Chapter 12

CONCLUDING COMMENTS

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SELECTED PATTERNS AND TRENDS

The preceding chapters have attempted to summarize the principal results of archaeological research for each major temporal period, from Paleoindian/Archaic through post-Puebloan. In this section of Chapter 12, no attempt is made to summarize each and every topic covered in the earlier chapters. Rather, temporal trends and patterns are reviewed only for certain basic categories of information: population and site distribution; evidence of subsistence patterns; material culture; and architecture.

Population and Site Distribution

Table 12-1 displays the distribution of dated site components by period and drainage unit. These data were assembled in 1998 from the Colorado state site files by Mary Sullivan and Richard Wilshusen. Some sites were recorded as having evidence of occupation in more than one period, and numerous sites could not be assigned to any major period. Hence, Table 12-1 is a record of dated site components, rather than of all sites in the state site files. These data are also presented in individual chapters, often with components divided into habitation versus nonhabitation categories.

Because it did not prove possible to assemble data on how much of each drainage unit had been surveyed, or on the relative intensity of survey in areas that had been covered, the component counts and percentages in Table 12-1 are not truly comparable. The drainage units vary in size, and because variation in survey coverage is not known, it was not thought useful to standardize component counts across drainage units by expressing them per square kilometer. Some data are available on survey coverage by county (Office of Archaeology and Historic Preservation 1996:43), but the time limitations and budget for this context study did not permit relating these data to the drainage units, or assessing how representative the coverage was, either by area or by environmental zone.

With an estimated 13 percent survey coverage by area (Office of Archaeology and Historic Preservation 1996:46), Montezuma County has from 4 to 2.5 times the survey coverage of the other counties in the study area. This indicates that the Mesa Verde-Mancos and the Monument-McElmo drainage units, which are predominantly in Montezuma County, have the highest percentage of survey coverage by area. Hence, the greater numbers of sites in those drainage units are at least in part a function of greater amounts of survey. In addition, some large survey projects may account for a substantial percentage of the site records in certain drainage units. For example, surveys done as part of the DAP undoubtedly have a strong influence on the summary data for the Dolores drainage unit; most of these survey records are from a relatively small part of the unit's area, focused on the Dolores River valley and surrounding uplands in the vicinity of what is now McPhee Reservoir.

Table 12-1. Counts and Percentages of Site Components in the Study Area by Drainage Unit and Period.

	USJ-Piedra	Animas	La Plata	M.V.-Mancos	Ute	Monu-McElmo	Dolores	Total
Paleoindian	1 (0.1%)	0	0	0	8 (0.8%)	3 (>0.01%)	7 (0.5%)	19 (0.1%)
Archaic	47 (4.5%)	51 (7.3%)	31 (12.8%)	8 (0.1%)	137 (14.1%)	80 (1.5%)	59 (4.2%)	413 (2.7%)
BM II	20 (1.9%)	58 (8.3%)	15 (6.2%)	2 (>0.1%)	2 (0.2%)	47 (0.9%)	12 (0.8%)	156 (1.0%)
BM III	99 (9.6%)	246 (35.0%)	52 (21.5%)	317 (5.3%)	83 (8.5%)	736 (14.2%)	369 (26.1%)	1,902 (12.2%)
Pueblo I	484 (46.8%)	242 (34.4%)	59 (24.4%)	2,135 (35.4%)	83 (8.5%)	907 (17.5%)	629 (44.5%)	4,539 (29.1%)
Pueblo II	240 (23.2%)	28 (4.0%)	33 (13.6%)	2,458 (40.8%)	339 (34.8%)	1,985 (38.3%)	254 (18.0%)	5,337 (34.3%)
Pueblo III	17 (1.6%)	10 (1.4%)	6 (2.5%)	1,097 (18.2%)	292 (30.0%)	1,397 (27.0%)	64 (4.5%)	2,883 (18.5%)
Post-Pueblo	127 (12.3%)	68 (9.7%)	46 (19.0%)	13 (0.2%)	29 (3.0%)	28 (0.5%)	19 (1.3%)	330 (2.1%)
Drainage Unit Totals*	1,035 (100%)	703 (>100%)	242 (100%)	6,030 (100%)	973 (99.9%)	5,183 (99.9%)	1,413 (99.9%)	15,579 (100%)

* Totals of the site components assignable to the listed periods.

Despite its limitations, the compiled survey data indicate some broad trends and patterns in site occurrence through time, most of which are discussed in more detail in the individual chapters. The most obvious pattern is that the great majority of the components (approximately 94 percent) date to the 800 years between the start of the Basketmaker III period at about A.D. 500 and the end of the Pueblo III period at about A.D. 1300. The nonagricultural Paleoindian and Archaic periods, which together may have lasted for 7,000 or 8,000 years, account for only a small fraction of the number of sites that date to the 800-year florescence of the Puebloan tradition. Sites assignable to post-Puebloan Native American occupation are also rare in the 600 years between A.D. 1300 and 1900. Most of these occupations were probably not strongly based on agricultural subsistence patterns.

Somewhat surprising is the relative scarcity of Basketmaker II components in the study area; they account for only 1 percent of the total dated components. Basketmaker II sites are numerous relative to total components only in the Animas and La Plata drainage units, and even

here, they make up only 8.3 and 6.2 percent of the components, respectively. The evidence is strong that the Basketmaker II adaptation was strongly dependent on maize agriculture (e.g., Matson 1991; Chisholm and Matson 1994). It also lasted at least 800 to 1,000 years in the study area (from several hundred years B.C. to approximately A.D. 500). Hence, the scarceness of these sites cannot be attributed to the effects on population density of a foraging-based, extremely mobile lifestyle; nor can it be due to the brevity of the Basketmaker II period, which is as long as the Basketmaker III through Pueblo III periods combined.

It might be assumed that some Basketmaker II components have been mistakenly classed as Archaic, but the Basketmaker II occupation would still be poorly represented even if all the Archaic components were assigned to it. It also is possible that Basketmaker II and other nonceramic components of all sorts are more likely to be grouped in the "unknown" category than are Basketmaker III and Pueblo period components. (The "unknown" components are not represented in Table12-1, but account for 12.3 percent of the components in the site files.) On the other hand, many Basketmaker II habitation sites are relatively large and distinctive, and open sites of this period have been recognized in the study area since the 1930s. It is hard to escape the conclusion that although the population of the study area increased in Basketmaker II relative to the preceding Archaic period, it remained relatively low until about A.D. 500, when there was a dramatic increase during the Basketmaker III period.

Factors influencing the increase may have included the introduction of beans as a supplemental source of protein and the development of better, year-round storage facilities. At this time, long-term storage of maize may have replaced expedient reliance on foraging as a strategy for dealing with crop shortfalls. In a comparison of household residential facilities at Basketmaker II and III sites on Cedar Mesa in southeastern Utah, Dohm (1988:301) found that late Basketmaker III households had more total storage and larger individual storage units than did late Basketmaker II households. Increased dependence on storage in Basketmaker III times may have resulted in diminished household mobility. In her Cedar Mesa study, Dohm (1988:305) did not find clear indications that Basketmaker III households were more sedentary than those of Basketmaker II. In the central part of the Mesa Verde culture area, however (i.e., in the Monument-McElmo and Mancos-Mesa Verde drainage units), the labor investment in Basketmaker III household facilities clearly appears greater than it was in Basketmaker II times, suggesting reduced mobility.

Migration to the study area could have contributed to Basketmaker III population increase, but this possibility cannot be assessed without a broader regional overview that is beyond the scope of this report. Impressionistically, however, Basketmaker II sites appear rare throughout the Four Corners area relative to site numbers assignable to the much shorter Basketmaker III period. It is likely that population growth in Basketmaker III was related in some way to moderate increases in subsistence intensification, greater reliance on storage as a way of buffering subsistence risk, and changes in household labor organization and mobility. This remains a problem needing a substantial amount of future research.

In the study area, Table 12-1 shows that component numbers increase greatly in Basketmaker III and then more than double in the Pueblo I period. All of the drainage units show significant numbers of sites during these two periods. Nearly 70 percent of the dated components from the Animas drainage unit occur during this interval, with about equal numbers in the Basketmaker III and Pueblo I periods. The La Plata and Monument-McElmo drainage units both have moderately strong occupations during these two periods, with slight increases in Pueblo I, although the Ute drainage unit has relatively low numbers of sites in both periods. Other units (i.e.,

Upper San Juan-Piedra, Mesa Verde-Mancos, and Dolores) show substantial increases in the Pueblo I period. The Upper San Juan-Piedra and the Dolores units both hit their peak frequencies of sites during Pueblo I. Overall, Pueblo I components are numerous in all of the drainage units, with high concentrations of sites in some areas.

The central and eastern parts of the study area (Upper San Juan-Piedra, Animas, and La Plata drainage units), plus the Dolores drainage unit, show significantly fewer Pueblo II components than ones dating to Pueblo I. In the Upper San Juan-Piedra unit, site numbers appear to have continued to decline through the Pueblo II period, with the exception of the Chimney Rock locality. All of the western drainage units, on the other hand, have significant increases. The Ute drainage unit has large numbers of components for the first time, and the Mesa Verde-Mancos and Monument-McElmo drainage units have their highest number of sites in this period. These data indicate an overall westward shift of population in the study area during the Pueblo II period.

The drainage units that lost population during the Pueblo II period continued to do so in Pueblo III. The Upper San Juan-Piedra, Animas, La Plata, and Dolores drainage units have very low numbers of sites, and large parts of these areas show little or no evidence of occupation, at least for habitation. Sites are concentrated in the Mesa Verde-Mancos, Ute, and Monument-McElmo drainage units. In all three units, numbers of components are lower than in the preceding Pueblo II period, but individual habitation sites are generally larger, due to a strong trend toward settlement aggregation during the late A.D. 1100s, and especially, in the 1200s.

The site frequencies displayed in Table 12-1 probably reflect trends in population size through time in each of the various drainage units. The extent to which they also reflect variation among drainage units in population size and density during particular periods is more problematic, because of differences in survey coverage among the units. However, large differences between units in numbers of recorded sites for a given period probably indicate real differences in site frequency.

Wilshusen (1996) has attempted to estimate numbers of people in the western part of the study area (Mesa Verde-Mancos, Monument-McElmo, Ute, and Dolores drainage units) for the period A.D. 800-1320. He bases his estimates on data from habitation sites in localities where intensive surveys have been carried out, and extrapolates the results to habitable portions of the area he is attempting to characterize. He also takes into account the periods of settlement aggregation that took place in the A.D. 800s and 1200s. Using "conservative" assumptions, Wilshusen projects a population of about 2,200 from A.D. 800 to 840. This figure rises to about 5,000 between A.D. 840 and 880, then declines to about 1,700 in the period A.D. 880-920. From that point, there is a steady rise in population, which levels off at a peak of about 13,800 from about A.D. 1260 to 1280. Population then declines rapidly as the region is depopulated in the very late A.D. 1200s. Wilshusen's (1996) "liberal" estimates display the same trends, but the values are approximately double those of the "conservative" estimates. A more recent attempt to model population change through time in southwestern Colorado (Duff and Wilshusen 1999) found the same trends as shown in Wilshusen's earlier study, but favored population size estimates at or in some cases below Wilshusen's (1996) "conservative" estimates.

