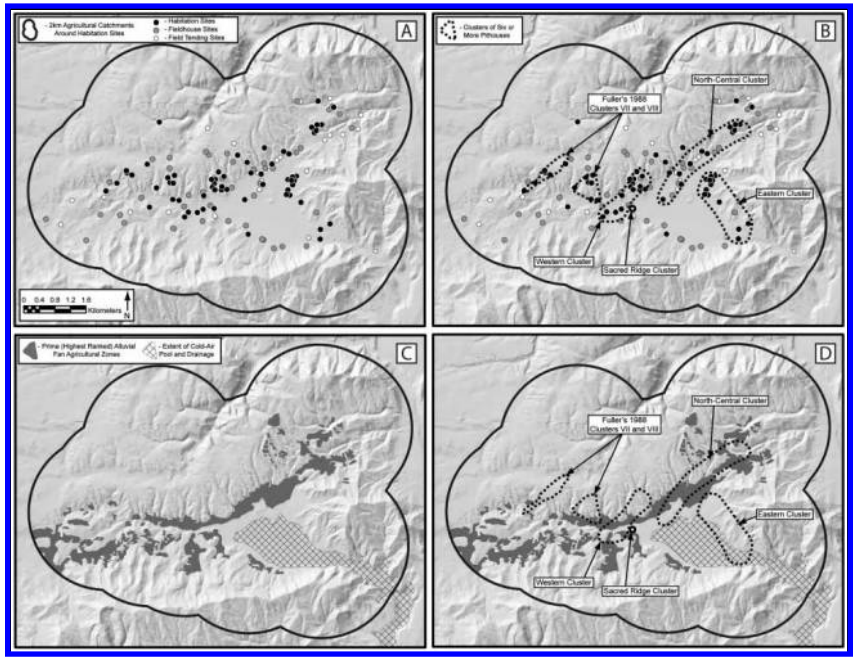

FIGURE 3. The Ridges Basin study area in relation to (A) all habitation, field house, and field tending sites within 2 km catchment buffers identified by Bellorado (2007); (B) Habitation clusters mentioned in text; (C) Primary (highest ranked) alluvial fan agricultural zones and cold-air pool extent; (D) habitation clusters in relation to prime alluvial fan agricultural zones and cold-air pool extent.

that had been the focus of earlier Basketmaker II sites, apparently establishing themselves as the descendants of these earlier groups. On the other side of Ridges Basin, early constructions on the Sacred Ridge hill top dating between A.D. 700–750 (Potter and Chuipka 2007) were not as old as the Basketmaker II sites near the North-Central cluster. Nonetheless, these early Pueblo I habitations appear to have provided the post-A.D. 760 occupants of Sacred Ridge with a sufficiently legitimate claim to stake a controlling share of the various resources available in Ridges Basin. Thus, the first comer status associated with these earliest constructions in Ridges Basin likely formed the basis for the primocracy that appears to have allowed the residents of Sacred Ridge and the North-Central cluster to enjoy some status in their control of the best agricultural lands (Bellorado 2007: 243, 2011b; Potter 2010d). At the same time several miles to the north in Hidden Valley (Figure 1a), another cluster of pithouses was built in close proximity to earlier Basketmaker II sites (at the Falls Creek Rock Shelters and Talus Village) and Basketmaker III sites (Bellorado 2007, 2009, 2011a, 2011b) laying claim to similar expanses of large alluvial fans as found in Ridges Basin. Indeed, throughout the larger Durango area it appears that many of the most productive agricultural zones were settled at this time by family or kin groups who settled in small clusters of roughly 6–8 pit structures (Bellorado 2007: 241–245, Chuipka 2008a; Potter 2010d). Wilshusen et al. (2000) have demonstrated that contemporaneously, early Rosa Phase (see Bellorado, this issue Table 1) populations throughout the uplands of the EMV settled in ecological niches similar to those selected by occupants of the Durango area and similar to locations occupied by Los Pinos Phase Basketmaker II peoples several centuries earlier. It is difficult to understand what made the upland valleys of the Animas River drainage any better than other upland areas of the EMV area. For example, the Gobernador area had a nearly identical climate during this time. But concurrently throughout the uplands of the larger region, other Rosa Phase peoples settled (or resettled if they were local to the EMV region) in similar ecological zones, though in fewer numbers (Hovezak and Sesler 2006).

Levy (1992) documents that for the Hopi, ownership of the most consistently productive lands by specific lineages, kin groups, or ethnic groups did more than provide its occupants with a secure access to sufficient quantities of food. It also allowed them a foothold by which they could attain social status by controlling both the access to economic resources as well as by attaining position in the ceremonial ranking of the community. Levy continues by suggesting that "the quality of the land controlled by a clan was shown to be positively associated with the number of ceremonies and offices it controlled, making it possible to define the social strata in ceremonial rather than economic life (Levy 1992: 156). Further, Lyons (2003) adds that for the people of Orayvi:

> At the risk of over simplification, the best agricultural lands (with access to sufficient water for agriculture) and clan ceremonial knowledge and paraphernalia are controlled by a single household in the prime lineage of a clan. Clans also have differential access to resources based on political power rooted in or symbolized by ceremonial rank and putative order of arrival. (Lyons 2003: 95)

In the case of the occupants of the loosely scattered North-Central cluster in Ridges Basin, site selection criteria was directed at locating places where alluvial fan maize farming, a system that had been used reliably for a millenia (Bellorado 2011a, 2011b) could be implemented (Figure 3d). Berdan (2008) notes that the use of common technologies, such as the knowledge of how to farm alluvial fans and to utilize the locally adapted seeds, is a potential marker of common ethnicity within a group. Recent experimental maize farming research has shown that these agricultural zones were the best in Ridges Basin for maize farming with regard to available moisture, soil texture, nutrient recharge, growing season length, and available heat throughout the growing season of corn (Anderson 2008a, 2008b; Anderson and Bellorado 2009; Bellorado 2007: 209, 2009).

The single aggregated village and largest site in Ridges Basin, the Sacred Ridge cluster (Figure 3b), is situated to take advantage of a great number of natural resources (Chuipka 2008a), including some of the most prime agricultural lands (Bellorado 2007: 242–247, 2009) (Figure 3d) and other wild plant resource communities (Adams and Reeder 2009). Chuipka (2008a, 2008b) also notes that villages throughout the Mesa Verde Region appear situated to make claims on major resources. However, the agricultural lands situated nearest to the Sacred Ridge cluster are more susceptible to short growing seasons and are near to the cold-air drainage pool at the center of the basin (Bellorado 2007: 245, 2009). Evidence of the relative success of the inhabitants of the Sacred Ridge village and amassing of prestige within the larger Ridges Basin community is evident in their relatively better access to faunal resources, the construction of the ridge top complex that housed a tower and large storage facilities, and the oversized pit structures found throughout the site (Potter and Chuipka 2007).

