

APPENDIX O
CULTURAL RESOURCES TECHNICAL REPORT

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Table of Contents

<u>Section</u>	<u>Page</u>
1.0 WHAT ARE CULTURAL RESOURCES?	1
1.1 National Historic Preservation Act	1
1.1.1 Archaeological Resources Protection Act	2
1.1.2 Native American Graves Protection and Repatriation Act	2
1.1.3 Archaeological Sites	3
1.1.3.1 Historic Buildings	3
1.1.3.2 Cultural Landscapes	3
1.1.3.3 Traditional Cultural Properties	3
1.2 Prehistory	4
1.2.1 Early Prehistory of the Planning Area	9
1.2.2 PaleoIndian Period (ca. 10000 B.C. to 5500 B.C.)	9
1.2.3 Archaic Period (ca. 5500 B.C. to A.D. 400)	10
1.2.4 Formative Period (ca. A.D. 500 to A.D. 1492) in the Planning Area	12
1.2.5 The Northern Area (Reaches 1 through 12)	12
1.2.5.1 Basketmaker III (ca. A.D. 500-700)	12
1.2.5.2 Pueblo I (ca. A.D. 700-900)	14
1.2.5.3 Pueblo II (ca. A.D. 900-1050)	14
1.2.5.4 Pueblo III (ca. A.D. 1050-1300)	15
1.2.5.5 Pueblo IV (ca. A.D. 1300 - 1540)	16
1.2.6 The Southern Area (Reaches 13 through 17)	17
1.2.6.1 Mesilla Phase (A.D. 400-1200)	18
1.2.6.2 Doña Ana Phase (A.D. 1200-1300)	18
1.2.6.3 El Paso Phase (A.D. 1300-1450)	18
1.3 HISTORIC PERIOD	19
1.3.1 The Northern Area (Reaches 1 through 12)	19
1.3.1.1 Spanish Period (A.D. 1540-1821)	19
1.3.1.2 Mexican Period (A.D. 1821-1848)	39
1.3.1.3 Euro-Anglo Period (1848 - present)	41
1.3.2 The Southern Area (Reaches 13 through 17)	43
1.3.2.1 The Spanish Period (1540-1821)	43
1.3.2.2 Mexican Period (1821-1846)	47
1.3.2.3 Euro-Anglo Period (1846 - present)	47
1.4 Projected Impacts and EIS Alternative Evaluations on Cultural Resources	49
1.5 Mitigation Measures	58

List of Tables

<u>Table</u>	<u>Page</u>
Table O-1.1. Regional Phase Sequences in the Planning Area	5
Table O-1.2. Summary of Site Cultural Affiliations in Reaches 1-2 (Colorado)	6
Table O-1.4. Frequency of Archaeological Components in Reaches 3-16 of the Northern Project Area.	8
Table O-1.5. Summary of PaleoIndian and Archaic Phase Occupations in the Planning Area.....	10
Table O-1.6. Summary of Anasazi Phase Components in the Northern Project Area.....	13
Table O-1.7. Summary of Mogollon Phase Occupations in the Southern Project Area.....	17
Table O-1.8. Basic Parameters for Cultural Resources in the Planning Area	51
Table O-1.9. Alternative Number and Reach-Specific Inundation of Archaeological Sites.....	53
Table O-1.10. Cross-Tabulation of Alternatives by Inundation Years and Inundation Days.....	56
Table O-1.11. Final Weighting of Alternatives Based on Impacts to Numbers of Cultural Resources.....	58

List of Figures

<u>Figure</u>	<u>Page</u>
Figure O-1.2. Population Distribution in 1750.....	26
Figure O-1.3. Population Distributions in 1775.	33
Figure O-1.4. Time-sequent Establishment of Spanish and Mexican Land Grants.....	37
Figure O-1.5. Alignment of the Old Spanish Trail.....	38
Figure O-1.6. Population Distributions in 1845	40
Figure O-1.7. Comparison of Inundation-Years by Alternative	54
Figure O-1.8. Comparison of Inundation-Days by Alternative	55
Figure O-1.9. Known Sites in the Broader Region.....	57

1.0 What Are Cultural Resources?

The term cultural resource is broadly defined under three bodies of law: (1) the National Historic Preservation Act (NHPA 1966; 36 CFR 800.2.e); (2) the Archaeological Resources Protection Act (ARPA 1979; 16 USC 470); and (3) the Native American Graves Protection and Repatriation Act (NAGPRA 1990; Public Law [P.L.] 101-601).