These estimates, of course, depend on the data and assumptions used. In Chapter 7 and elsewhere (Wilshusen and Ortman 1999), Wilshusen has argued that the population decline at the end of the A.D. 800s was deeper and more rapid than the modeled figures indicate. Lipe (Chapters 8 and 9) has also argued that the middle A.D. 1100s may have seen some movement of population

out of the study area, and that regional population probably peaked in the early 1200s, declined somewhat in the late 1200s, and then dropped very rapidly to zero or near-zero between about A.D. 1280 and 1300.

Evidence of Subsistence Patterns

Little can be said about Paleoindian subsistence patterns on the basis of evidence from the study area per se. The distribution of late Paleoindian projectile points (see Chapter 4) suggests that activities tended to occur at somewhat higher elevations than are typical of later periods when agriculture was important. Paleoindian points have been found in diverse environments, but no clear inferences about subsistence resources can be drawn from the distributional evidence. Other regional context reports and more general reviews of the Paleoindian period in the western United States provide evidence and hypotheses than can perhaps be generalized to cover the study area (e.g., Pitblado 1999; Stanford and Day 1992; Willig et al. 1988).

There also is little evidence from the study area on which to base inferences about Archaic period subsistence patterns. However, approximately one-third of the recorded Archaic sites from the area are in the Ute drainage unit; here, they are concentrated in relatively low elevation, sandy areas south of Sleeping Ute Mountain. This pattern suggests that these sites are associated with warm-season collection of grass seeds (e.g., Indian ricegrass and sand dropseed) and other annuals, a pattern documented in similar physiographic settings south of the San Juan River by studies associated with the NIIP (Vogler 1993a) and other extensive projects associated with energy development in the northern San Juan geologic basin. A modest amount of data from the study area and from adjacent mountainous areas suggests that high elevation environments also saw considerable use in Archaic times. Survey data from the study area suggest that the pinyon-juniper zone, which was heavily occupied by agricultural peoples, was relatively unimportant in Archaic adaptations.

More data are available for the Basketmaker II through Pueblo III periods, when maize agriculture was clearly the most important source of subsistence, supplemented by other cultigens and by a variety of gathered plants. Squash was present throughout, but beans appear not to have been farmed until the Basketmaker III period. A number of animals were hunted in all periods, and domestic turkey appears to have become an increasingly important food source after the Pueblo I period (Munro 1994; Driver 1996b). Several lines of evidence can be used to make inferences about subsistence patterns.

Settlement Pattern Evidence

Matson (1991) has argued that early Basketmaker II farming in the Four Corners region occurred predominantly on flood plains, and that dry-farming did not become an important alternative until late Basketmaker II times, i.e., until sometime after A.D. 1. Some excavated Basketmaker II sites in the study area are in situations favorable for flood plain farming, while others are in upland settings, where dry-farming would have been most likely; in the latter category are sites in the Bodo Canyon area near Durango, and site 5MT5376 in the Monument-McElmo drainage unit. This site appears to date between 100 B.C. and A.D. 100, indicating that diversity in types of farming practice is fairly old in the study area.

Settlement patterns for the Basketmaker III through Pueblo III periods indicate heavy use of the uplands, and support the inference that dry-farming was probably the dominant mode of

crop production in the study area as a whole. Sites are also located adjacent to valley flood plains and to small ephemeral washes (see Huckleberry and Billman 1998), and these settings are relatively more common in the lower elevations. In general, the settlement pattern data indicate a sophisticated knowledge of the farming potential of many different combinations of slope, exposure, soil, and water supply. In the Pueblo II and Pueblo III periods, some locations also have systems of check dams on small ephemeral drainages, and/or terraces and stone alignments on slopes. These developments generally are associated with large aggregated settlements or with concentrations of smaller settlements that result in high local population densities (as in the Pueblo II period on the Mesa Verde proper). These features evidently represent attempts to intensify production and/or to diversify field locations to provide a buffer against failure of the primary fields. The water and soil control systems do not appear large enough or extensive enough to have been more than a supplement to the main cropping systems, which probably required much lower inputs of labor per unit land or per unit of harvested crops.

Faunal Evidence

In recent years there have been numerous excellent analyses of macrobotanical and zoological remains from particular sites or projects, but few synthetic and comparative studies of these data. An exception is Driver's (1996b) preliminary synthesis of faunal analyses from the western part of the study area. It includes data from Basketmaker III through Pueblo III contexts in an area that includes the Monument-McElmo, Dolores, Ute, Mesa Verde-Mancos, and Animas drainage units, as well as portions of New Mexico north of the San Juan River and west of the Animas River, and portions of southeastern Utah north of the San Juan River and east of Cottonwood Wash. With regard to the overall importance of animals to the Basketmaker-Pueblo peoples in this area, Driver (1996b:2-3) writes: "Animals probably contributed marginally to human energy needs, and were probably not even a major source of protein. However, animals were probably highly desired as food, not only for taste and protein, but also for fat (Speth and Spielmann 1983) and essential vitamins and minerals (Spielmann and Angstadt-Lebo1996:79-82). Animals would have been valued for other reasons. They were a source of raw materials, such as bone, sinew, fur, feathers and hide. In some cases, animals had important symbolic value, and it is likely that hunters gained prestige through the killing of some species."

Driver uses three indexes to examine trends through time in the study area. The lagomorph index (Szuter and Bayham 1989) is derived by dividing the number of cottontail bones by the total number of lagomorph bones (i.e., cottontails [*Sylvilagus*] plus jack rabbits [*Lepus*]). Following Szuter and Gillespie (1994), Driver expects this index to decline with rising population, because land clearance for farming would favor jack rabbits, and larger residential communities would favor communal jack rabbit hunts. The artiodactyl index is based on the ratio of artiodactyl bones to lagomorph bones, and is expected to be an index of the availability of large game. Although it might be expected to decline with population increase due to depletion of local game, Driver notes that Speth and Scott (1989) make the case that the index may increase when hunters have to go longer distances for game; under these circumstances, it is more efficient to hunt larger animals. Finally, Driver examines the turkey index, defined as the number of turkey bones divided by the number of lagomorph bones (Spielmann and Angstadt-Lebo 1996). This is expected to indicate dependence on domestic relative to wild animal resources.

Assuming that population in the study area increased through time, Driver expected there to be evidence for 1) intensification of turkey production, as reflected in a higher turkey index, 2) a decrease in the lagomorph index, as jack rabbit populations prospered in response to land

clearing and more communal hunts were organized, and 3) increases in the artiodactyl index, as game depletion in the vicinity of increasingly aggregated communities promoted more long-distance hunting.

Only the first expectation was met. The evidence showed that the turkey index was low in Pueblo I, increased substantially during the Pueblo II and III periods, and was highest in Pueblo III, the time of peak population. The artiodactyl index generally decreased in the later periods, and especially in Pueblo III. Also contrary to expectations, the lagomorph index declined through time, because in most parts of the area, jack rabbit bones decrease relative to cottontail bones in the later assemblages.

Driver (1996b:15) suggests that these trends can be "explained as a result of increasing human population and a shift in subsistence strategies, primarily in Pueblo III times." As larger game was depleted in the vicinity of settlements during the Pueblo II and III periods, turkeys were increasingly raised for meat and lagomorphs continued to be important prey. The expected shift to long-distance hunting for artiodactyls did not occur, however. With reference to the Pueblo III period, "it appears that in densely settled areas there was little exploitation of more distant habitats" (Driver 1996b:16). Driver also assembled data showing that carnivores are fairly common in early assemblages, but nearly absent from those dating to the Pueblo III period. Because both artiodactyl and carnivore populations would be subject to depletion from over-hunting, he takes the Pueblo III decline in carnivore bones as further indication of less exploitation of "wild" areas (i.e., nearby unoccupied zones) during the last period of Puebloan occupation of the region.

Although Driver does not discuss it, the evident increase in warfare during the Pueblo III period could have made long-distance hunting somewhat hazardous, and hence have contributed to the patterns he observed. There also may be taphonomic factors not considered in the study that could have affected the results; for example, the small bones of lagomorphs and turkey might not be as well preserved in earlier deposits. On the other hand, some of the trends are so robust that it is hard to see how taphonomic effects could account for them. Driver's study is an important initial effort to synthesize the evidence from faunal remains, and presents evidence for some patterns that more detailed future comparative studies can test.

Floral Evidence

In the study area and immediately adjacent regions, there have been numerous recent macrobotanical and palynological studies have focused on the uses of plants for subsistence and other economic purposes (e.g., K.R. Adams 1999; Kohler and Matthews 1988; Petersen et al. 1986). Nearly all relate to the Basketmaker III through Pueblo III periods, and focus on analysis of materials from particular sites or projects; there are no detailed syntheses as yet. Nevertheless, some generalizations can be made about the macrobotanical evidence. Plants important for subsistence can be classed as cultigens, pioneer plants (colonizers of disturbed areas), and wild plants. A stable pattern emerged by Basketmaker III and probably by Basketmaker II: cultigens provided the majority of the diet; various weedy pioneer plants were important supplements; wild foods such as pinyon nuts were consistently used when available but were less important than the pioneer complex.

Among the cultigens, maize is consistently the most widespread—and usually the most abundant—economic plant recovered from hearths and often from other contexts as well. Remains

of beans and cucurbits are less commonly found, and in many contexts are rare, probably because of differential patterns of both deposition and preservation. Maize kernels and cobs are more likely to be carbonized and hence preserved than are the seeds and other plant parts of other cultigens. In dry sites, cucurbit remains are often abundant. The consistent absence of beans from well-dated Basketmaker II contexts indicates that this cultigen did not become a regular part of the diet—and probably was not raised in the area—until Basketmaker III times.

In hearth contexts, the most commonly encountered nondomesticated food plants consist of pioneer plants (Matthews1986)—generally weedy annuals that flourish in recently disturbed areas such as active or recently abandoned agricultural fields. For example, in Pueblo I and early Pueblo II contexts from the DAP (A.D. 720-980), Matthews (1986:174) reports that in flotation samples from hearths and other fire-related features, the 7 most common pioneer taxa were *Amaranthus*, *Chenopodium*, cheno-am, Cruciferae, *Descurainia*, *Physalis*, and *Portulaca*. Similar, though not identical, lists of pioneer taxa have been compiled from macrobotanical studies at other Basketmaker III through Pueblo III sites in the study area. Other plants of this type that occur widely in contexts indicative of their use as food include *Cleome*, *Helianthus*, *Mentzelia*, *Polygonum*, *Solanum*, and various species of Compositae and Graminae. It appears that use of pioneer plants as supplemental foods was a well-established part of the subsistence pattern in the study area. Plant parts used included seeds, and in some cases, leaves and stems. The availability of these plant foods was undoubtedly enhanced by the vegetative clearance and soil disturbance that accompanied cultivation of maize, beans, and squash. It is likely that growth of these plants in active farm fields was encouraged so long as they did not crowd out the cultigens.