While Bellorado (2007: Table 7.1, 2009) notes the large amount of agricultural lands in Ridges Basin would have provided even peak momentary population estimates with enough land to subsist, this is assuming that the resource was shared somewhat equally amongst the larger Ridges Basin population. It seems likely that the residents of Sacred Ridge and the North-Central Cluster would have been in a somewhat competitive relationship regarding access to the prime agricultural lands (Figure 3d), as both clusters appear to highly value the large alluvial fans. The Eastern Cluster, however, was situated on the worst farm lands in Ridges Basin (Anderson 2008a, 2008b; Bellorado

2007: 242–247, 2009) and likely would have forced these residents to obtain sufficient quantities of agricultural products through other methods. This competition over agricultural lands could be one of the issues of contention that developed between the different ethnic groups represented by the different site clusters in Ridges Basin. It is likely that the different ethnic groups in the clusters had differential access to the farmlands and crop yields, based on their rank within the primocracy.

The climatic data for the period clearly shows a major downturn in the early A.D. 800s that was significant in terms of both temperature and precipitation departures (Figure 2). For early villagers, particularly those with limited storage potential (Anderson, 2008b), these events would have been devastating to the local economy and by extension the social structure of the community. Particularly during these times of stress, social pressure would have been placed on the leaders and ritual specialists of the community in all its facets and among all of the larger community's various segments. Potter and Chuipka (2010) document ethnic conflict as the primary motivator of a massacre that occurred at the Sacred Ridge site in the early 800s. They note that this massacre, or Extreme Processing (EP) event was likely the culminating event in historically rooted patterns of ethnic strife. It is interesting that this event occurred during this major climatic downturn.

Further, Potter and Chuipka (2010) suggest that ethnic conflict culminated in the massacre where a small village-sized population, likely the inhabitants of the Sacred Ridge were brutally killed, mutilated, buried in a pithouse, and then burned. We must ask why these people were the target of this attack and not the residents of another of the site clusters in the basin? The answer likely lies in the visible hierarchy and relative wealth established by the residents of Sacred Ridge and the likelihood that large community integrating rituals and communal storage occurred there (Potter et al. 2012).

Research has shown that throughout the pueblo sequence, peoples of Upper San Juan descent routinely reject various types of social change from outside the region (Bellorado, this issue; Borck 2012; Chuipka and Fetterman, this issue; L. Reed 2006, 2009). In the EMV, the type of social hierarchy that developed at Sacred Ridge had never been witnessed previously. At least some of the ritual specialists at the peak of the political hierarchy in Ridges Basin appear to have lived at the Sacred Ridge site. Potter (2010d) suggests that a unique ritual hierarchy, and even a specific ritual, appear to have developed at Sacred Ridge that involved the use of a multistoried tower and an oversized (possibly communal) storage structure. Larger pit structures were also constructed around a central monumental core and indicate that an intricate ritual system was in place in Ridges Basin before the community splintered, and before the Durango area became depopulated.

The ethnographic record in the American Southwest is strewn with references to the idea that control of the weather was one of the primary foci of

ritual systems (Ford 1972, 1992; Levy 1992; Lyons 2003; Parsons 1966a, 1966b; Titiev 1943). Ritual specialists were often the leaders of Ancestral Puebloan communities (Judge and Cordell 2006), and their social and political power were influenced by their ability to effectively control environmental and climatic factors for the benefit of the people of their community. The ability of these specialists to convince their communities of their power and ritual prowess depended on their ability to negotiate the social institutions of their time (Potter and Perry 2000).

EMERGING IDENTITIES IN THE FACE OF CONTACT AND COMPETITION: RIDGES BASIN AFTER A.D. 775

Potter and Yoder (2008: 29) note that, right around A.D. 780, pit structures throughout Ridges Basin were "smaller, more variable [in layout], and mostly unburned at abandonment," but that after about A.D. 780, "many of these smaller, more diverse structures were abandoned" and replaced with larger and more uniform houses that, "emulated the style of larger pit structures at the Sacred Ridge site." This reformatting of the social landscape, as Potter and Yoder (2008) call it, indicates that the village of Sacred Ridge had become the primary focal point of the early Pueblo I community in Ridges Basin. This basin-wide change was accompanied by the construction of communal architecture at the site of Sacred Ridge (Potter and Chuipka 2007; Potter and Yoder 2008) (Figure 3b). These efforts may have been an attempt to usurp, enhance, or legitimize the Sacred Ridge occupants claim to primary agricultural lands within Ridges Basin and possibly resources beyond the boundaries of the basin. It appears that these efforts were successful.

This move to secure power at Sacred Ridge may have been spurred by a response to a decade and a half long dry spell that stretched from the late 760s to about 780 and affected the Durango and Gobernador areas most severely (Figure 2). Given the high rank of the people in the North-Central cluster of Ridges Basin on the best agricultural lands, it seems likely that these people also enjoyed higher ceremonial status. If the assumption is correct that the people occupying the North-Central cluster were indeed perceived as "local" to the Upper San Juan area (as discussed above), then we can assume that the rituals they controlled were also seen as "local" and were likely focused on creating and maintaining the climatic, agricultural, and overall good living conditions that were best suited for agricultural lifeways in the Upper San Juan. Contrastingly, the groups inhabiting the Sacred Ridge site appear to have had ties to populations further to the west (Alison 2008; Potter 2010c), and thus their ceremonies may have been structured somewhat differently from those local to the Upper San Juan. This situation may have created competition in the ritual cycle in Ridges Basin when the Durango area

became relatively worse to farm than it was in neighboring subregions (especially those to the west). The people of the larger Ridges Basin community may have felt that the ceremonial rank afforded to their "local" minority had been misplaced. Possibly then, the competing ritual specialists and/or leaders at Sacred Ridge took advantage of this political situation to seize control of land tenure and ritual systems in Ridges Basin. Climatic amelioration in the late A.D. 770s may have stabilized and reinforced the correctness of the Sacred Ridge community's power grab in the eyes of the inhabitants of Ridges Basin and possibly the larger Durango area. Indeed, Potter and Yoder (2008: 30) suggest that, "during this later phase, structures thus became more standardized in appearance as each house cluster signaled its shared identity with Sacred Ridge by building houses of a more formal style."