1.1 National Historic Preservation Act

To provide some sense of the range of phenomena that is encompassed by the simple term *cultural resources*, we first turn to definitions provided under the National Historic Preservation Act (NHPA).

Historic property means any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register. This term includes, for the purposes of these regulations, artifacts, records, and remains that are related to and located within such properties. The term eligible for inclusion in the National Register includes both properties formally determined as such by the Secretary of the Interior and all other properties that meet National Register listing criteria.

This definition subsequently has been expanded to include *traditional cultural properties*. These are defined as properties having cultural significance to one or more ethnic groups.

"Traditional" in this context refers to those beliefs, customs, and practices of a living community of people that have been passed down through the generations, usually orally or through practice. The traditional cultural significance of a historic property, then, is significance derived from the role the property plays in a community's historically rooted beliefs, customs, and practices.

A traditional cultural property can be defined generally as one that is eligible for inclusion in the National Register because of its association with cultural practices or beliefs of a living community that (a) are rooted in that community's history and (b) are important in maintaining the continuing cultural identity of the community. Various kinds of traditional cultural properties will be discussed, illustrated, and related specifically to the National Register criteria.

Examples of properties possessing such traditional cultural significance include (a) a location associated with the traditional beliefs of a Native American group about its origins, its cultural history, or the nature of the world; (b) a rural community whose organization, buildings and structures, or patterns of land use reflect the cultural traditions valued by its long-term residents; (c) an urban neighborhood that is the traditional home of a particular cultural group and that reflects its beliefs and practices; (d) a location where Native American religious practitioners have historically gone and are known or thought to go or today to perform ceremonial activities in accordance with traditional cultural rules of practice; or (e) a location where a community has traditionally carried out economic, artistic, or other cultural practices important in maintaining its historic identity.

Finally, the NHPA has been extended to include *cultural landscapes*, defined in National Park Service Bulletin 30 as:

a geographic area, including both cultural and natural resources and the wildlife or domestic animals therein, associated with a historic event, activity, or person or exhibiting other cultural or aesthetic values.

There are four general types of cultural landscapes, none of which are mutually exclusive: historic sites, historic designed landscapes, historic vernacular landscapes, and ethnographic landscapes. Of these, the ethnographic landscape is directly relevant for this project and is defined as a:

landscape containing a variety of natural and cultural resources that associated people define as heritage resources. Examples are contemporary settlements, religious sacred sites and massive

geological structures. Small plant communities, animals, subsistence and ceremonial grounds are often components.

The NHPA provides perhaps the most all-encompassing definitions of cultural resources and is the standard that has been used during this project.

1.1.1 Archaeological Resources Protection Act

The Archaeological Resources Protection Act provides complementary definitions of cultural resources, focusing more narrowly on archaeological remains as a basis for its definition of *resources*.

The term "archaeological resource" means any material remains of past human life or activities which are of archaeological interest, as determined under uniform regulations promulgated pursuant to this chapter. Such regulations containing such determination shall include, but not be limited to: pottery, basketry, bottles, weapons, weapon projectiles, tools, structures or portions of structures, pit houses, rock paintings, rock carvings, intaglios, graves, human skeletal materials, or any portion or piece of any of the foregoing items. . No item shall be treated as an archaeological resource under regulations under this paragraph unless such item is at least 100 years of age.

1.1.2 Native American Graves Protection and Repatriation Act

Finally, definitions appearing in the Native American Graves Protection and Repatriation Act (NAGPRA) provide yet a third construal of what may constitute *cultural resources* (NAGPRA 1990; P.L. 101-601).

- (1) "Burial site" means any natural or prepared physical location, whether originally below, on, or above the surface of the earth, into which as a part of the death rite or ceremony of a culture, individual human remains are deposited.
- (2) "Cultural affiliation" means that there is a relationship of shared group identity which can be reasonably traced historically or prehistorically between a present day Indian tribe or Native organization and an identifiable earlier group.
- (3) "Cultural items" means human remains and items of "cultural patrimony" which shall mean an object having ongoing historical, traditional, or cultural importance central to the Native American group or culture itself, rather than property owned by an individual Native American, and which, therefore, cannot be alienated, appropriated, or conveyed by any individual regardless of whether or not the individual is a member of the Indian tribe or Native Hawaiian organization and such object shall have been considered inalienable by such Native American group at the time the object was separated from such group.