Wild food plants—i.e., those whose growth was not necessarily favored by anthropogenic disturbance of vegetation and soil—are also commonly encountered in Basketmaker and Pueblo contexts throughout the study area. For example, in the DAP analyses referenced above, the most common wild plant foods included seeds of pinyon pine (*Pinus edulis*) and juniper (*Juniperus osteosperma*), and the fruits of yucca (primarily *Yucca baccata*), prickly pear (*Opuntia* sp.) and squawbush (*Rhus aromatica*). These and various other wild plants are locally common at sites in the study area.

Some plants could be considered to belong to both the "pioneer" and "wild" categories. Seeds of grasses such Indian ricegrass (*Oryzopsis hymenoides*) and sand dropseed (*Sporobolus cryptandrus*) are abundant in some site contexts. These plants sometimes flourish in recently disturbed situations such as abandoned fields but may also be abundant in sandy locations that have not been recently disturbed. This is also true for prickly pear (Minnis 1989:550).

In general, it appears that in most times and places in the study area, the pioneer plants, most of which were probably harvested from active or recently abandoned fields, were more important supplemental foods than were the "wild" plants. Undoubtedly, pinyon nuts provided an abundant and nutritious supplementary food in years when nuts were plentiful, but typically nearly all the pinyon trees in a region yield at the same time and good harvests are usually at least 3 years apart and usually more.

Although the pattern of primary dependence on maize supplemented by both pioneer and wild plants is widespread in the study area and the Four Corners region in general (Minnis 1989), there appears to be considerable variation in detail through time and space. For example, K.R. Adams (1999) reports that in the Sand Canyon locality of the Monument-McElmo drainage unit, early Pueblo III mesa-top residents appear to have relied heavily on weedy cheno-ams, *Physalis*,

and *Portulaca* as supplemental foods. Late Pueblo III residents "relied less on these three taxa and included a notably wider variety of weedy species in their diet" (K.R. Adams 1999). As noted above, it would undoubtedly be productive to compare macrobotanical evidence across the study area in search of general temporal or geographic patterns; however, such a study is outside the scope of this report.

Coprolite Analyses

Although plagued by small sample size, the few studies of human coprolites from the region provide some basis for considering dietary change through time. Mark Stiger (1979) analyzed 20 Basketmaker III coprolites from Step House, a sheltered site on Wetherill Mesa, and 77 Pueblo III period coprolites from Hoy House and Lion House, cliff dwellings in Johnson Canyon, located in the Ute Mountain Ute Tribal Park just south of Mesa Verde National Park. All three sites are in the Mancos-Mesa Verde drainage unit. Although maize occurred most frequently in both samples, it was present in virtually all (96 percent) of the Pueblo III coprolites but in only 65 percent of the Basketmaker III specimens. Occurrence of beans increased somewhat between the Basketmaker III and Pueblo III periods (from 5 to 16 percent), and squash declined somewhat (from 40 to 22 percent). Nondomesticates were present in most if not all the specimens. Remains of prickly pear had the highest occurrence—in 40 percent of the Basketmaker III specimens and 35 percent of the P III specimens (Stiger 1979:135). Stiger (1979) notes that the majority of the nondomesticates were weedy plants that would have thrived in environments disturbed by humans. The most notable change through time in nondomesticates was in a "wild" plant; 40 percent of the Basketmaker III specimens had remains of pinyon nuts, but this dropped to 13 percent in Pueblo III. Stiger (1979) attributes the rise in occurrence of maize and the decline in the occurrence of pinyon pine to intensification of farming and concurrent forest clearance on the Mesa Verde.

Aasen (1984) analyzed 28 coprolites from Basketmaker II midden strata at the Turkey Pen site in Grand Gulch in southeastern Utah. Four radiocarbon ages from the deposit ranged from 1490 ± 75 to 2065 ± 50 B.P. Matson (1991:92-93) summarizes Aasen's results:

> ...25 of the 28 coprolites contained maize, and in 17 of these the maize remains accounted for greater than 50 percent of the total macrofossil weight. Pinyon pine-nut hulls were found in 13 of the coprolites, and in 6 of these the hulls exceeded 50 percent of the total macrofossil weight. The next most abundant macrofossil, chenopod leaves, was found in 10 coprolites, and either chenopod or amaranth seeds were identified in three. Indian ricegrass seeds were found in 9 coprolites and exceeded 50 percent of the weight in two, in fact making up more than 90 percent of the weight in both cases. Besides these "staples" lesser amounts of other resources were found in a few coprolites; prickly pear seeds in two, squash seeds in three, beeweed (*Cleome*) in one, Bur-sage (*Franseria*) seeds in two, and *Franseria* spines in one [Matson 1991:92-93].

These data indicate that the basic pattern of primary reliance on maize with nondomesticates as supplemental foods was established in the western Mesa Verde region by late Basketmaker II times. Eighty-nine percent of the Turkey Pen coprolites contain maize remains—considerably higher than for Stiger's (1979) Basketmaker III specimens and only slightly below the 95 percent value for his Pueblo III specimens. About the same percent of Turkey Pen Basketmaker II and Step House Basketmaker III coprolites contained evidence of pinyon nut consumption (46 percent to 40 percent).

Stable Carbon Isotope Analyses

Stable carbon isotope studies also indicate that primary reliance on maize was well established by late Basketmaker II times, and that there was only modest variation through time in the overall pattern of plant use. This method is based on the "...presence of two photosynthetic systems, or pathways, in plants and the effects of these two modes of photosynthesis on the stable carbon isotope composition of the plant tissues. Most species of plants use the C_3 mode of photosynthesis....The C_4 plants, on the other hand...discriminate less against the heavier $^{13}CO^2$ than the C_3 plants. Therefore the ratio of ^{13}C to ^{12}C in the tissues of C_3 plants is lower than the ratio in C_4 plant tissues" (Decker and Tieszen 1989:36).

Maize is a C_4 plant, though the other common cultigens and many of the pioneer and wild food species commonly eaten in the Four Corners area are C_3. Some amaranths, chenopods, and grasses are C_4 plants, however, and prickly pear may have isotopic values intermediate between typical C_3 and C_4 plants. When human bones yield stable carbon isotope values consistent with a diet high in C_4 plants, maize is the most likely source, but other sources (including animals that have been eating large quantities of C_4 plants) must also be considered.

Decker and Tieszen (1989) report on the stable carbon isotope analysis of bone from 35 individuals from collections at Mesa Verde National Park; one individual dating to the Basketmaker III period was included, 6 from Pueblo I, 9 from Pueblo II, 15 from Pueblo II-III, and 4 from Pueblo III. Although interindividual variability was observed, values for each period indicated heavy dependence on C_4 plants. Decker and Tieszen (1989:39) discount the contribution of C_4 plants other than maize to the diet on the basis that *Amaranthus* had a low occurrence in the Mesa Verde coprolites that Stiger (1979) analyzed, and that cacti occur only sparsely in the locality. Stiger had shown that prickly pear remains had a relatively high occurrence among the coprolites he analyzed. Given the relatively small size of the fruits produced by prickly pear in the study area, their relatively low caloric value, and their highly seasonal availability, it would be hard to make a case that they were a quantitatively important food source.

Decker and Tieszen's (1989) principal conclusions were that 1) C_4 pathway plants were the dominant source of food from the Basketmaker III through Pueblo III periods, 2) there was no discernible change in this pattern from early to late, 3) maize was the primary food source, and 4) maize probably contributed from 70 to 80 percent of the diet during throughout the temporal periods addressed in the study.

Chisholm and Matson (1994) and Matson and Chisholm (1991) analyzed a smaller sample of human remains from southeastern Utah; included were 4 individuals of late Basketmaker II (Grand Gulch phase) age and 3 of Pueblo II and/or III age from the Cedar Mesa area, and 2 Basketmaker II individuals from Old Man Cave, an excavated site near upper Comb Wash, just east of Cedar Mesa (Geib and Davidson 1994). One early Archaic individual from Sand Dune Cave near Navajo Mountain was also analyzed. The results indicated that the Basketmaker II individuals were dependent on a diet rich in C_4 plants and were much more similar to the Pueblo individuals than to the Archaic individual. Chisholm and Matson (1994:247-248) suggest "a C_4 intake of about 83 to 87 percent for the Pueblo II/III individuals, of about 79 to 84 percent for the Grand Gulch Basketmaker II individuals, and of between 60 to 80 percent for the two Old Man Cave Basketmaker II individuals." Chisholm and Matson also discuss possible sources of C_4 influence other than maize, (including consumption of bighorn sheep meat), and conclude "it is clear that the Basketmaker and Puebloan individuals on Cedar Mesa analyzed here were obtaining

nearly all of their protein-forming carbon from C4 species. This is an increase of about 40 to 60 percent from the Archaic and, no doubt, results from the introduction of maize into local diets. There also appears to be a slight increase (about 5 percent) in C4 use from Grand Gulch Basketmaker II to Pueblo II/III times. This is probably due to an increase in maize consumption" (Chisholm and Matson 1994:251).

In summary, general dietary patterns probably did not change a great deal from Basketmaker II through Pueblo III times in the study area and adjacent parts of the Four Corners area. Perhaps the most striking change was the substantial increase in turkey production and consumption in the more densely populated parts of the study area. This is probably related to depletion of wild game in the vicinity of increasingly aggregated settlements, and the lack of development of a pattern of long-distance hunting. The widespread occurrence of soil and water control devices such as check dams in the late Pueblo II and Pueblo III periods may represent an intensification of agriculture as access to good farmland became more restricted due to population growth, and as households planted larger areas in some years to rebuild depleted, two-year reserves of stored food. The small garden plots created by check dams and terraces may also have served to diversify food production as a hedge against crop failure in the primary fields. Both intensification and risk reduction would have been promoted by an increased reliance on stored maize as population growth increasingly foreclosed the option of foraging for wild plants and animals should crops fail. Overall, the evidence suggests that in an average year, Pueblo III people may not have been eating much more maize than their Basketmaker predecessors, but that they were probably working harder to produce it, were more dependent on stored food, and had fewer alternative food-getting strategies available to fall back on if crops failed.

Chronological Trends in Material Culture

Changes in material culture can often be used as chronological markers and also may indicate changes in manufacturing technology, or in how particular tools or other material items were used. Below is a brief review of patterns of change through time in common items of material culture in the study area. The discussion is limited to post-Archaic manifestations.

Pottery

Chronological variation in pottery assemblages has been reviewed in the various chapters, generally following Wilson and Blinman (1991a). The focus here will be on major trends in form and function.