While agricultural yields during the first two decades would likely have ranged between adequate and good, around A.D. 785 we see a downturn in the climate of the region when temperatures cooled gradually. A very cold year in A.D. 804 marked the beginning of 25 years of climatic downturn in overall temperatures. During the general downturn in regional temperatures there is a sharp downturn in the PDSI levels in the mid-A.D. 790s (Figure 2). The uplands of the EMV, via the Durango area, as well as the Chaco area would have been much drier than other portions of this study area. Eddy (1968: 57) noted that this period was also concurrent with a shift to a summer dominate rainfall regime in the Upper San Juan that brought short-lived, but violent, thunderstorms and flash floods, all factors that negatively affected alluvial fan farming. At the same time though, the Gobernador and Mesa Verde areas would have been wetter and remained so into the first decade of the A.D. 800s.

There is a suggestion of alternative leadership and land tenure strategies from communities close to Ridges Basin, namely at Blue Mesa and Grandview Mesa (Figure 4a), that provide a conflicting perspective on cause and effect. The general cooling, drying, and flooding period appears to coincide with building episodes on Blue Mesa (Chuipka and Potter 2007) and Grandview Mesa (Chuipka 2008b) around A.D. 775. The primary agricultural soils in these areas would have supported farming in both dryland and alluvial fan settings, thus expanding farmable areas beyond the alluvial fan focused system only.

Dryland agricultural systems were probably not developed in the Durango area, even though local Basketmaker III populations might have experimented with dryland farming strategies to a limited extent (Sesler and Hovezak 2002). However, some of the groups of migrants that entered the area after A.D. 760 appear to have brought a suite of dryland maize farming practices and potentially new corn varieties to the Durango area. While this may seem an innocuous act, it would have a lasting influence on Ancestral Puebloan lifeways ever after.

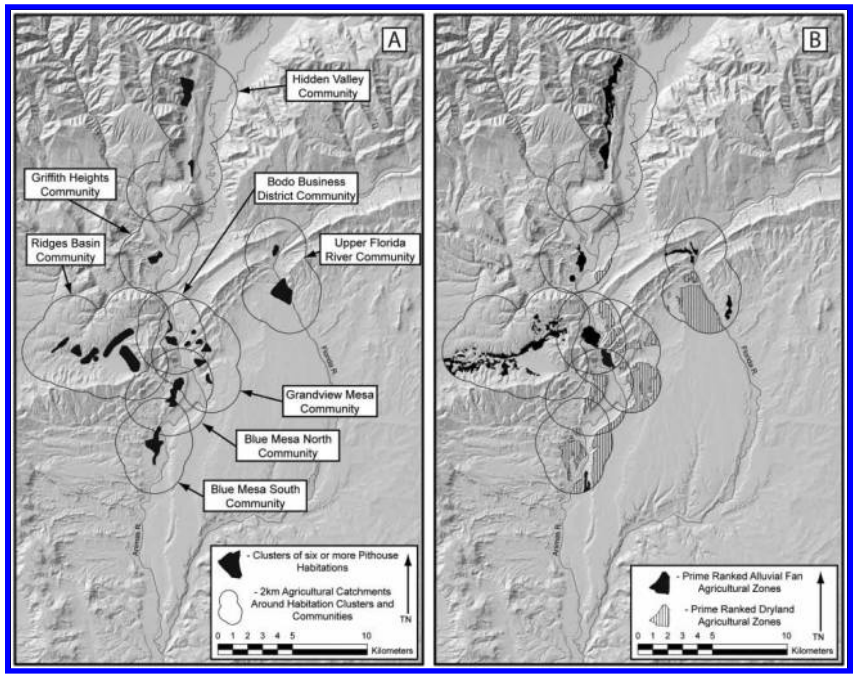

FIGURE 4. (A) Community clusters of six or more habitations and (B) prime (highest ranked) alluvial fan and dryland agricultural zones within 2 km catchments in the larger Durango area defined by Bellorado (2007, 2009) and mentioned in text.

THE EXPANSION OF DRYLAND FARMING AND ITS AFFECTS ON LEADERSHIP AND LAND TENURE IN THE DURANGO AREA

Analysis of potential agricultural landscapes in relation to known Basketmaker III and Pueblo I settlements in the larger Durango area by Bellorado (2007: Figure 7.5) outlined the character of potential alluvial fan and dryland farmlands in the uplands of the EMV region (Figure 5a and b). This research suggests that the use of dryland adapted agricultural techniques and maize varieties would have opened up new portions of the landscape for use as farmlands.

Dryland farming would have been available on the low mesa tops and benches along the Animas and Florida Rivers throughout the Durango area (Figure 4b). These areas offered access to deep well-drained soils that would have been less susceptible to cold-air drainage and flash-flooding (Figure 5b). These newly available farmlands would have been less susceptible to the periodic declines in annual temperatures than in the perched basins of Hidden Valley and Ridges Basin (Figure 4). However, the dryland fields were watered

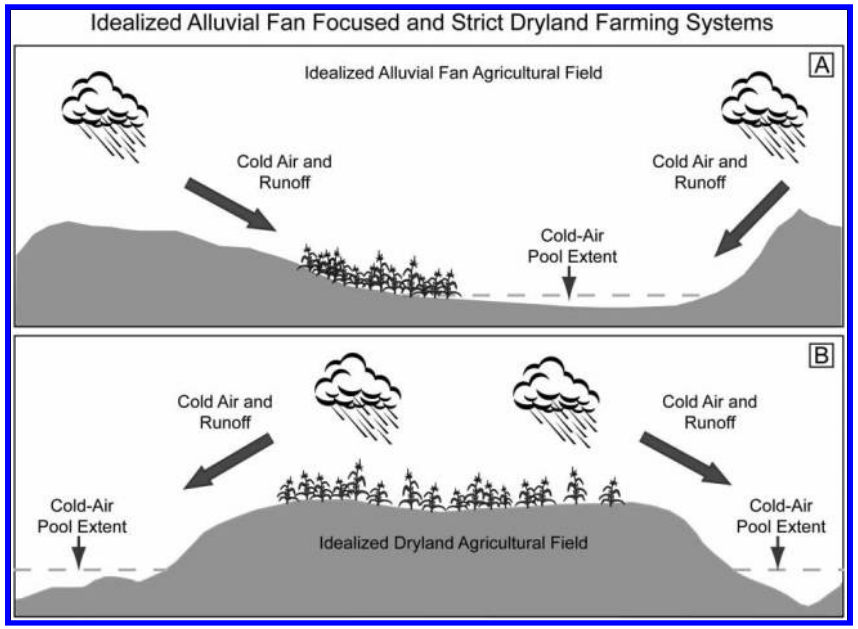

FIGURE 5. Idealized cross-sections of the types of landforms that support alluvial fan and strict dryland agricultural systems described in text. (A) Displays an idealized cross-section of an alluvial fan focused farming system. (B) Displays an idealized cross-section of a strict dryland farming system. Note that the alluvial fan systems receive more moisture but are prone to cold-air drainage and cold-air pooling problems, while strict dryland farming systems have access to less moisture but are not affected by cold-air drainage and pooling.

solely through direct precipitation making them more susceptible to drought conditions (Figure 5b).