From these three bodies of legislation, it is possible to find statutory bases for defining *cultural resources* as:

- Individual buildings or groups of buildings, whether prehistoric or historic in age.
- Archaeological sites, both prehistoric and historic, as well as artifacts in those sites.
- Graves, even if not situated in nominal archaeological sites.
- Traditional cultural properties that play a role in a community's historically rooted beliefs, customs, and practices. This may include properties important to Native American or other ethnic groups.
- Cultural landscapes consist of geographic areas of varying size including ethnographic landscapes that associated people define as heritage resources (e.g., contemporary settlements, religious sacred sites, massive geological structures or religious or cosmological importance, small plant

communities where plants used in rituals are obtained, small animal communities where animals used in rituals are obtained, and specific areas used to conduct ceremonies).

All these classes of *cultural resources* are considered as part of the Review and Environmental Impact Statement (EIS) analysis. Among the cultural resources known in the planning area are archaeological sites, historic and prehistoric buildings, potential cultural landscapes, and traditional cultural properties (TCPs). Each of these is discussed in a preliminary fashion below. It should be emphasized that these are not mutually exclusive categories; it is quite possible to have historic buildings in archaeological sites that constitute traditional cultural properties, all of which are situated in cultural landscapes.

1.1.3 Archaeological Sites

More than 6,838 known prehistoric and historic archaeological sites are situated in the planning area. Of the known sites, approximately 40 (0.6 percent) would be directly impacted as a result of proposed changes in water operations.

Based on variations in surveyed acres and estimated site densities, approximately 153,000 archaeological sites are projected to be located within the planning area. Of the projected number of sites, between 383 and 465 sites (0.3 percent of the total) would be adversely affected by proposed changes in water operations.

1.1.3.1 Historic Buildings

Historic archaeological sites are present among the known sites in the planning area. However, current evidence indicates that none of these sites would be affected by proposed changes in water operations.

1.1.3.2 Cultural Landscapes

It is difficult to ascertain whether cultural landscapes—whether Native American, Spanish, or Anglo—will emerge as important in the planning area. However, recently there have been changes in zoning regulations in Rio Arriba County designed to protect agricultural lands. This suggests that agricultural lands may constitute Spanish cultural landscapes in the statutory sense of the term. Similarly, it is likely that certain parts of the planning area may be deemed cultural landscapes by Native American communities. Spanish cultural landscapes tend to be concentrated in the Rio Chama Basin (Reaches 5, 6, and 7), while Native American cultural landscapes are concentrated along the mainstem of the Rio Grande in Reaches 8, 9, 10, 11, and 12.

1.1.3.3 Traditional Cultural Properties

At a bare minimum, there are two general classes of TCPs found within the planning area. The first of these are New Mexico's acequias. All of the state's acequias have been determined by the New Mexico Office of Cultural Affairs, Historic Preservation Division, to be eligible for inclusion on the National Register of Historic Places (NRHP) as TCPs. Acequias occur near and within traditional Spanish towns and villages along the Rio Chama.

The second class of TCPs found within the planning area is sites sacred to New Mexico's Native American communities. These are *de jure* eligible for inclusion on the NRHP as TCPs. The spatial distribution of these sites relative to the projected impact zones associated with each of the EIS alternatives is as yet unknown.

Still other TCPs may also emerge. For example, it is quite likely that reaches of the Rio Grande containing certain kinds of plants may be found to be TCPs if these plants are used by Native Americans in religious and other ceremonies.

What follows is a broad overview of the development of Native American, Spanish, and Anglo-American communities across the large and complex landscape encompassed by the planning area. This discussion provides a historical context within which specific cultural resources—archaeological sites, historic

buildings, cultural landscapes, and traditional cultural properties—may be viewed. Without this context, is virtually impossible to accurately interpret cultural resources in the project area or, equally important, begin to evaluate the potential effects of proposed changes in water operations on these cultural resources.

1.2 Prehistory

The planning area contains evidence of prehistoric occupations designated by archaeologists as *Anasazi* and *Mogollon*. This distinction is predicated on differences in ceramics, architecture, and myriad other archaeological evidence that has been amassed over the past century. The northern reaches of the project area contain remains typical of Anasazi occupations, while Mogollon occupations are typical of the southern reaches. Areas along the boundary between these two geographically defined types of occupations often contain evidence of both Anasazi and Mogollon occupations.