Mesa Verde tradition pottery was made throughout the study area as well as in adjacent areas of southeastern Utah and northeastern New Mexico. It was produced by a coiling technique. Although some of the earliest examples of fired ceramics from the study area were brown ware (Wilson and Blinman 1994), most pottery produced in the area from early Basketmaker III on was fired in a reducing atmosphere, producing vessels with a gray to white surface color. Red ware was also a part of the Mesa Verde pottery tradition in the Pueblo I and early Pueblo II periods, but evidently was made only or predominantly in southeastern Utah and traded into the study area; substantial amounts of this pottery occur in sites of this period in the study area, with frequency decreasing from west to east.

From the Basketmaker III through Pueblo III periods, a distinction is often made between utility vessels and serving vessels. Utility vessels, which appear to have been used principally for

cooking and storage, are classed as gray ware; their surfaces are not slipped or polished and are either left plain or are decorated by surface texturing. Predominant forms are jars. Serving vessels, which appear to have been used principally for food serving, and sometimes for storage, are classed as white ware; their surfaces generally are polished and/or slipped, and left smooth, with designs painted on them in black. The most common forms are bowls and secondarily, narrow-necked jars.

Evidence from a number of sites in several periods indicates that pottery was produced primarily or exclusively at the level of the household. When evidence of pottery production is sought or recognized during excavations (e.g., in the form of unfired clay, unfired vessels, tempering material, scrapers used to smooth the surfaces of vessels), such evidence is present in a sizable percentage of residences. Since the deposition and preservation of such evidence is subject to a variety of processes that can keep it from appearing in the archaeological record, the actual frequency of pottery production in households in probably higher than is indicated by the archaeological evidence. Furthermore, no evidence of specialized, large-volume pottery production workshops has been found.

However, in the late Pueblo II and III periods, large pit kilns occur in the western part of the study area. They appear to have been used primarily to fire white ware bowls and jars. The size of these kilns and other evidence associated with them indicates that groups larger than households probably joined forces to fire pots together at locations away from residential sites (Purcell 1993; Fuller 1984). The implication is that pots were formed by numerous potters, working at the household level, but that firing was sometimes a collaborative activity involving potters from numerous households.

As previously noted, during the Pueblo I and early Pueblo II periods, there was regional specialization in southeastern Utah in the manufacture of red ware, which was then widely traded to adjacent regions in the Four Corners area. It is unlikely that this red ware was made by specialists; production was probably at the household level.

The earliest pottery in the study area occurs in the eastern drainage units in late Basketmaker II contexts (probably post-A.D. 300) and early Basketmaker III contexts. Called Sambrito Utility by Wilson and Blinman (1994), it is a brown ware produced by coiling. Necked jars are the most common form, but seed jars, bowls, dippers, and pipes also occur (Wilson and Blinman 1994). This pottery resembles early types made in the Mogollon region, but appears to have been locally produced. It is not abundant at any of the sites where it is found, is not universally present in late Basketmaker II contexts, and appears to have been a minor part of the material culture at that time.

Plain gray pottery is abundant in Basketmaker III contexts throughout the study area. Narrow-necked ollas and seed jars are predominant forms, but wide-mouthed jars, gourd-shaped jars, dippers, and bowls also occur. Bowls are sometimes polished and occasionally slipped, and often decorated with simple designs in black mineral. Rims of both bowls and jars are typically pointed to rounded in cross section.

A style of textured decoration of utility jars referred to as neck banding becomes popular over much of the upland Southwest, spreading most rapidly in the Pueblo I period. This style depends on leaving the coils on jar necks—and sometimes shoulders—unsmoothed during manufacture. This technique of decoration appears in the Mimbres area of southwestern New

Mexico and then spreads throughout the northern Southwest, becoming popular at somewhat different times between about A.D. 750 and 1000 in different regions. In northeastern Arizona and the northern San Juan areas, neck banding became widespread about A.D. 750 (Pierce 1999).

In the study area, the appearance of neck banding correlates well with a substantial increase in the frequency of wide-mouthed gray ware jars at the expense of seed jars and other forms. Blinman (1988a) argues that the proportional shift to wide-mouthed cooking jars reflects increased use of boiling as a food-preparation technique. This in turn correlates with other lines of evidence indicating increased reliance on stored maize; presumably corn meal became a more common component of the cuisine. Pierce (1999:169) summarizes evidence that long boiling or simmering of starchy foods increases the digestibility of the starches and removes some components that may inhibit digestion and absorption. In the Pueblo I period, the frequency of bowls remains low relative to jars in terms of sherd frequencies and probably in terms of relative numbers of vessels in standing assemblages. White ware vessels (which are predominantly bowls) are more frequently polished and slipped than in the Basketmaker III period. Paint is based primarily on mineral pigments (i.e., iron oxide and/or manganese oxide). As noted above, red ware bowls and jars are produced in substantial amounts in the western Mesa Verde region and traded into the study area.

In the early Pueblo II period, neck banding on utility vessels becomes more variable and elaborate over much of the northern Southwest; innovations included corrugation of some of the exposed coils. Through time, either plain or corrugated coils were left exposed over increasing proportions of the vessel. Full-body corrugation initially existed alongside neck-banding, but then replaced it entirely. By about A.D. 1000, full-body corrugation was the common pattern for gray ware vessels at sites in the Chaco Canyon area; other regions of the northern Southwest followed suit, with this style becoming predominant in the study area by about A.D. 1030 (i.e., when Mancos Corrugated had largely replaced Mancos Gray). The technique of corrugation first appeared in the study area about A.D. 930. Consequently, it took approximately 100 years for it to become the strongly preferred surface treatment for gray ware vessels produced in the area. Pierce (1999) presents evidence that fully corrugated cooking pots are somewhat more resistant to breakage than plain ones as a result of the stresses engendered by repeated heating, but argues that this was probably only one of a complex of factors that promoted the spread of full-body corrugation.

Late Pueblo II also saw a substantial increase in the proportion of white ware sherds in pottery assemblages in the study area and other parts of the Four Corners area. This apparently results from increased numbers of bowls and white ware ollas in standing assemblages, and perhaps from increased breakage rates for these vessels due to more frequent use. Overall, Pueblo II designs are more elaborate than in the previous period. As in previous periods, styles in the study area have some general similarities to styles occurring elsewhere in the northern Southwest, but regional design traditions (i.e., Mesa Verde versus Kayenta) also are more easily recognized at this time.

It seems likely that the increase in number and elaboration of serving vessels during the late Pueblo II period represents some type of elaboration of mealtime behavior—perhaps more formal serving and dining etiquette and/or separation of different types of foods from one another. Average bowl size does not appear to decrease at this time, so it probably does not represent a shift from shared to individual servings. In the study area and in the Mesa Verde tradition generally, the late Pueblo II period saw a strong trend away from mineral-based to carbon-based pigment for the

paint used in black-on-white bowls and jars. Throughout the Pueblo II period, rims of white ware bowls gradually become thicker and more uniformly rounded than was typical in the preceding Pueblo I period.

In the Pueblo III period, full-body, corrugated, wide-mouthed jars continue to dominate the utility vessel assemblage. Black-on-white pottery designs become more elaborate, and in Pueblo III, the Mesa Verde design tradition is more distinct from other regional traditions than previously. Carbon-based black paint is predominant, although some localities continue to use mineral-based pigments as well. Rims of bowls tend to be relatively broad and squared off in cross section, and painted "ticks" are common on the tops of rims. The more highly populated portions of the Mesa Verde culture area (i.e., including Aztec Ruin and the Totah region, and from the Mesa Verde proper west to Cottonwood Wash in southeastern Utah) have higher frequencies of the especially elaborate type Mesa Verde Black-on-white than do more sparsely populated areas such as Cedar Mesa or the Glen Canyon area farther west in southeastern Utah. Several distinctive forms—classic Mesa Verde mugs and "kiva jars"—also characterize the Pueblo III period and appear to be more common in the heavily populated "core" of the Mesa Verde area than elsewhere. The shift back to plain-surfaced gray ware that takes hold in late Pueblo III in the Kayenta region of northeastern Arizona and extreme southeastern Utah does not appear at all in the study area.

Numic (probably ancestral Ute) pottery appears in small quantities at a few sites in the study area, and probably represents occupations occurring after the end of the Pueblo III period (Errickson and Wilson 1988; Hill and Kane 1988).This pottery contrasts strongly with Pueblo pottery. It is a brown ware, plain except for occasional decoration by fingernail or fingertip impressions, and most frequently has micaceous inclusions, probably from the rock used to temper it or because clay derived from micaceous rock was used (Hill and Kane 1988). Both ethnographic observation of nineteenth century Ute potters and inferences based on alignment of temper particles indicate that vessels were constructed using the paddle-and-anvil technique (Hill and Kane 1988).

Athapaskan pottery from the study area and the Dinetah region of northwestern New Mexico also probably postdates the Pueblo III period. The predominant ware is Dinetah Gray. As described by Brugge (1963) and Brown (1996), conical vessels were shaped by a coil-and-scrape technique, and corncobs were often used to scrape and smooth vessel walls. Firing was in a variable, but generally reducing atmosphere (Hill and Kane 1988; Brugge 1963). Micaceous clays or tempers are used farther south in the area between Mount Taylor and Chacra Mesa (Brugge 1963), but not in the study area. Some examples are decorated with shallow indentations. After about A.D. 1630, a painted type, Gobernador Polychrome, makes its appearance (Reed and Reed 1996). Its production was evidently inspired by Pueblo examples.

Projectile Points

Formal, named, projectile point types are seldom utilized in published descriptions of archaeological contexts in the study area, and relatively little use is made of stylistic variation in projectile point styles as an indicator of chronology. At least in part, this may be a reflection of the rarity of projectile points in habitation sites, especially after the Basketmaker II period.

Not surprisingly, point styles in the study area for the most part reflect general patterns of stylistic change that occur widely in the western United States. Basketmaker II points from sites in

southwestern Colorado and adjacent parts of the Four Corners area are typically side-notched or corner-notched dart points. The classic side-notched San Juan Basketmaker points from the Four Corners area (Morris and Burgh 1954; Kidder and Guernsey 1919) are generally similar to San Pedro Cochise dart points from southern Arizona. Matson (1991) relies on this and other artifactual similarities to infer that some Basketmaker II complexes in the Four Corners area represent migrations of San Pedro groups. He suggests that other Basketmaker II complexes, e.g., the late Basketmaker II Los Pinos phase sites from the Durango area, may have developed out of local Late Archaic traditions after the adoption of agriculture and other traits from San Pedro migrants or from Mogollon sources. In this vein, Matson (1991:315) suggests that the expanding stem corner-notched points common in the Los Pinos phase sites are related to Elko series corner-notched points found in Late Archaic contexts in the Great Basin.

Although dart points are generally characteristic of the Basketmaker II period, during late Basketmaker II times (ca. A.D. 1-500), there is evidence of the use of the bow and arrow in some contexts in the Four Corners area. Geib and Bungart (1989) report small Rose Spring Corner-notched points from aceramic contexts in southeastern Utah that apparently date between about A.D. 100 and 500. Reed has reported similar points from probably late Basketmaker II contexts from the study area, i.e., at the Tamarron site in the Animas drainage unit (Reed and Kainer 1978) and at site 5DL896 in the Dolores drainage unit (Reed 1990). Thus, it appears that the bow and arrow began to see some use prior to the end of Basketmaker II, but that the atlatl and dart remained more common at most sites until Basketmaker III. This evidence is consistent with Holmer's (1986:106) conclusion that "the replacement of the atlatl-and-dart by the bow-and-arrow apparently began in the Intermountain West at about A.D. 300 and was complete by A.D. 600."