The incorporation of the dryland fields expanded the farming base outside of the traditionally used alluvial fan focused farming systems (Figure 3d) and may have provided an alternative to the emerging stratified power structure rising at Sacred Ridge (Figure 4a). Looking again to Sacred Ridge, Chuipka (2009) suggests that a political hierarchy was likely developing that was more network oriented, and likely used a visible leadership strategy with a more entrenched/institutionalized stratification of the leadership.

The early Pueblo I village on Blue Mesa was one of the largest in the Durango area, dating between A.D. 760–810. Like Ridges Basin it likely developed quickly and reached its largest population in the 790s (Potter and Chuipka 2007) (Figure 2 and 4a). Chuipka (2009) suggests that unlike Sacred Ridge, the layout of the community at Blue Mesa suggests residents were more corporate oriented, less likely to have used a visible leadership strategy, and had a much less entrenched/institutionalized stratification of the leadership

over the larger mesa top community. Bellorado (2007: 251) notes that many of the Pueblo I sites in the larger Durango area that date between A.D 775–810 were situated to take advantage of both dryland and alluvial fan maize farmlands, including the Blue Mesa South, Grandview Mesa, and Upper Florida River communities (Figure 4a and b).

There is little evidence of investment in building field modifications such as check dams, diversion dams, or irrigation throughout the Durango area, and regionally in the Pueblo I period (Bellorado 2007: 99). However, sometime during the Pueblo I occupation, field house sites begin to be built and used "to make a statement about ownership or land tenure" and that "it would be expected that they would be most common when ownership might be contested" (Chuipka 2008b: 7–23). Many field house sites occur throughout the Durango area (Bellorado 2007: 148), and it appears likely that they were established to visually create a means by which specific farmers or groups could mark their claims to specific tracts of "owned" farmlands in much the same way as Earle (1997) documented for the contested agricultural landscapes among precontact Hawaiian populations.

While the landscapes outside of Ridges Basin were being claimed by various social groups after about A.D. 780, major social changes were also taking place within the basin on a landscape scale. Potter and Yoder (2008) documented a reformatting of the social landscape that appears to have established the larger Ridges Basin community as a single, cohesive, and possibly intimidating community among the larger areas populations. Outside of the Sacred Ridge village this occurred with the destruction and burning of several of the more variable style of pithouse construction layouts, several violent deaths, and the construction of several new pithouses which followed a more uniform layout (Potter and Chuipka 2007). Within Sacred Ridge, several new oversized and standardized pithouses were built around the base of the hill top complex. This series of events that began around A.D. 775 also appear to have had the affect of reformatting the land tenure and religious systems in the basin, indicating that Sacred Ridge had taken a more direct control over the Ridges Basin communities' economic and social resources.

THE FAILURE OF SACRED RIDGE

In the Durango villages, the cultural mechanisms in place to negotiate times of climatic stress in the large, newly formed communities appear to have failed near A.D. 810, conspicuously concurrent with the Sacred Ridge massacre (Potter and Chuipka 2007; Potter and Yoder 2008). Within a few years almost the entire Durango area was abandoned (Bellorado 2007: 158, 264; Chuipka and Potter 2007: 237; Potter and Yoder 2008: 39). So the questions need to be asked: Did the failure of the Sacred Ridge community, and the collapse of Ridges

Basin society, herald a new era in the importance of land tenure and social hierarchy? Can we really attribute this to changes brought about by agricultural strategies: e.g. floodwater verses dryland farming?

Here we may see some of the ways Puebloans perceived and reacted to random changes in the climate, and how at times people sought desperately to influence these conditions. Again Ford (1992: 144) noted that historically the inhabitants of San Juan Pueblo believed that their "actions can influence the rhythm of nature, both beneficially and adversely," and that ritual specialists "can control certain natural forces." So, when climatic conditions favorable for alluvial fan agriculture declined drastically, those who ceremonially controlled these "natural forces," might have been perceived to have failed. Indeed, Titiev notes that, "even the highest officers in a pueblo may be accused of witchcraft, sometimes for no better reason than they hold positions of such extraordinary importance." In other cases "village chiefs may be accused of being two-hearted [witches] whenever anything goes wrong" (1943: 553).

The concurrent timing of the Sacred Ridge massacre, the collapse of the early Pueblo I communities throughout the Durango area, and one of the longest cold periods on record, may also inform us about the nature of the ceremonial structure in use in Ridges Basin (centered on Sacred Ridge) and those in use in the dryland farming focused communities along the Animas River corridor (Figure 4a and b). By looking at the conditions in which these systems failed we can better gauge what they were originally designed to produce. Bellorado (2007: Table 6.5) has shown that in Ridges Basin, the prime agricultural lands and agricultural focus were on the large alluvial fans that were most limited by growing season lengths and the accumulation of sufficient heat to bring crops to maturity—due to cold-air drainage patterns and the limiting affects of high elevation farming. The ritual and social hierarchy, whatever its complexity, developed directly in association with these limiting conditions and were likely geared around bringing and maintaining the warmth of summer during the maize growing season. Based on the inferred social structure that Chuipka (2009) and Potter (2010d) have argued for the Sacred Ridge village and larger Ridges Basin community, it is also likely that the power these ritual specialists held over the surrounding communities, and their control over the prime agricultural lands and their harvests, lay in the specialists ability to maintain favorable conditions for farming.