Archaeologists working in different parts of the Anasazi and Mogollon culture areas have defined regional phase sequences based on subtle differences in the characteristics of artifacts associated with sites, as well as slight differences in the ages of remains in certain regions. Regional phase sequences, presented in **Table O-1.1**, include these more focused phase sequences for the San Juan, Middle Rio Grande, Gallina, Rio Abajo, and Jornada portions of the project area. These regional phase sequences are contrasted with the more generalized Pecos sequence that was used during the early years of archaeological investigations across the region.

There are two terms appearing in the following discussions that require explanation. The term *site* refers specifically to a bounded geographic location that contains evidence of past human occupations. The use of the term *occupations* in this definition recognizes that many sites (i.e., locations) may contain evidence of occupations spanning substantial periods of time. Each of these time-sequent occupations are termed *components*. Consequently, it is almost always the case that the number of *components* is greater than the number of *sites*. Accordingly, there will be variations between the numbers of sites and the numbers of components that appear in the tables that follow.

Table O-1.1. Regional Phase Sequences in the Planning Area

Age	San Juan Basin	Middle Rio Grande	Gallina	Rio Abajo	Jornada	Pecos Classification
1900						
1800						
1700	Cabazon		Cabazon			
1600						
1500	Gobernador	Historic	Gobernador			
1400	Dinetah	Pueblo IV	Dinetah	Historic	Historic	Historic
1300						
1200	Pueblo III		Largo-		El Paso	Pueblo IV
1100		Coalition-		Late		Pueblo IV
1000					Doña	Pueblo II
900	Pueblo II		Arboles	Early	Mesilla	
800						
700			Piedra	Tajo		Pueblo I
600	Pueblo I	Pueblo II				
500						
400		Pueblo I	Rosa			Basketmaker
300			Sambrito			
200	Basketmaker			San	Hueco	
100						
0	Basketmaker					
-100			Los Piños			Basketmaker
-200		Basketmaker				
-300						
-400						
-500	En Medio					Basketmaker
-600						
-700						
-800						
-900						
-1000	Armijo	Rio Rancho		Archaic	Fresnal	Archaic

Mention must be made of the overall character of archaeological sites in the northernmost portion of the project areas, which are situated in southern Colorado and includes Reaches 1 and 2. There are no proposed changes in water operations in this part of the project area and so this summary is quite general.

Colorado archaeological records are recorded in a system that is quite different from New Mexico Cultural Resources Information System (NMCRIIS). Since it is impossible to completely correlate the Colorado system with that used in New Mexico, simple queries regarding the character of prehistoric and historic archaeological sites are presented below. Records obtained from the State Historic Preservation Office in Denver, Colorado, indicate that 813 sites are situated adjacent to Reaches 1 and 2. Reach 1 encompasses 643,415,000 acres and contains 217 sites. Reach 2, which encompasses the margins of the Rio Grande mainstem, contains 1,151,590,000 acres and 591 sites. At first glance, this might suggest that fully 73 percent of the total known sites for the two reaches combined are situated in Reach 2. However,

once the size of the two reaches is standardized, it is evident that there are minimal differences in the overall numbers of archaeological sites between these two reaches.

The majority of sites in Reach 1 and Reach 2 are of unknown affiliation and time period (**Table O-1.2**). Of those that can be assigned to specific time periods, most date to the middle-late Archaic Period, with progressively smaller numbers of sites dating to later prehistoric times. Historic sites (e.g., Ute, Hispanic, Euro-Anglo) are also rare, perhaps indicating that this part of the project area was not settled until relatively recently.