Projectile points from Basketmaker III, Pueblo I, and Pueblo II contexts in the study area are predominantly small, corner-notched, stemmed arrow points. These are generally similar to the Rose Spring Corner-notched series, which dates from about A.D. 300 to 950 in the Great Basin and the northern Colorado Plateau (Holmer and Weder 1980). Following Thomas (1981), Holmer (1986) combines the Rose Spring and Eastgate point series into the "Rosegate" series, which extends from about A.D. 300 to as late as 1250 in some areas.

Some stylistic differences are apparent between Basketmaker III, Pueblo I, and Pueblo II points in the study area. Basketmaker III points tend to have fairly large corner notches and expanding stems; in Pueblo I, the corner notches are very large and the stems are small, with straight to contracting sides and straight to convex bases; in Pueblo II, corner notches are small and stems are again expanding, often with convex bases (Schwab and Bradley 1987:48). Phagan (1988a, 1988b) has published an extensive formal study of projectile points from the DAP; the majority of these are from Pueblo I contexts.

Stemless triangular points become common in the Pueblo III period; this style may occur in some late Pueblo II contexts as well. Most commonly, these points are long relative to their width and have narrow side notches. Sometimes the notches are lacking, however, and the points are simply plain triangles. Bases are straight to concave. These points are very similar to the Nawthis Side-notched and Bull Creek types from Utah that are described by Holmer and Weder (1980) and Holmer (1986). Stemmed arrow points also occur in Pueblo III contexts in the study area.

Post-Puebloan occupations are often recognized by the presence of Desert Side-notched or Cottonwood Triangular arrow points, or both (Holmer 1986). Both types tend to be shorter relative

to width than are the triangular arrow points found in Pueblo III contexts. In addition to their narrow lateral side notches, Desert Side-notched points usually have a pronounced concave base, often with a narrow vertical notch in the center of the base. Desert Side-notched and Cottonwood Triangular points appear to correlate with the expansion of Numic speakers—in this case, the ancestors of Ute and Paiute people. These point styles also occur at sites thought to represent ancestral Athapaskan occupation. They should perhaps be considered as widely distributed temporal styles, rather than as markers of particular ethnic or linguistic groups. Similar styles occur in the late prehistoric and protohistoric periods of other parts of the United States as well.

Food-grinding Equipment

Food-grinding tools in the study area display the sequence of changes described by Woodbury (1954): from basin grinding slab and one-hand mano to troughed metate and two-hand mano to flat metate set in a slab bin, also used with a two-hand mano. These changes occur widely over the northern Southwest, and reflect increasing technological specialization for grinding large quantities of seeds—in most cases, maize. Woodbury (1954) noted that grinding slabs had oval basins that had been produced by circular or variable motions with a one-hand mano. He thought that the grinding slab and one-hand mano constituted a generalized tool set that could have been used to crack and process a variety of seeds, using pounding and/or grinding motions. Troughed and flat metates, on the other hand, reflected a reciprocal grinding stroke, ordinarily delivered by a two-hand mano. This allowed a larger grinding area to be employed with each stroke. Woodbury (1954) thought that the latter two styles of metate were specialized for efficient grinding of maize. Because flat metates were ordinarily mortared into a fixed bin, this implied that maize grinding was a regular activity that could be assigned a permanent facility.

Work by Hard (1990; Hard et al. 1996) supports Woodbury's model. Hard et al. (1996) used ethnographic, archaeological, and stable carbon isotope data to test the hypothesis that mano surface area was positively related to dependence on maize; the evidence supported the hypothesis. J. Adams (1999) has recently published an analysis of the mechanics and efficiency of grinding seeds with various types of metates and manos. She also obtained experimental data on grinding efficiency and assembled ethnographic accounts of how mealing tools were used by various Native American groups in the greater Southwest. J. Adams (1999:492) concludes that the form of food-grinding tools does not directly reflect dependence on maize (or any other seed food). Instead, tool shape reflects how food grinding was integrated into an overall food-processing strategy that included considerations of efficiency, desired end product of grinding (i.e., flour versus coarse meal), the social organization of grinding, and strategies for managing tool wear. She argues that the widespread changes in metate and mano design noted above are likely related to the "increasing importance of flour and flour-based recipes in the prehistoric diet" (J. Adams 1999:492).

In the study area, shallow-basin grinding slabs and one-hand cobble manos appear to be characteristic of the Archaic, although data are sparse. In late Basketmaker II Los Pinos phase habitation sites, however, assemblages frequently include thick grinding slabs with oblong grinding basins that approach true troughs in form; in addition, two-hand as well as one-hand manos are frequently present (e.g., Morris and Burgh 1954). Farther west, in the Cedar Mesa area of southeastern Utah, thin grinding slabs with shallow basins are common in late Basketmaker II contexts, as well as the heavier semi-troughed variety. Hard et al. (1996) found that late Basketmaker II manos from Cedar Mesa were in the same size range as manos from other groups that had independent evidence of substantial dependence on maize, and were approximately 84

percent as large as Pueblo II and III period manos from the same area. As previously discussed, the coprolite and stable carbon isotope data from Cedar Mesa indicate a degree of maize dependence for Basketmaker II that is also close to the Pueblo figure. Hard's mano size correlations somewhat "underpredicted" Basketmaker II maize dependence for this area relative to what is indicated by the coprolite and stable carbon isotope analyses. This is perhaps consistent with the idea that even though there was relatively little increase in overall dietary dependence on maize from the Basketmaker II to late Pueblo periods, there were increases in the efficiency and intensity of maize processing associated with greater dependence on dried, stored maize.

Troughed metates appear to become the norm in Basketmaker III and Pueblo I times. Data from the DAP show that in late Basketmaker III and early Pueblo I contexts, two-hand manos are 1.5 to 2.5 times as common as the one-hand variety (Phagan 1988c:188). In late Pueblo I—in conjunction with rapid regional population increase and settlement aggregation—two-hand manos become about 8 times as common as one-hand manos.

Troughed metates continue to be used during the Pueblo II period, but by late in the period, flat metates in bins make their appearance. This type of grinding facility is predominant in Pueblo III habitation sites in the study area.

Data from the DAP indicate some variability in grinding tool occurrence with site type, with most of the examples being from Basketmaker II and Pueblo I contexts (Phagan 1988c). Manos and metates both increase as a percentage of the nonflaked lithic assemblages at hamlets and villages, as opposed to limited activity and seasonal sites. On the other hand, indeterminate nonflaked lithics are much more common at the latter two site types. Many of these items are probably fragments of expediently used, thin grinding slabs and abrading stones. There are probably some differences among site types in all periods, with the higher-investment grinding tools such as heavy troughed metates, mealing bins, and two-hand manos more likely to be found at habitation sites, and cobble manos and expediently made, thin grinding slabs more frequent at sites used for short periods of time. Nevertheless, the overall temporal trends in grinding tool form appear predominant, and affect the composition of ground stone tool assemblages more than does site type.

Chronological Variation in Architecture

Domestic Architecture

Changes in domestic architecture have been reviewed in some detail in the chapters devoted to particular temporal periods. Only the main patterns of continuity and change are discussed below, with emphasis on the central and western parts of the study area, where architectural evidence is most abundant.

Little can be said with confidence about domestic architecture of the Archaic, because so few examples clearly referable to this period have been excavated in the study area. These examples, plus evidence from nearby areas, indicate that Archaic houses were shallow pit structures, circular to oval in plan, with light superstructures of poles and branches. Fire features and small to medium-sized storage pits are often associated, both inside and outside the house.

A number of continuities characterize domestic architecture from the Basketmaker II through Pueblo III periods. Residential facilities associated with individual nuclear or small

extended family households are always identifiable, either as spatially separate structures or as small complexes of structures. A pit structure is always present and is the principal residential structure in Basketmaker II and III sites; associated surface rooms begin to appear in late Basketmaker III and Pueblo I times, and are almost always present in Pueblo II and III examples. The household architectural complex is ordinarily patterned along a north/south axis. Typically, the pit structure has an entryway or ventilator opening to the south or southeast; a line drawn north through this passage will pass through an upright deflector, a firepit, and often from Basketmaker III on, a sipapu or vault feature north of the firepit. When surface structures appear (either rooms or storage cists or both) they are usually to the north or northwest of the pit structure, and a midden area is usually located to the south or southeast of it.

Basketmaker III and Pueblo I pit structures are generally deeper and larger than those of Basketmaker II, and the spatial patterning of floor features is somewhat more uniform. The structure roof is supported by four posts set in the floor away from the walls. In Pueblo II and III contexts, pit structures remain deep but are generally smaller and architecturally more formally patterned. Roof support posts are initially moved flush with the pit structure wall, and then by the late Pueblo II period, the support system changes to masonry pilasters sitting atop a masonry or earthen bench. By late Pueblo II times, the number of pilasters is usually 6, and a southern recess over the ventilator tunnel has become standard. One effect of the change in the way the roof was supported was to do away with reliance on posts set in the ground; posts begin to rot and have to be replaced after 10 to 20 years. The shift to masonry pilaster roof supports thus may have increased the use life of pit structures, or at least the intervals between major remodeling episodes.

Conventionally, pit structures from Basketmaker III are called "pithouses," those of Pueblo I are called "proto-kivas," and Pueblo II and III examples are called "kivas." The subterranean character of these structures may symbolize the widespread Puebloan belief in the emergence of people from an underworld; they also commonly have sipapus and/or vaults that probably had ritual or symbolic functions. Pit structures of all periods also have evidence of domestic use, however, and they undoubtedly functioned as part of a household's residential facilities. The specialization of kivas for ceremonial use seems to have occurred in the Pueblo IV period in the Western Pueblo and Rio Grande areas, rather than during the Puebloan occupation of the Mesa Verde area. The great kivas of the Mesa Verde area may be functionally more analogous to some of the Pueblo IV and historic kivas (particularly those of the Eastern Pueblos) than are the small "residential" kivas of the Pueblo II and III period. These do not appear to have good analogs in the Pueblo IV and historic periods.

In the Basketmaker II and III periods, storage appears either to have been in pits—some of them quite large—or in small, above-ground cists with superstructures of mud, sometimes with poles and/or slabs incorporated as well. Storage pits occur both inside pit structures and in open areas outside structures. Through time, storage increasingly shifted to surface rooms, which in turn became increasingly well built. In late Basketmaker III and early Pueblo I times, individual, small, surface storage rooms of poles and mud, often with vertical slabs at the wall base, are found in the area north of the pit structure.