The communities that focused on dryland farming situations outside of Ridges Basin and Hidden Valley (Figure 4a and b), however, would have had less need of ritual systems focused on bringing sufficient heat in favor of rites designed around bringing sufficient moisture to bring crops to maturity. Therefore, there may have been competition of the various ritual systems that held the early Pueblo I villages together in the Durango area. People farming in areas that focused on alluvial fan farmlands needed the climate to produce a specific set of

results whereas the farmers of the dryland field needed a different set of outcomes over the development of each growing season. Consequently, when conditions a ritual specialist was seeking occurred, that specialist was deemed more favorably than when conditions did not. This also afforded the lineage and ethnic group associated with that ritual specialist greater (or lesser) prestige as the climate waxed and waned. Further, if the causal view of the world and its occurrences was already imbedded in Puebloan mentalities by the early Pueblo I period, a ritual specialist would have also been held responsible if climatic conditions became too dire.

Ethnographic accounts of pueblo peoples have documented how Eastern Puebloan groups thought about climate change and what factors in their social landscapes caused these changes. Often, the leaders of a community were blamed for nearly all types of bad luck, especially concerning small- and large-scale climatic changes. Commonly, the changes that affect the agricultural cycle and ultimately interferences in the pursuit of obtaining sufficient corn supplies, such as droughts, wind storms, hail storms, flash floods, late or early frosts, insect infestations, early snows, and cold snaps were blamed on the ritual specialist and political leaders of a community.

> The annual cycle of works by the Made People [community leaders and ritual specialists] influences and brings forth specific events in nature, e.g., bringing the leaves to life. Destructive frosts, floods, and other events are attributed to the improper performance of these works. Similarly, if the Summer Headman eats fresh food before the Early Harvest, he threatens the bell-being of the society because grasshoppers will eat the crops. Individuals who do not follow the customs are threatened by the loss of crops through insect or flood damage while their ritually correct neighbors are not. (Ford 1992: 146)

Worldwide, ritual specialists are particularly susceptible to being distrusted within their communities. Mair (1969) suggests that with their ability to affect the world for good, these specialists also posses the ability to affect the world in less favorable ways. Titiev adds that "because of the close connection between sorcery and curing all medicine men are regarded with a mixture of respect and fear" (1943: 552).

Out of the ordinary occurrences and events are often blamed on ritual specialists and community leaders, which can be seen as the effect of ritual practitioners working intentionally to cause harm, being solely incompetent, or acting in socially unacceptable ways, and the resulting social consequences and backlash could be dire. Often, the more powerful a ritual specialist was perceived to be, the more they were mistrusted. Thus, a deep mistrust of ritual specialists likely existed, particularly between ethnic groups within a particular community. In extreme cases, community members and/or competing ritual

specialists accuse individuals of misusing their power, of being witches or two-hearteds (Ford 1972; Ortiz 1969; Parsons 1966a, 1966b; Simmons 1974; Titiev 1943). These individuals are then subject to justice, often through some kind of trial. If they are found guilty by the community then death may result (Triadan 2006). Titiev adds that, "Successful shamans … are well paid, and are very clever in taking advantage of Hopi beliefs by blaming their failures on the work of powerful witches over whom they have no control" (1943: 553).

These ethnographic accounts, combined with the paleoclimatic and settlement patterns in Ridges Basin; indicate that in the face of ever worsening conditions for farming, the ritual specialists and leaders (and their lineages or ethnic groups) who controlled the village of Sacred Ridge and exerted its tenured claim to restricted resources and the best agricultural lands in Ridges Basin, was no longer legitimate. This may have led ultimately to the large massacre event at Sacred Ridge around A.D. 810 (Potter and Yoder 2008: 38). Indeed, it is possible that these individuals were assigned the blame for the hardships in Ridges Basin and possibly Durango area as a whole. Whatever the cause, this extreme social breakdown at Sacred Ridge appears to have made the remaining early Pueblo I occupants in the eastern uplands consider other options, in other parts of the region and with other social structures. The newly developing alternative leadership and community organization strategies that the villages centered on Blue Mesa, Florida Mesa, and Grandview Mesa, may have provided a model by which the migrants out of the Durango area could use in these new areas. The new organization may have been along the vain of Berry's (1982) assertion that forced contact between diverse cultural groups in upland refugia shaped cultural transformations and presaged the development of new integrative mechanisms in these newly forged societies. Following the depopulation of the Durango area in the early 800s, we see several more shifts of people from lowlands to uplands and back within the EMV, each time their movements mirroring the pattern established in the Early Pueblo I. However, the Durango area specifically was never intensively populated again by Puebloan groups (Bellorado 2007: 182; Potter and Yoder 2008: 38).

POST-DURANGO VILLAGES IN THE EAST: CLIMATE, SOCIAL ORGANIZATION, AND CULTURAL RESPONSES OF CLIMATE SHIFTS

The collapse of the early Pueblo I villages in the Durango area appears to have prompted a large scale demographic shift throughout the Upper San Juan area, particularly in the Durango area. These occurred on only a slightly smaller scale than the population migrations into the upper Animas that had initially spawned the formation of the early Pueblo I villages in Durango. When these peoples left the upper Animas they carried social identities that had grown and developed in the specific social and atmospheric climate of

the Durango area. Consequently a unique set of cultural baggage likely guided their site selection criteria in their target destinations, particularly their uniquely Upper San Juan style of alluvial fan focused agricultural systems recently infused with the knowledge and technologies of dryland farming systems.

During the extended cold period in the early A.D. 800s (Figure 6), it seems likely that migrants from the Durango area would have been looking for areas that allowed for a more dryland farming focused subsistence or a hybrid of both alluvial fan and dryland farming systems. The destinations of these migrating populations has been suggested by several researchers (Bellorado 2007: 282; Chuipka 2007; Potter 2010d; Potter et al. 2012; Wilshusen 2009).