Table O-1.2. Summary of Site Cultural Affiliations in Reaches 1-2 (Colorado)

Cultural Affiliation	Reach 1	Reach 2	Total
	Site Frequency	Site Frequency	
PaleoIndian	2	1	3
General Archaic	3	4	7
Early Archaic	0	2	2
Mid-Late Archaic	0	13	13
Late Archaic	2	21	23
Archaic/Puebloan	0	1	1
PaleoIndian-Archaic	0	1	1
BM II	0	1	1
PII - PIII	0	1	1
Pueblo III	2	0	2
PIV-Late Prehistoric	6	4	10
Anasazi	5	2	7
Unknown Cultural	76	166	242
Unknown Aboriginal	30	29	59
Historic Ute	0	2	2
Hispanic	0	3	3
Euro-Anglo	1	2	3
No data	90	326	416
TOTAL	217	579	796

Table O-1.3. Summary of Site Types and Sizes in Reaches 1-2 (Colorado)

Code	Site Types	Reach 1		Reach 2	
		Number	Size (m2)	Number	Size (m2)
1	Open Lithic	19	5923	81	7923
2	Open Architectural	5	9890	17	54250
3	Open Camp	14	2310	20	6348
4	Rock Art	2	3050	0	N/A
5	Historic Period	1	400	7	1434
6	Sheltered Camp	0	N/A	0	N/A
7	Stone Quarry	0	N/A	0	N/A
8	Historic Trash Scatter	2	12810	1	N/A
9	Historic Foundations	0	N/A	0	N/A
10	Isolated Find	3	178	50	98
11	Isolated Feature	0	N/A	0	N/A
12	Herding/Sheep Camp	2	5375	3	11367
13	Mining Operation	13	8424	0	N/A
14	Lumbering Operation	0	N/A	1	N/A
15	Railroad Related	0	N/A	1	N/A
16	Sheltered Architectural	0	N/A	0	N/A
17	Historic Cabin	4	4705	0	N/A
18	Tree Carvings	0	N/A	0	N/A
19	Quarry	1	135	11	6242
20	Unspecified	156	N/A	399	N/A
	OVERALL TOTAL	222	5,407	591	10,285

Table O-1.4. Frequency of Archaeological Components in Reaches 3-16 of the Northern Project Area.

Reach	PaleoIndian	Archaic	Anasazi	Anasazi/ Mogollon	Mogollon	Puebloan	Ute	Apache	Navajo	Hispanic	Anglo	Unknown	Totals
3	1	107	111	0	0	11	0	5	1	29	21	219	505
4	0	2	24	0	0	8	0	0	0	12	5	11	62
5	0	9	10	0	0	0	0	1	0	17	14	82	133
6	3	129	324	0	0	10	21	3	48	34	31	327	930
7	4	112	283	0	0	20	1	4	5	52	16	261	758
8	0	6	82	0	0	10	0	0	0	26	15	31	170
9	1	94	1068	0	0	67	0	0	0	19	22	665	193
10	2	36	220	0	0	54	0	0	0	27	18	308	665
11	1	15	37	0	0	28	0	0	0	3	4	50	138
12	1	27	267	0	0	33	0	1	1	81	69	206	686
13	0	5	70	12	0	12	0	0	0	77	30	23	229
14	2	40	68	117	39	19	0	2	0	60	66	125	538
15	0	5	1	0	63	0	0	0	0	2	41	64	176
16	2	64	1	0	398	1	0	2	0	12	118	289	887
Total	17	651	2566	129	500	273	22	18	55	451	470	2661	781

1.2.1 Early Prehistory of the Planning Area

Despite the geographic extent of the planning area, the early prehistory of the region exhibits many commonalities through the PaleoIndian (*Circa* [ca.] 11,000 B.C. to ca. 7,000 B.C.) and Archaic (ca. 7,000 B.C. to ca. A.D. 300) Periods. It is only during the Formative Period (ca. A.D. 500 to A.D. 1492) that regional differences in the character of prehistoric occupations emerge.

Accordingly, the discussion of PaleoIndian and Archaic occupations focuses on general similarities across the project area as a whole. In contrast, the discussion of Formative Period occupations divides the project area into various subareas (e.g., Northern Rio Grande, Middle Rio Grande, and West Texas) whose archaeological characteristics are internally similar, but that differ from each other in subtle ways.

Region-specific phase sequences are presented in **Table O-1.1**. In general, the prehistory of the northern planning area is divided into five major periods. The earliest evidence of human occupations in the region is termed PaleoIndian. This is followed by the Archaic Period during which the beginnings of agriculture emerge in the archaeological record. Subsequent developments are designated as the Formative, or Developmental, Period when agriculture and large towns began to appear across the Colorado Plateau. This, in turn, is followed by the Historic Period which includes developments by both American Indians, as well as later Euro-American settlers.