Beginning in the Pueblo I period, a small room block is typically constructed north of the pit structure. It consists of a row of usually no more than 3 or 4 large habitation rooms, with a row of more numerous, smaller and better constructed storage rooms attached to the north side of the habitation rooms. Gross (1987, 1992) convincingly argues that the shift from pit to surface storage and the development of larger, better-built storage facilities in Pueblo I is due to increasing

dependence on secure storage of more than a single winter's supply of maize. The construction of surface habitation rooms indicates that indoor residential/domestic activities are now being split between the pit structure and surface structures, with the former perhaps being more important in cold seasons, and the latter during the warmer part of the year (see discussions in Lightfoot 1994). These developments establish the "Prudden unit" (Prudden 1903) or "habitation unit" (Bullard 1962) consisting of a pit structure and an associated surface room block that can be identified as a basic household residential complex from the Pueblo I through Pueblo III periods. Whether such units were occupied by a single family or by several related families (thus creating a joint household) remains a point of discussion. Lightfoot (1994) makes a strong case that the habitation units (a pit structure and associated surface rooms) of the late Pueblo I period were the residence of a single nuclear or small extended family.

During the Pueblo II and III periods, surface room blocks appear not to be as rigidly zoned into "front" (southern and nearer the pit structure) habitation rooms and "back" storage rooms, and storage rooms appear to be more variable in size. In the Pueblo III period, the general lack of formal hearths in surface rooms also makes distinguishing storage from habitation rooms somewhat more difficult. Instead of formal hearths (i.e., a pit bordered by a clay or slab coping), Pueblo III surface living rooms are more likely to have "burned spots" on the floor, suggesting that fires were less commonly built in Pueblo III structures of this type than in previous periods. The large size of the rooms, the presence of large doorways with relatively low sills, and the occurrence of other floor features such as metate bins, indicate that these rooms were used for a variety of domestic activities rather than for long-term food storage. Storage rooms are smaller, have fewer floor features, and have small high-silled doorways.

Masonry construction begins to appear in the Pueblo I period and increases in frequency through Pueblo III, but with a great deal of variation from one site and locality to another. Most Pueblo I surface structures are of pole-and-mud construction, with the roofs supported by interior posts set in the ground. The bases of walls often incorporate vertical slabs or several courses of masonry; rarely, masonry walls are full height. The roofs of at least the larger surface rooms are typically supported by interior wood posts set in the ground. In the Pueblo II period, full-height masonry walls are increasingly used to support the roofs of surface rooms. This practice probably increases the use lives of surface rooms—or at least the intervals between major reconstructions—by removing dependence on wooden support posts, the bases of which usually begin to rot after a few years. Masonry continues to increase in popularity through the Pueblo II period and becomes almost universal for surface rooms in Pueblo III. Masonry is also increasingly used to line kivas, although there are some earth-walled or only partially lined kivas even in late Pueblo III.

The distinctive "McElmo" style of northern San Juan masonry appears in the late Pueblo II period and becomes widespread in Pueblo III. This includes the use of large, usually shaped, rectangular blocks of stone that are coursed with relatively thin layers of mud mortar. In this style, building stone faces are sometimes made uniform by pecking; masonry finished in this way usually appears on the exterior or public sides of walls, as well as on lower kiva lining walls and the faces of pilasters.

Post-Puebloan domestic architecture, which includes forked-stick hogans and brush wickiups, displays relatively low levels of investment in constructed shelter. Not surprisingly, it reflects the more mobile lives and lower population densities of the Athapaskans and Numic-speaking people who succeeded the Puebloans in the study area.

Non-domestic Architecture

Included here is a variety of structure types that may represent "public" architecture in the sense of having been used by groups larger than households, as well as structure types that possibly represent residences of religious or political leaders and as such, are architecturally differentiated from "ordinary" residences.

The earliest likely nondomestic structure in the region is a large, circular, shallow pit structure at Valentine Village, a late Basketmaker II (Los Pinos phase) site on the Pine River in northwestern New Mexico, just south of the Colorado border (Eddy 1961). Although this structure has the same general form and floor plan as an "ordinary" house, its floor area is several times as large. It has a central firepit and numerous, large, interior storage pits. It may have been a structure that "belonged to" the community, where numerous households could gather for ceremonies. On the other hand, it could instead have been the residence of a political and/or religious leader whose social position required displaying hospitality and hosting feasts, hence, the large interior floor space and large storage pits.

Although great kivas appear as a distinct structure type in the greater Four Corners area in the Basketmaker III period, to date no examples have been identified in the study area. Wilshusen (Chapter 6) notes that the nearest Basketmaker III great kivas are in the Chaco Canyon area and at the edge of the Carrizo Mountains in northwestern New Mexico. The presence of a great kiva may be an indicator of increased organization at the community or locality level. Group rituals and other assemblies held in such structures could have reinforced whatever institutions were involved in conflict resolution or other organizational tasks at a suprakin group level. In the study area, Basketmaker III period sites are numerous, but small and dispersed. Social institutions that depended on community-level decision-making may not have been important enough or frequently enough relied upon to support the construction of expensive facilities such as great kivas. Instead, community integration may have relied on less formal facilities, such as dance grounds, that are not detectable archaeologically.

In the Pueblo I period, however, great kivas are clearly present in southwestern Colorado and remain a feature of the social landscape into the Pueblo III period. In Pueblo I times, they are not abundant enough to indicate that each local community had such a structure. Some great kivas may have served more than one local face-to-face community, while other communities probably did not utilize this type of structure in community or intercommunity organization. Lightfoot (1988) shows that construction of great kivas required the procurement of large timbers and the expenditure of a large amount of organized labor in excavating and roofing the large pit. In addition, maintenance of such structures would have required a regular investment of labor. Building a great kiva clearly depended on tapping the efforts of groups larger than a single household or local kin group. Those who contributed labor would have had to be convinced of the importance of doing so.

At some Pueblo I sites, "oversized pit structures" are present. These are modeled in detail on the domestic pit structures but are much larger. These structures may have been devoted to suprahousehold ritual activities (and hence may have been functionally analogous to Pueblo IV and later Western Pueblo kivas) or they may have been part of the residential facilities of ritually and/or politically important households. There is some evidence that these structures and

associated room blocks were the loci of "potluck" type feasting (Blinman 1989), which would be consistent with either of the interpretations above.

In the Pueblo II period, great kivas become more common in the study area. They appear to have served as central structures in many but not all communities, which typically were residentially dispersed. In late Pueblo II times, "great houses" that appear to be based on Chacoan models appear in many existing and a few newly established communities. These compact structures are built entirely of masonry, have kivas built into the room block, and often have multiple stories; frequently, they are built on prominences or divides that command a large view shed. The great house structures clearly are houses, but are larger and much more formal and ostentatious than are the ordinary small habitations that comprise the rest of the community. It seems likely that they were occupied by families or lineages having local political or religious power or both. Each great house probably served as a symbol of power or influence; its large storage capacity probably housed food used in feasting and hosting, and its kivas perhaps were the loci for ritual events involving selected individuals from the local community or visitors from other communities. In addition, there is almost always a great kiva close to the great house. It seems likely that the occupants of the great houses controlled or at least played a leading role in the activities that took place in the great kivas. Pueblo II great kivas sometimes have associated storage rooms, and it is likely that many of the rooms in the great houses were devoted to storage. Consequently, the great house occupants potentially controlled very substantial amounts of food and other goods. The extent to which the great house dwellers derived their power from some type of formal relationship to the centers at Chaco Canyon or Aztec Ruins is unclear; it seems unlikely, however, that they represented a leadership imposed on existing communities by a controlling Chacoan hierarchy.

Great kivas continue to be used—and probably built—in the Pueblo III period, although they become markedly less common through time. Stand-alone Chaco-like great houses are no longer built after late Pueblo II times, but multistoried structures with blocked-in kivas that are reminiscent of great houses appear as parts of multiple-room block nuclei within early Pueblo III communities. In addition, some Chaco-era great houses were reoccupied and remodeled in Pueblo III times.

In late Pueblo III times, various types of architecture that do not fit the standard habitation unit model become common. Some of these, such as masonry towers, are first seen in late Pueblo II times, but are not common until late Pueblo III. Both Pueblo II and Pueblo III towers may be incorporated in habitation units, in which case they are not infrequently connected to the kiva by a tunnel. Stand-alone towers proliferate in the late Pueblo III period, occurring singly or in complexes on canyon rims, or as constructions on large boulders located below the canyon rim, often adjacent to a spring. Some of the larger multi-room canyon-rim towers may be residences, but most do not appear to have been used as habitations. Most have only a single room per floor, and access to the various floors and to the tower roof was presumably through interior hatchways; this would make their use for long-term, secure storage of food somewhat awkward, though not impossible. The term "tower" includes a variety of forms and settings; although it is likely that many if not most of these structures had defensive purposes, they may have had other uses as well. The proliferation of towers in the late Pueblo III period is probably related to the increase in warfare and defensive measures seen at this time.

Residential aggregation increases through the Pueblo III period, and in late Pueblo III times, the village becomes the standard community pattern, with varying numbers of small

residential outliers. Late Pueblo III villages commonly have one—or rarely two—large, masonry, D-shaped structures, usually built on the canyon rim. These are variable in internal construction, but the larger ones usually have small, high-ceilinged storage rooms around the outer periphery. The interior of the "D" is often bisected by a wall forming two courtyards, each of which may contain a kiva or circular above-ground structure. The smaller, D-shaped structures may lack some of these characteristics, including buildings in the interior courtyards. Whether D-shaped structures are centralized storage complexes, the loci of certain suprahousehold ritual activities, or the residences of villages religious and/or political leaders is not clear, although there is some evidence that at least some of them were residences during at least part of their use lives.

Other features of public architecture associated with late Pueblo III villages include informal plazas; low walls that surround either the whole settlement or a selected precinct that includes towers and a D-shaped structure; and a variety of subtly expressed, enigmatic features on or just outside the edges of the village that may be shrines or community boundary markers of some sort. The canyon-rim villages are usually separated into two parts by a drainage, and some of the larger cliff dwellings are divided by a wall that inhibits traffic between the two parts of the site (Lipe and Ortman 1999; Nordby 1999; Rohn 1971; Roberts 1999).

Additional Observations on Architectural Variation

In all periods, there is substantial variation among and sometimes within settlements in the amount of labor invested in structures and in the formality with which walls and other features are finished. These variations are probably related to actual or anticipated length of a structure's use life, to whether it was used seasonally or year-around, to the types of raw materials available, to the environmental setting (e.g., elevation, soil depth) and to attempts to communicate particular messages (e.g., about religion, or status, or inclusion/exclusion) by means of architectural form. In addition to variations within and among the sites in a particular locality, there often are differences between drainage units. The abundant literature from the study area would permit systematic examination of temporal, spatial, and functional variability in architecture, but for the most part, such studies have not been done and cannot be attempted here. Hence, the survey above has reviewed only the most obvious patterns, with emphasis on the central and western parts of the study area, where architectural evidence is most abundant.