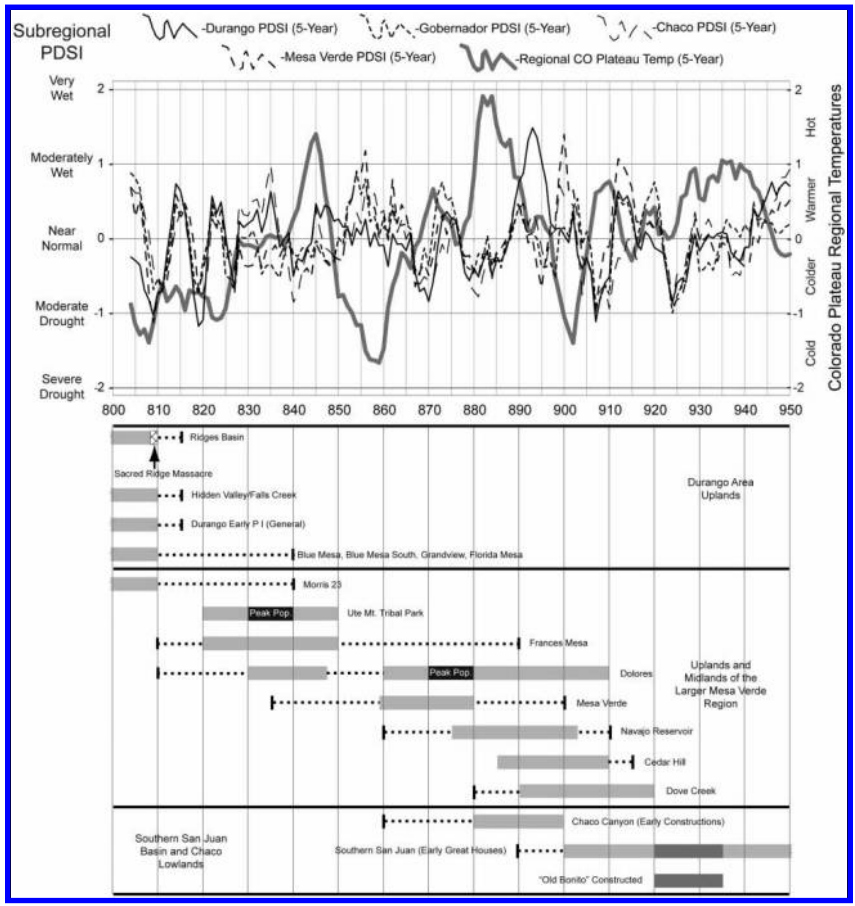

FIGURE 6. Paleoclimatic reconstructions for the A.D. 800–950 period and date ranges for select sites in Eastern and Central Mesa Verde and Chaco Subregions.

Target areas were likely generally warmer than the uplands of Durango in areas where cold-air pooling and drainage was minimized. Throughout this time of overall cooling, upland valleys of the larger EMV would have been too cold to farm, and we see a shift of new settlements to areas with primarily dryland farming settings, for example at Grass Mesa Village in the Dolores area (Wilshusen and Ortman 1999), the Ute Tribal Park on the mesa tops above Mancos Canyon (Wilshusen and Blinman 1992), and Frances Mesa in New Mexico (Potter et al. 2012; Wilshusen et al. 2000) (Figure 1a). Importantly, in these new settlements people were choosing almost strictly dryland farming situations on the landscape.

By and large, these various ideas propose that the eastern highlands of the Upper San Juan east of the Animas drainage were the immediate target for these peoples, based on similarities in material culture remains, community layout, and patterns of resource use. Additionally, Wilshusen and Ortman (1999) have suggested that some of the early settlers in the Grass Mesa Village community in the Dolores area were of Upper San Juan descent based on similarities in community layout and material culture. More importantly, however, these are strictly dryland farming areas that dominated Puebloan cultural landscapes in the EMV between about A.D. 820–850.

After the region emerged from a very cold spell at the beginning of the 800s, annual temperatures ameliorated briefly in the mid-A.D. 820s and increased until around A.D. 840. In this situation the dryland farmland areas sought after the migration out of Durango, would have become increasingly stable in terms of both precipitation and temperature and allowed farmers to plant at higher elevation fields and in valleys where the extents of cold-air drainage may have subsided. The overall conditions would have allowed farmers to expand onto previously unusable agricultural zones around their villages (Figure 6).

Around A.D. 850 there is another steep downturn in temperatures until the 870s followed by a dramatic increase in temperatures into the 890s and a gradual 20-year decrease until just before when the region would have been very cold for about a decade. Simultaneously PDSI indices show that the entire northern Southwest, including the Gobernador area, were getting wetter as well, while the Durango area remained the driest in the region until the A.D. 860s. In this situation, farmlands at the upland/lowland border (midland elevations) would have likely faired the best in the EMV region as the uplands were again too cold to farm and the lowlands may have been too dry. Interestingly, between A.D. 840–880 Wilshusen notes that numerous villages were established in the CMV area, and several in the EMV area (1995: Figure 6.10) that were "typically in upland settings between 2000 m (6560 ft.) and 2200 m (7380 ft.) in elevation" (1995: 73). In the east, Eddy (1974) suggests that populations may have moved upstream along the San Juan River

between A.D. 800–900, farming on terraces and alluvial fans where they could gain an adequate mix of sufficient moisture and heat for their crops.

During this downturn in temperatures we see a shift of populations to lower elevations where lower annual temperatures would have had a smaller influence on maize farming. This shift occurred in the Dolores and Chaco areas and in the Navajo Reservoir district. Lower elevation settings during this period would have been favorable throughout the region as temperatures yet again would have made upland areas too cold for agricultural production. Intriguingly, after temperatures returned to near and just above the mean in the late A.D. 860s we do see several of the Martin sites on the McElmo dome (Wilshusen et al. 2012) and sites on Mesa Verde proper (Dean 1974) being occupied. We also see large increases in the populations of the Dolores areas (Schlanger and Wilshusen 1993). Overall, tree-ring dates for the period indicate several large construction episodes after the A.D. 860s that appear to coincide with the gradual increase in regional temperatures (Figure 6).

Concurrent, with the relative increase in regional temperatures to near two standard deviations from the mean around A.D. 880, another demographic shift culminated in the establishment of new settlements such as Bancos Village and other Navajo Reservoir sites, at Cedar Hill, and in the Dove Creek areas (Figure 1a), population increased in the Dolores area and peaked in the A.D. 870s, and Mesa Verde populations burgeoned; all areas that appear to provide immediate access to both farmlands and an array of wild resource procurement areas at the upland/lowland boundary. In all of these new sites, the primary agricultural landscapes appear to be tied to the combination of both dryland farming and alluvial fan focused landscapes.

There are clear connections between the early Pueblo I settlements in the uplands of the Durango area and those of the late Pueblo I in the Gobernador area in terms of ceramics, architecture, village layout, and settlement selection criteria (Bellorado 2007; Chuipka and Fetterman, this issue; Chuipka 2009; Potter et al. 2012; Wilshusen 1995; Wilshusen et al. 2000). Intriguingly, patterns of ritual violence in response to climate change appear to also connect these villages in the east with the earlier peoples of the Durango area. While the evidence is far from clear, it appears that the ritualized violence documented at Sacred Ridge (Potter 2010d; Potter and Chuipka 2010) was but the first in a series of similar events that occurred later in the Navajo Reservoir district.