1.2.2 PaleoIndian Period (ca. 10000 B.C. to 5500 B.C.)

The PaleoIndian Period was characterized by relatively small bands of hunters relying on large, now-extinct, Pleistocene megafauna (i.e., mammoth and bison), many of which were migratory. As a result, PaleoIndian sites are ephemeral, reflecting periodic movement of camps to areas where animals might be found. There is also evidence of reliance on plant resources. Such high mobility is accompanied by relatively low archaeological visibility and the overall number of PaleoIndian sites known in the project area as a whole is quite low (Biella and Chapman 1977:113; Kirkpatrick et al. 2000:85; Scheick et al. 1991:107)

PaleoIndian sites have been found in a variety of settings. The first is along the margins of playas small ephemeral lakes that hold water for short periods during the rainy season (Judge and Dawson 1972). The second setting where PaleoIndian sites are found is along ridge lines paralleling large drainages where water might be available (Vivian 1990:81), as well as immediately adjacent to the mainstem of the Rio Grande (Marshall and Walt 1984:17; Scheick et al. 1991:107). Small PaleoIndian sites consisting of chipped stone artifacts; occasional hearths have been found in uplands settings adjacent to the Rio Grande, notably in the Cochiti Dam region (Biella and Chapman 1977:113).

In the northern reaches of the project area, PaleoIndian sites are known from the Puerco Basin, the Española Basin, the Chuska Valley along the Arizona-New Mexico border, and the Chaco Plateau (Vivian 1990:81). Most consist of isolated projectile points, again consistent with a highly mobile way of life (Scheick et al. 1991:107-108). PaleoIndian occupations have tentatively been identified from cave sites situated in the Sandia Mountains near Albuquerque (Schutt and Chapman 1992:24) and from mesa settings overlooking the Rio Grande near Rio Rancho, as well as from floodplain settings near Socorro (Weber 1963).

To the south, between the Rio Puerco to downstream below Elephant Butte Reservoir, artifacts consistent with Clovis and later Folsom occupations also have been found (Beckes 1977; Broilo 1973; Camilli et al.

1988; Cordell 1979; Eidenbach 1983; Elyea 1987; Everett and Davis 1974; Harkey 1981, Kauffman 1984; Krone 1976; MacNeish 1991; Quimby and Brook 1967; Russel 1968; Weber and Agogino 1968). Clovis remains are quite rare, probably because sites from this period are generally scarce in near-riverine setting (Marshall and Walt 1984:21).

Specialized tools in the form of end-scrapers, denticulates, notched flakes, and bifacial and unifacial knives characterize most PaleoIndian assemblages (Judge 1973; Chapman 1977). In addition, sites from this period exhibit large bifacial projectile points. These points were attached to wooden shafts to form atlatls, or throwing sticks. Variations in the ways these points were manufactured, specifically reliance on fluting and lateral thinning, have allowed archaeologists to separate the PaleoIndian Period into three time-sequent complexes. The earliest complex is typified by non-fluted Clovis points. Later, fluted points signal the appearance of the Folsom complex. Finally, points typified by extreme lateral thinning are indicative of the Plano complex.

Detailed analyses of archaeological site records from the NMCRIS indicate that there are 17 sites with PaleoIndian occupations in the planning area (**Table 0-1.5**). PaleoIndian components constitute approximately 0.2 percent of the total number identifiable components in the project area. PaleoIndian sites are found in approximately 60 percent of project area reaches, but are more common in Reaches 6 and 7.

1.2.3 Archaic Period (ca. 5500 B.C. to A.D. 400)

The Archaic Period consists of more diversified adaptations that began approximately 8,000 years ago and persisted until about 2,000 years ago. The Archaic Period is signaled by the extinction of earlier Pleistocene fauna due to the combined effects of drought and possible over-hunting by PaleoIndian peoples. The decline in big game hunting as a major subsistence focus was replaced by a more diversified set of exploitative technologies.

Although hunting remained important throughout the Archaic Period, there was greater emphasis on smaller game (e.g., deer). Projectile points decrease in size consistent with the hunting of smaller animals. This was accompanied by greater reliance on gathering of wild plant resources. Consonant with this subsistence shift is the appearance of new classes of artifacts, notably ground stone implements used to process plant foods for consumption.