RESEARCH NEEDS

Research necessary to a better understand the archaeological—and in some cases the environmental—record of each period has been discussed in previous chapters and these discussions need not be repeated here. In addition, a number of comparative studies could and should be done, utilizing the extremely rich literature and the numerous museum collections that have accumulated as a result of more than 120 years of research in the area. Many questions requiring data from systematic comparisons could be addressed as Master's theses, or in some cases, even as graduate seminar research papers. Certain types of field studies would also be very productive. Some thoughts on these topics are offered below, more as a stimulus to further thinking than as an attempt to provide a exhaustive "laundry list" of research needs.

Studies that result in improved chronological control will always be useful, for example:

- Although standard typological analysis of pottery can result in good chronological assignments of archaeological contexts (e.g., Wilson and Blinman 1991a), work by

Hegmon (1991) and Ortman (1995a) with Pueblo III pottery has shown that assemblage seriation based on attribute analysis can further refine chronological control. This type of approach could be extended to pottery from periods earlier than Pueblo III.

- Variation in projectile point style remains a largely untapped resource for chronological control. Points from well-dated contexts across the study area should be studied to determine if temporal patterns of stylistic variation can be identified and related to regional patterns such as those described by Holmer (1986).

- Although architectural styles tend to vary with site type and local raw materials as well as temporally, there may be possibilities for developing chronological indicators based on certain architectural attributes. For example, size of building stone and type of shaping appear to vary temporally; can these trends be quantified and patterns be found that would be useful in dating surface rubble mounds?

Additional, systematic, comparative studies are necessary to help provide contexts for interpreting data from individual sites or from groups of sites.

- Studies like Driver's (1996b) pioneering comparative study of variation in faunal assemblages need to be done of macrobotanical and palynological data, much of which is available in individual reports or publications.

- Likewise, an abundance of information is available on how architecture and features vary with structure type, site type, time period, and drainage unit. Systematic studies of such variation should be of great help in the functional interpretation of archaeological contexts, and in fine-grained analysis of social and cultural change through time.

- There also appear to be significant variations in the relative frequencies of different kinds of common artifacts among site contexts (e.g., Schlanger 1991, 1992). Does this variation result from differences in artifact use lives in relation to the time represented by particular assemblages, or does it relate to differing activities related to site function, or both? For example, are measures such as the ratio of discarded food-grinding tools to cooking pot sherds of any use in making inferences about agricultural intensification? Does the variation in projectile point frequency relative to cooking pot sherds tell investigators anything about the importance of hunting in different locales?

Systematic comparative studies utilizing existing artifact collections could also be productive in other ways, for example:

- Long-distance relationships can be assessed on the basis of the presence and frequency of items from outside the study area. It appears that importation of pottery from long distances peaked in late Pueblo I period and again in late Pueblo II, and that evidence of such extraregional connections was extremely low in late Pueblo III. These impressions need to be checked by systematic examinations of the literature coupled with reanalysis of selected collections.

- Identifying patterns in the exchange of goods within the study area is more difficult, because source areas for raw materials used in manufacture are more likely to be shared

among sites. However, such studies can be done and can be informative, as recent work by Glowacki et al. (1995, 1998) has shown.

- Overt artifactual indicators of differential social status are rare in the archaeological record of the study area, but more subtle indicators might be revealed by systematic comparative studies of site or room block assemblages. Are artifacts with more elaborate or more formal decoration, or greater investments of production labor differentially distributed within and among sites?

Much ink has been spilled in attempts to "explain" settlement pattern changes, population fluctuations, and regional abandonments by relating them to regional climatic changes, especially in the amounts and timing of effective moisture. Considerable space is devoted to discussing these possible correlations in various parts of the preceding chapters. It seems likely that unfavorable climatic conditions contributed to low population levels in the western part of the study area in the late A.D. 800s and 900s, and to what may have been a period of social disruption and possible population decline in the mid A.D. 1100s. Drought and possibly a loss of predictability in summer rainfall also undoubtedly played a role in the depopulation of the area in the late A.D. 1200s. The population "boom" in the area was probably promoted by the northward expansion of reliable summer rainfall in the A.D. 1000s, but climatic explanations have not been proposed for the peaking of population in the early to middle A.D. 1200s.

The quality of the paleoenvironmental, demographic, and settlement pattern data available from the study area and adjacent parts of the Four Corners are unequaled in western North American archaeology. Although numerous attempts have been made to relate environmental, cultural, and demographic evidence, the time seems ripe for a more comprehensive approach to pursuing this line of research.

- Paleoenvironmental data should be further evaluated along the lines discussed in Chapter 2, then used to construct a model of how resource supply and resource risk varied through time in the various environments of the study area, or to the extent possible, of the larger Four Corners area.

- On the basis of the model, predictions should be made regarding likely population and settlement pattern responses to resource variation.

- These predictions should be examined in light of archaeological evidence on changes in population size, population distribution, and settlement patterns in the study area.

- Results should be interpreted with the perspective that social and demographic responses to environmental change were always mediated by culture, and by the economic and social options available over an area much larger than the study area.

- On the basis of this exercise, more sophisticated models and reconstructions can be developed that integrate both environmental and cultural variables, and consider both "push" and "pull" factors that affected population movements.

In several of the period summaries in the preceding chapters, questions were raised as to whether some communities were more mobile at the household or whole community level than others, perhaps due to variations between localities in the reliability of resources, or perhaps to the

different ways in which communities were organized to utilize resources. Comparative studies based on multiple lines of evidence already reported in the literature can probably be used to address this question productively. In addition, however, refining our understandings of mobility at the household, community, and regional population levels can also be a goal of future fieldwork.

- Well-designed field sampling schemes may enable researchers to use rate-of-accumulation methods to assess variability in the use lives of habitation sites (e.g., Varien and Mills 1997; Varien and Potter 1997). This is key information in reconstructing rates of mobility of households and communities. Sampling must be adequate to allow estimation of total populations of key types of artifacts at sites or appropriately selected portions of sites.

- Excavations in most periods have tended to concentrate on habitation sites, and often on the best-defined structures and midden accumulations. Although excavation of habitation sites often does produce the greatest amount and variety of information for the time and money expended, there is a need for additional intensive excavations of the "lightly expressed" aspects of settlement patterns—both to increase our understanding of differences between whole settlement systems in patterns of mobility and adaptation, and to better understand the seasonal and special activity loci associated with any particular settlement system.

- In other words, future excavation needs include gaining a better understanding of sites that have been given such labels as "sherd and lithic scatter,""field house," and "seasonal habitation" on the basis of surface evidence. Field experience in the study area suggests that such surface evidence often underestimates the intensity of occupation at these sites. Can archaeologists use focused excavations to learn how to better identify short-term and low-intensity uses of the landscape from surface evidence?

As discussed in Chapter 11, NAGPRA and recent efforts in the field of archaeology to take account of Native American concerns have brought the study of culture history back to the forefront, after 30 years or so of relative neglect.

- The richness of the study area's archaeological record can be coupled with the equally rich ethnographic, documentary, and oral historical records of the greater Southwest to achieve new understandings of cultural-historical relationships.

- Archaeologists should reexamine the concepts and methods they use to make inferences about cultural-historical relationships between archaeological complexes and the cultures/societies of historic and modern times. Taxonomic constructs inherited from the 1940s and 1950s are likely to be inadequate for this task.

- Native oral traditions should be analyzed for their historic content, using methods that have proved successful, whether or not they have previously been applied in the Southwest.

- The work of inferring cultural-historical relationships between archaeological manifestations and more recent cultural groups needs to go forward in consultation with contemporary native peoples.

Further suggestions regarding research needs could be proliferated. In summary, the main points are these:

- The abundance of past archaeological and paleoenvironmental research in the study area makes it fertile ground for any number of comparative studies based on the existing literature and museum collections.

- Investigators now have the methods needed for obtaining data on site use lives and activity patterns, and these methods need to be better employed in future field studies, not only at habitation sites, but with respect to the more subtle manifestations of past land use as well.

- The study area can be a productive focus for a much-needed reexamination and, if necessary, a reinvention of cultural-historical studies focused on tracing relationships between archaeological cultures and those of historic and contemporary native peoples.

RESOURCE MANAGEMENT NEEDS

Having a World Heritage site (Mesa Verde National Park) that draws hundreds of thousands of visitors a year focuses not just national but international attention on the study area, and on the archaeological research, resource management, and public education that takes place there. A very large amount of archaeology has been done in southwestern Colorado during the past 30 years, most of it in the context of CRM, broadly interpreted. Compliance with federal and state policy and law has resulted in extensive archaeological field studies in response to reservoir construction, intensive exploration for and development of energy resources, construction associated with transportation and power transmission, among others. Knowledge of the archaeological resources, especially on public land, has increased greatly, both as a result of extensive inventory, and as a result of testing and mitigative studies done in advance of the kinds of development projects noted above. The creation of the Anasazi Heritage Center and Crow Canyon Archaeological Center have also added new dimensions to archaeological public education in the area, complementing the long-standing programs maintained by the NPS at Mesa Verde National Park and Hovenweep National Monument.

Even though the study area has witnessed many successes in CRM, additional work always remains to be done and the approaches that are used can always be improved. The following comments are offered in the spirit of making a strong system better. The recommendations are primarily addressed to state and federal managers who have legal responsibilities for archaeological resources in the study area. However, effective protection and management of the area's archaeological record requires the support and efforts of the whole archaeological community, and the recruitment of increased numbers of the lay public.

Improving the State Archaeological Database

- The database would be much more useful if it were easier to obtain information about what areas have and have not been inventoried, and about the intensity and quality of the existing inventory coverage. Ideally, this information would be available in a GIS.

- The site records also suffer from extensive variability in terminology, modes of defining site boundaries, and accuracy and precision in assigning dates. This is not surprising, since standard recording lexicons and protocols were not in place during most of the time that

site records were being accumulated, and too-rigid protocols in any case bring about their own problems. The site records contain much valuable information, however, that can be aggregated if differently labeled categories of information are carefully collated and relabeled. Richard Wilshusen and Mary Sullivan collaborated on such a project to produce some of the tabular information presented in this report. It would be useful if the Colorado Historical Society could further pursue this approach and prepare summary reports showing component distributions by temporal period, drainage unit or other geographic subdivision, site type, and relationships to appropriate environmental variables. Displaying survey coverage, as noted above, would also be essential for such reports.

- Of the variables recorded in the site records, accurate assignment to temporal period is perhaps the most essential. It is clear from a perusal of records, however, that the quality of these assignments is highly variable; field archaeologists have often assigned sites to very broad periods, e.g., Pueblo II-III, when it is clear from evidence in the report itself that a much tighter assignment could have been made. Future site recording should be held to a higher standard. It may be helpful for the OAHP to prepare additional reference material on chronological placement of surface assemblages, and to require that field archaeologists make use of such guides. Additional workshops on this topic might also be developed.

- It would be helpful if a subsample of the records in the site files could be carefully reanalyzed to abstract more precise and consistent data on location, chronological placement, kinds of structures, features and artifacts present, site condition, and overall site function. This project would provide a better understanding of the data potential of the existing site files, and the resulting database could serve as a tool for characterizing the archaeological record of the study area.