Potentially, at least three other possible EP (Extreme Processing) events in the EMV area also occurred at Late Rosa Phase and Piedra Phase communities in the Navajo Reservoir district (see Bellorado, this issue Table 1), although Eddy (1966: 493) and Flynn et al. (1976: 315) suggested that these events were likely the result of cannibalism. The first of these potential EP events occurred at Sambrito Village (LA4195) (Figure 1a) where disarticulated and fragmented skeletons from at least 15 individuals were recovered from the fill of two

burned pithouses (Pit House 6: 3 individuals; Pit House 25: at least 12 individuals) dating to the Piedra Phase between A.D. 875–950 (Eddy 1966: 493). It should be noted that a larger number of individuals may have been interred but the structure was only trenched and not fully excavated. The remains showed some similarities to the Sacred Ridge massacre as reported by Potter and Chuipka (2010) and Potter et al. (2010, 2012), including extensive facial and cranial trauma, potential relatedness of the group members, evidence of a single EP event, and no evidence of grave offerings. Flynn et al. determined that these remains were the result of starvation cannibalism because the remains were "characterized by long bones split lengthwise while still fresh, some with impact percussion scars, and shattered skulls. Unlike normal burials, however, these two [burials in pithouse deposits] contained no offerings, were incomplete, and many bones evidenced burning" (1976: 315).

The second, a more poorly documented and potentially smaller scale EP event, occurred at Bancos Village (LA4830) (Figure 1a), where the remains of badly charred and fragmented human skeletons were found incinerated on the floor of two pithouses (Pit House 3: Burial 1 and Pit House 5: Burial 2). The pithouses contained the remains of a total of seven individuals, including at least one infant, a child, and an adolescent. Unfortunately, no direct dates were reported for these structures and thus these events can only be dated to sometime between A.D. 875–950 (Eddy 1966).

While the individual structures containing these large burials are poorly dated, the larger sites of both Sambrito and Bancos Villages are well dated to the late A.D. 800s and early 900s (Eddy 1966). Recently, Sesler and Hovezak (2002: 176) have suggested extending the Rosa Phase into the A.D. 880s for Frances Mesa not far to the south of Bancos and Sambrito Villages (Figure 1a, and see Bellorado, this issue Table 1), potentially suggesting that both of these events might have occured later in time. These events are nonetheless comparable in style to the large massacre at the village of Sacred Ridge in near Durango in the early A.D. 800s.

The third, and best documented mass inhumation comes from LA4528, a multiple habitation site with three pit structures on Burnt Mesa (Figure 1a), also in the Navajo Reservoir district and dating to roughly A.D. 900–950 (Flynn et al. 1976). The mass inhumation at this site was found in a single pithouse (Pit House 1) and contained 11 disarticulated individuals. As at Sacred Ridge, the demographic make-up of these individuals included infants, children, subadults, and adults. The burial population at LA4528 also consisted of individuals of both sexes. Additional characteristics indicate the "skeletal destruction is that of dismemberment, crushing of long bone shafts, facial mutilation, scattering and loss of elements of the trunk (ribs, vertebrae, and pelves), and the loss of the hands and feet" (Flynn et al. 1976: 313). The mass burial assemblage

from LA4528 is reminiscent of the Sacred Ridge massacre, including the intentional destruction of the face and head, the use of groundstone as anvils in the butchering of these people, and the fact that all of the butchered skeletons were deposited in a single event while the pithouse was still habitable.

Overall, with the inclusion of these additional EP events with the Sacred Ridge massacre assemblage, we can begin to see a pattern of the violent reaction proceeding from the massacre of 35 individuals at Sacred Ridge in the early A.D. 800s, continuing into the later Rosa Phase or early Piedra phase sites in the late A.D. 800s or early A.D. 900s.

Given the close cultural affiliation that peoples in the Upper San Juan had with earlier groups in the Durango area, it is interesting that three instances of similar EP events occurred after the Sacred Ridge massacre event. It is unfortunate that we cannot narrow down the date range of these events to see precisely how the timing coincides with the climate conditions in the area. However, if we take the Sacred Ridge massacre event as a guide that later descendant societies in the EMV region had learned from, then we might expect to see a recurrence of this specific type of response to climatic conditions.

Bracketing the A.D. 875–950 period in which the Upper San Juan EP events occurred, there are two major climatic shifts that are reminiscent of the conditions in the Durango area in the early A.D. 800s (Figure 6). The first of these major climatic shifts occurred in the late A.D. 800s and early A.D. 900s. This climatic shift was characterized by the decline of a three decade long hot-warm spell in a period of slightly dry conditions in the northern Southwest. In the A.D. 890s the climate continued to cool and the Gobernador area became one of the driest in the larger region while the upper elevations of the Durango area were experiencing a moderate wet spell. In the late A.D. 890s temperatures continued to plummet year after year until A.D. 899 and didn't ameliorate completely until roughly A.D. 903. The PDSI indices show that conditions throughout the northern Southwest continued to be dry during this period leaving the larger region in drought conditions. By around A.D. 913, moisture conditions had returned to near normal levels. The second of the major climate shifts between A.D. 875–950 occurs roughly 50 years after the first. It was, however, somewhat less severe and of shorter duration. During this major climatic shake up beginning in the A.D. 940s a somewhat different course of events occurred with regional temperatures dropping to just below a z-score of -0.5 while concurrent PDSI levels show that the Gobernador area was near normal, but the driest in the region. In the early years of the A.D. 950s temperatures remained below the 150-year mean and the region experienced a mild to moderate drought (Figure 6).

Generally, both of these climatic downturns occurred after wide spread productive periods in which the Gobernador area would have been a favorable place to farm. During both of these significant downturns in regional

temperatures, the Gobernador area was likely never the worst place in the northern Southwest to eek-out an agricultural existence. In both of these cases, the Gobernador area remains relatively drier compared to the rest of the region and recovered relatively quickly from drought conditions. However, if we are looking for climatic downturn events as the initiating devices for social upheaval in the contexts of the EMV uplands, these are the two most likely suspect periods for potential EP events to have occurred between A.D. 875–950. Further, if Wilshusen and Van Dyke (2006) are correct that much of the Central and Eastern Mesa Verde areas were depopulated relatively quickly at the end of the ninth century, and that many of the villages occupied in the late A.D. 800s were very short lived, then the dramatic downturn in the late A.D. 880s was the most likely to be the climatic culprit.