Table 0-1.5. Summary of Paleolndian and Archaic Phase Occupations in the Planning Area

Reach	PaleoIndian	Archaic	TOTAL
3	1	107	108
4	0	2	2
5	0	9	9
6	3	129	132
7	4	112	116
8	0	6	6
9	1	94	95
10	2	36	38
11	1	15	16
12	1	27	28
13	0	5	5
14	2	40	42
15	0	5	5
16	2	64	66

Reach	PaleoIndian	Archaic	TOTAL
17	0	0	0
TOTAL	17	651	668

The appearance of broader spectrum hunting and gathering subsistence practices was accompanied by increases in the number and size of resource zones and in the variety of resources that were utilized. Consistent with this subsistence change, settlement patterns also changed noticeably so that Archaic sites found in a broader variety of elevational and topographic settings (Dick 1965; Human Systems Research 1972; Laumbach 1980a; Martin et al. 1949; Whalen 1971).

As in the PaleoIndian Period, Archaic hunting-and-gathering groups seem to have remained small in size, probably consisting of no more than a few co-residential, extended families. Archaic sites are more visible than PaleoIndian sites, but also remain relatively ephemeral. This is again consistent with high mobility when groups continually move to take advantage of geographic and seasonal variations in the availability of plant and animal resources.

Variability in projectile point production technologies (e.g., hard versus soft hammer percussion, basal thinning, corner-notching) suggests that regional differentiation was developing (Taylor 1964; Winters 1969). Social groups were probably still organized at the family and band level, with a concurrent high degree of residential mobility inferred for these groups.

In the northern portion of the planning area, Archaic sites are best known from the Navajo Reservoir region southward to Gallegos Mesa, the Española Basin, the Rio Santa Cruz Basin, the Galisteo Basin, the Chuska Valley, the Chaco region, and Arroyo Cuervo (Scheick et al. 1991:115-119). Beginning with relatively few early Archaic Jay phase (*ca.* 5500-4800 B.C.) sites, there is a progressive increase in the number of later Bajada (*ca.* 4800-3200 B.C.), San Jose (*ca.* 3000-1800 B.C.), Armijo (*ca.* 1800-800 B.C.) and En Medio (800 B.C. - A.D. 400) phase sites in the northern portion of the project area (Irwin-Williams 1979). Sites tend to be larger by the San Jose phase and are accompanied by the first evidence of structures, probably constructed of poles and brush. The number and size of sites increases steadily in succeeding phases, all of which is consistent with the aggregation of larger groups of people, generalized population growth, and repeated occupations of larger base camps. Some of the earliest evidence for domesticated crops, specifically maize, appears among Armijo phase sites in the northern part of the project area in the San Juan Basin.

Sites tend to alternate between semi-permanent (winter) base camps that were repeatedly occupied from year to year and more ephemeral (summer) sites related to specific seasonal hunting or gathering activities. Sites are common along canyon heads and cliff tops, as well as in floodplain environments and escarpments overlooking the Rio Grande (Scheick et al. 1991:109-110; Snead 1995). Based on ethnographic analogies, the size of territories exploited by Archaic groups was inversely proportional to environmental diversity: where diversity was higher, territories probably were smaller and the converse.

In the southern portion of the planning area, the Archaic Period is divided into the Gardner Springs (6000-4000 B.C.), Keystone (4000-2500 B.C.), Fresnal (2500-900 B.C.), and Hueco (900 B.C.-A.D. 250) phases. These temporal distinctions are based on changes in tool technology, primarily projectile point types. Small numbers of Archaic sites have been found in Socorro, Sierra, and Doña Ana counties (Kirkpatrick et al. 2000:97).

Archaic sites are generally situated along the margins of the Rio Grande on the east and west mesas adjacent to Las Cruces and parallel to the Rio Grande (Ackerly 1999; Camilli et al. 1988; Marshall and Walt 1984; Lekson 1985; Ravesloot 1988; Seaman et al. 1988), as well as in the San Andres Mountains and White Sands Missile Range to the east (Eidenbach 1983). Archaic sites are generally absent from the floodplain of the Rio Grande, due probably to avulsive channel migration events that would have periodically scoured parts of the floodplain, thereby removing evidence of occupations (Kirkpatrick et al. 2000:66-67; Marshall and Walt 1984:21). Sites do, however, seem more common in dune fields adjacent

to the mainstem of the Rio Grande, as well as along escarpments paralleling the river (Marshall and Walt 1984:21). General trends in the number of Archaic sites across the project area are interpreted as reflecting gradual, sustained population growth throughout the Archaic Period (MacNeish and Beckett 1987; Minnis 1980).