- Consideration should be given to establishing a program of small grants to encourage use of the state site files and database for specific research projects. These could be focused on CRM-related topics or on research questions regarding the study area's prehistory. These projects would produce substantive contributions to understanding the area's prehistory and archaeological resources, and would also increase knowledge about the information potential of the site files.

Improving Dissemination of Descriptive Reports and Research Results

Anyone working in the archaeology of the study area recognizes the need to become familiar with a large quantity of relevant literature. It is hoped that this context document will be helpful as a guide to that literature, and to some extent, as a summary of it. Nonetheless, anything that can be done to improve both the timely production and the dissemination of reports will be helpful. Dissemination of information from publicly funded or mandated archaeological studies is part of the public trust that such work is designed to honor. Currently and in the past, dissemination has been highly variable. In seeking information for the Southern Colorado River Basin context, the authors have had a range of experiences, from finding it very difficult to acquire extensive reports resulting from the expenditure of large amounts of public funds, to having other, equally extensive reports come in through the mail without being solicited. The most basic need is improved dissemination of data-rich reports of basic fieldwork and analysis, i.e., of excavations, extensive surveys and testing programs, and analyses of artifacts and ecofacts from well-dated contexts. Such reports constitute an essential part of the formation of archaeological knowledge.

They need to be produced as part of the process of learning from the archaeological record, and they need to be available to the archaeological community and to such members of the general public who wish to see them. If such reports are not produced or are produced but remain inaccessible, the fieldwork might as well never have been done. On the other hand, because of their bulk, they are useful primarily as reference tools; principal project results need to be circulated in less bulky formats. The following suggestions are made in order to encourage productive discussion of this important aspect of public archaeology:

- Federal agencies responsible for projects that produce the kinds of results noted above should take responsibility for seeing that copies of the reports are disseminated—or at least advertised—to other agencies engaged in CRM activities, to individual researchers and consulting firms active in the area, and to local organizations that maintain research libraries, such as Fort Lewis College, the Anasazi Heritage Center, and the Crow Canyon Archaeological Center. Major reports should also be sent to the principal museums and research libraries in the Four Corners states. Public libraries near the project location should also be included in the distribution of major reports. Primary reports that do not provide significant amounts of information about archaeological contexts should be archived, but do not need to be widely circulated; reports cited in the bibliography of this context document, and especially, those summarized in the attached annotated bibliography provide examples of the materials that need to be systematically disseminated.

- Agencies, consulting firms, and other organizations involved with archaeological work in the area should continue to experiment with use of the Internet and CD-ROM formats to disseminate bulky descriptive reports; several individuals and organizations have already shown leadership in doing this. Archaeologists need to learn from these initial efforts and move ahead to make this a regular form of information dissemination. There of course needs to be a state or national system to archive these digital reports, and individuals, governmental agencies, and other organizations concerned about the archaeology of the study area should support the development of such archiving systems and protocols.

- Agencies in charge of CRM contracts should require the personnel in charge of major projects to produce journal articles presenting the principal results of the work, and to submit such articles to appropriate peer-reviewed journals. Archaeologists not working in the study area cannot be expected to glean a project's principal findings from bulky descriptive reports, nor should this burden be placed on the interpretive specialists who form the links between the technical practitioners of archaeology and the general public. "Interpretive specialists" include journalists, educators, museum exhibits specialists, media producers, or others who make a living repackaging archaeological science and scholarship into forms that can be more easily assimilated by a broad audience. Publishing in journals (or in edited books) is the standard way that archaeological research is received and critiqued by the archaeological community. Journal articles and published books also provide interpretive specialists with manageable access to information about current archaeological research. Interpretive specialists can also use these publications to identify individuals and institutions that can provide further information about a particular topic or area. Participating in the standard research publication process will help the agencies responsible for major projects to meet their responsibility to disseminate the principal project results and will also ensure that the work is subjected to appropriate scrutiny by professional peers and the general public.

Continuing to Improve Public Education

Southwestern Colorado is growing rapidly in population, in residential and commercial development, and in visits to public and state lands by members of the public in search of recreation. Each of these trends has the potential to cause significant damage and loss to the archaeological record. Minimizing this damage will require additional investment in law enforcement on the part of federal land-managing agencies, and to some extent, by local law enforcement as well. Although enhanced law enforcement is necessary, it is only part of the solution. More important and effective will be programs that help school children and members of the general public understand and value archaeological sites as repositories of information and as places culturally important to many Native Americans.

The study area is fortunate in having a number of organizations that are active in various aspects of public archaeological education. These include the BLM Anasazi Heritage Center, the National Park Service at Mesa Verde National Park and Hovenweep National Monument, the San Juan-Rio Grande National Forest, the Ute Mountain Ute Tribal Park, the Southern Ute Museum, Fort Lewis College, the Crow Canyon Archaeological Center, the Cortez Center, the Mitchell Springs Archaeological Project, and the local chapters or affiliates of the Colorado Archaeological Society (San Juan Basin Archaeological Society and the Hisatsinom Chapter). These organizations have become increasingly effective, but much remains to be done to reach the goal of having an informed public that understands the area's archaeological history, and respects archaeological resources and Native American cultures. Additional funding for public education needs to be developed from the private sector, as well as from local, state, and federal sources. In addition, the various organizations in the area that are involved in aspects of archaeological education need to intensify their efforts to communicate and coordinate with one another.

Developing Incentives for Site Protection on Private Land

Because prehistoric communities and settlement systems include multiple sites dispersed over hundreds or thousands of acres, these phenomena commonly extend over both public and private lands—there are thousands of sites in both category of land stewardship. Substantial legal protections and active management programs are in place on public land, but similar laws and programs do not apply to private land and probably never will, given the U.S. system of law and long-standing cultural traditions regarding the sanctity of private property.

The pace of residential development in rural settings has increased enormously in the study area in recent years. The expansion of irrigation due to the completion of the DAP has promoted the removal of topographic irregularities (such as rubble mounds) on many farm properties, as has the increased size and power of farming equipment. The market for antiquities continues to flourish, and it is clear that much of the commercial looting has shifted to private land. All of these factors combine to place archaeological sites on private land in peril.

The public education efforts referred to above can be as effective in convincing private landowners to protect and respect archaeological resources as they can be in convincing public land users to do the same. To preserve archaeological sites, however, private landowners may sometimes have to forego certain farming practices or choose not to locate a house or outbuilding in the most convenient spot. Many farmers and other residents of the study area make these sacrifices because they are committed to preserving the archaeological record of the past.

However, this requires them to shoulder a burden individually for the benefit of society in general and future generations.

It is time for federal and state agencies, the archaeological community, and concerned citizens to explore the creation of incentives for landowners to preserve significant sites in their ownership. The U.S. Department of Agriculture (USDA) currently has incentive programs to encourage farmers to preserve wetlands and wildlife habitat. These sorts of incentives should be extended by the USDA or by appropriate state agencies to at least the most significant cultural resources that are on private lands. At the least, the organizations in the area that are most concerned with archaeology and public education should take the lead in giving public recognition to landowners who act as good stewards for archaeological sites on their property.

Encouraging Earlier Involvement of Native Americans in Project Planning

Native Americans are stake holders in archaeological research, resource management, and public education. Agencies and organizations that conduct these programs need to move proactively to engage representatives of Native American communities at the project planning stage, and they need to find ways to compensate these representatives for the time they must spend away from their regular employment and other obligations to their families and communities. This will not ensure that conflict is avoided, but it will put potential conflicts on the table for discussion before projects are actually implemented. Early engagement is the best way to build the lines of communication and trust that are essential for establishing cooperative relationships between the archaeologists, resource managers, and Native American communities.

Thinking about Ends as Well as Means

In a recent article titled "In Defense of Digging: Archeological Preservation as a Means, not an End," Lipe (1996:23-24, 27) wrote:

> ...a starting point for federal archeological preservation programs is a consideration of the primary social contribution of archeology, i.e., the production and dissemination of new information about the past based on the systematic study of the archeological record. Many archeological sites have associative or educational values in addition to or independent of their research value, but most sites in fact gain their primary social value because they have the potential to contribute new information about the past when subjected to archeological study....Under the NHPA, if sites are preserved on the grounds that this makes it possible for them to be studied in the future, one measure of a preservation program's success is whether anything useful or at least interesting to scholars and the general public has been learned by the subsequent study of those sites. It follows that decisions about the physical preservation of archeological sites should take into account how these sites can contribute to public understanding and appreciation of the past through archeological study or interpretation. The public benefits of preserving any particular archeological site may not be realized for a long time, or perhaps never; my point is that programs of archeological preservation need to consider both the means (preservation) and the ends (increased public understanding and appreciation of the past), and not assume that the latter will somehow take care of itself....Long-term, frugal consumption of the archeological record by well-justified research—both problem-oriented and mitigation-driven—must be an accepted and integrated part of the preservation program. If the research doesn't get done, or if it gets done and we don't

learn anything from it, or if only scholars learn from it and the public is shut out, then preservation will have been in vain, because its goals will have not been achieved.

This was written in reaction to what Lipe saw as a sometimes unreflective tendency by resource managers

- to always see site avoidance as a preferred impact mitigation strategy relative to "data recovery,"
- to limit "consumptive research" (primarily excavation) to sites that are threatened with destruction by development projects, and
- to "bank" sites in "research-free zones" with the expectation that they could be studied more productively in the future.

Lipe (1996) argued that this sort of formulaic approach to archaeological resource management risks creating outcomes which in the long term may work against the underlying goals of the management program. He suggests that:

- Avoidance as a mitigation strategy needs to be coupled with firm plans for future protection, including periodic monitoring of site condition.
- Managers should consider problem-oriented research based on excavation and/or surface collection as one of the permissible uses of archaeological resources. Such research would have to be well-planned and justified in terms of the potential contribution to scholarly and public knowledge, and should be designed to make frugal use of the archaeological record consistent with research goals. The alternative—of always limiting consumptive research to cases in which sites would otherwise be destroyed by development projects—implies that gaining new information through problem-oriented research never outweighs road-building or other such projects as a reason for intruding upon the archaeological record; this is not a sustainable position.
- Management of the archaeological resources of particular areas by "banking" them for the future always needs an exit strategy. If the field of archaeology continues to improve, it will always be possible to argue in the future that the sites could be studied more effectively in a still more distant future. Programs of banking sites for the future need to have explicitly stated goals, and conditions or criteria need to be described under which the sites might again become eligible for research access in the future.

These ideas are presented at the conclusion of this section not in the expectation that they will be accepted without further argument, but to stimulate such argument and discussion. The main point is that cultural resource managers, and the archaeological community in general, need to step back occasionally from their immersion in the details of their work and consider larger questions of ends and means. There is just one archaeological record for any particular period of the past, and many of the management decisions made today have the potential to forever affect the future quality of that record. Management decisions also may affect the kinds of substantive archaeological knowledge that the archaeological record of an area can provide to scholars and ultimately to the general public that supports both the management effort and the production and dissemination of archaeological knowledge.