The Sacred Ridge massacre was clearly an unprecedented event. Potter and Chuipka (2010) suggest that if it was associated with witch destruction then it was of a scale not seen in the ethnographic literature. Although earlier as yet undiscovered episodes may yet be found, we suggest that for events like this, people needed no precedence. These data suggest that not only were a large segment of the Gobernador area populations descendant from the early Pueblo I villages in the Durango area, but that the overall mentality that segments of those populations could be held responsible for climatic downturns was remembered and continued to hold a place in the minds of the late Pueblo I era villagers. In this section we have shown that there is a pattern in the way peoples of the EMV area responded to dramatic shifts in climate and other environmental factors during the Pueblo I period and how early villagers developed unique mechanisms for explaining and responding to climatic changes in the area. These responses, though socially motivated, were ultimately tied to the dedicated use of alluvial fan farming systems in the EMV area.

CONCLUSIONS

Throughout the Ancestral Puebloan occupation of the EMV region, changes in temperature regimes appear to have been the most significant influence on demographic movements of farming societies at several key points in time. Relative drought severity within the subregions of the northern Southwest also played an important role in ancient farmers' decisions to stay in an area or move to another location that was perceived to have the potential to be farmed with greater success. This pattern demonstrates that farmers in the EMV area had long-standing, reliable, and probably quite formal subsistence strategies that included periodic movements from lowland to uplands (and back) in response to climatic changes. In the EMV region (Figure 1a) this pattern is notable from Basketmaker II times through the end of the Pueblo I period, and probably into the later Pueblo II and III periods. In these strategies,

people moved to upland areas during warm drought periods and to the lowlands during cold periods, regardless of precipitation patterns. Occasionally, farmers in the region may have moved to midland elevation areas to take advantage of mesa top dryland farmlands away from the affects of cold-air drainage, particularly during cold and wet spells.

It appears that during the mid- to late A.D. 700s there was an introduction of strict dryland farming systems in the eastern upland areas of the EMV region. This occurred during a period of mixing, rediscovering, and redefining of social and ethnic identities in the early Pueblo I period with the introduction of groups from outside the region. After this era of unprecedented demographic aggregation, people in the EMV continued to prefer alluvial fan and runoff based agricultural systems over dryland systems, but included dryland farming as a buffer against crop loss caused by cold temperature regimes. Further, this study has established that peoples in the EMV developed intimate knowledge of the cycles of climatic shifts and cold-air drainage patterns in the areas they inhabited.

We have also documented several instances between A.D. 700–950 where farming peoples' knowledge of the unique landscapes on which they lived and farmed allowed segments of the population to amass prestige, political and ritual power, and followers through their control of available farmlands and agricultural surpluses. At the same time, other segments of these populations appear to have used these in-depth understandings of the ecology of agricultural landscapes to form alternative leadership, ritual, and social organizations to counter or resist pressures of the ruling society, sometimes to violent ends.

Also of great importance is that, even at this early date, ritual specialists and leaders of communities apparently gained and lost prestige, power, and influence over their communities frequently, largely due to their perceived abilities to control weather conditions for the benefit of their people (and their crops) through the control of esoteric and ritual knowledge. What we have to understand is that when these ritual specialists gained power they were doing so within a politically charged landscape and their rule was tentative at best. Between the early Basketmaker II and late Pueblo I periods in the EMV area, rules of conduct and expectations of service were made and remade over centuries depending on the political and atmospheric climates of the time. If the local populations lost confidence in the method of leadership, community, and ritual organization there could be disastrous consequences not only for the ritual specialist or leader, but for their entire family, kin, or ethnic group.

Finally, we have documented how the use of fine-grained (high frequency) climatic reconstructions can inform archaeologists about the nature of human-climate interactions with a clarity that is lost when using smoothed 50, 100, or even 200-year reconstructions as presented by Benson and Berry (2009), Cordell et al. (2007), and Wright (2010). So, while megadroughts and long regional wet periods inevitably affected Ancestral Puebloan farmers throughout the Colorado

Plateau, we have to ask ourselves, could the farmers actually see these broad changes or were they more often preoccupied with the shorter term, fine-grained changes to their agricultural and social landscapes? We suggest the latter, that farming peoples responded more often to short-term and dramatic changes in the climatic factors that directly affected their livelihood. In the northern Southwest, archaeologists are blessed with the luxury of having both fine-grained paleoclimatic reconstructions and tight dating resolution of sites from tree-ring and ceramic chronologies. In the future, archaeologists should focus efforts to combine these chronologies at fine-grained levels. Or as Ford has suggested:

> The Pueblo Indian [farmer] has to deal with a variety of factors that are neither regular in their occurrence nor equally pervasive in their effect … it is precisely to these unpredictable environmental fluctuations that individual pueblos must adapt. (Richard Ford 1972: 6)

Further, Puebloan peoples have viewed climatic changes through the lens of their society. As we have demonstrated, in the collective consciousness of these peoples, climatic changes and fluctuations happened for a reason. Anyone, especially ritual specialists and community leaders, through their correct or incorrect actions could be directly responsible for the relative prosperity of their societies, at least in the eyes of the communities that supported (or occasionally withdrew their support of) these people. In the face of climate and other environmental changes, peoples who lived in the EMV region routinely looked for causes for stresses on agricultural production. Beginning at least with the early Pueblo I villages in the Durango area, and again in the Gobernador area in the late A.D. 800s, ancient Puebloan peoples appear to have formed shifting alliances and experimented with different power structures during periods of climate flux to legitimate or corroborate their claims to a variety of resources. These resources could include areas of the landscape, control over segments of the population and ritual systems, and even human lives through the vein of a causal view of human-climate interactions and responses. In this article, we have departed from a simple view of "the climate made me do it," to looking at the complex social interactions that ancient farmers had with each other and their agricultural landscapes, and how these interactions shaped their worldviews and the perceptions of events that unfolded in the natural world over time.

We hope that this research has shed light on the interplay among climate, culture, and agricultural mechanisms, which influenced site selection through time in the Eastern Mesa Verde region and beyond. We also hope that this article has illuminated new methods of identifying potential low visibility traces of social identities, ethnicities, and land tenure systems across ancient agricultural landscapes and of identifying the ways farming societies responded to

new environments, social structures, and shifting climatic regimes in the northern Southwest.

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