Further downstream, cave sites near Bishop's Cap, southeast of Las Cruces, have yielded preserved maize that dates to around 3000 B.C. (Upham et al. 1987). These are among the earliest dates known for domesticated crops in the American Southwest and presage the much greater reliance on domesticated crops that characterizes the later prehistory of the project area.

The appearance of maize in the Archaic Period archaeological record is accompanied by the almost simultaneous appearance of more permanent structures and storage facilities presumably for storing surplus maize. Stylistic variations among projectile points increased drastically during the Archaic. Such wide variations can possibly be explained by regional differentiation among various Archaic groups with attendant decreases in interaction and the exchange of information. This may have been further exacerbated by progressively greater differentiation in the economic pursuits of these groups.

Detailed analyses of archaeological site records from NMCRIS indicate that there are 651 sites with Archaic occupations in the planning area (**Table O-1.5**). Archaic components constitute approximately 8.3 percent of the total number identifiable components in the project area. Archaic sites are more prevalent in Reaches 3, 6, 7 and 9, but are found in all of the project reaches.

1.2.4 Formative Period (ca. A.D. 500 to A.D. 1492) in the Planning Area

During the Formative Period, the prehistory of the planning area begins to become geographically differentiated. This is almost certainly due to appearance of the Chaco phenomenon, a sequence of development centered in the Chaco Canyon region that had profound effects in the northern part of the project area, but whose effects were attenuated in the southern reaches of the project area. Accordingly, what follows is a discussion of the prehistory of the northern and southern parts of the project area. Based on the spatial distributions of archaeological sites assigned to specific cultures, the northern area referred to in this appendix includes Reaches 1 through 12. In the Review and EIS, these reaches are found in the Northern Section (Reaches 1 through 4), the Rio Chama Section (Reaches 5 through 9), and the upper portion of the Central Section (Reaches 10 through 12). The southern area referred to in this appendix includes Reaches 13 through 17. In the Review and EIS, these reaches are found in the Central Section (Reach 13), the San Acacia Section (Reach 14), and the lower portion of the Southern Section (Reaches 15 through 17).

1.2.5 The Northern Area (Reaches 1 through 12)

The northern portion of the project area contains remains typically referred to as *Anasazi*. Archaeological sites affiliated with Anasazi occupations are common in the Rio Chama Basin (Schaafsma 1976; Whitten and Powers 1980), along the mainstem of the Rio Grande into the Cochiti Reservoir area (Biella and Chapman 1977), and southward into the Albuquerque region (Schutt and Chapman 1992).

The sequence of prehistoric development in the northern planning area progresses through the Basketmaker and Puebloan occupations dating. Within these two broad cultural periods are numerous time-sequent phases, each of which is discussed below. The overall number of site components (i.e., occupations) dating to specific phases is summarized by reach in **Table O-1.6**.

1.2.5.1 Basketmaker III (ca. A.D. 500-700)

Basketmaker (BM) III occupations in the northern portion of the planning area are characterized by widespread use of domesticated crops accompanied by the appearance of pithouses, the advent of ceramic manufacturing, and the introduction of bow-and-arrow technology. Crops recovered from sites dating to this period include maize, squash, and beans. The adoption of agriculture was probably facilitated by a

return to increases in effective moisture over much of the Colorado Plateau during this period. Yet, indirect evidence of droughts during this period suggests that this was not a stable climatic regime. As a consequence, BM III groups continued to rely on wild plant and animal resources, with agricultural products largely used to supplement wild resources.

Population growth continued during BM III at relatively high rates, with the cumulative effect that BM III groups became more densely packed into the landscape. The presence of neighboring groups who also depended on the same resources would have constrained the ability of any one group to complete seasonal movements to obtain wild plant and animal resources. Such constraints on movement, in conjunction with improved climatic conditions, contributed to the more widespread adoption of cultivated crops during this period. Similarly, by late BM III times, a major population shift from the La Plata region into the central portion of the San Juan Basin had occurred, perhaps in response to improved agricultural conditions.

Table O-1.6. Summary of Anasazi Phase Components in the Northern Project Area

Reach	BM III	P I	P II	P III	P IV	TOTAL
3	45	26	39	57	51	218
4	7	7	7	15	22	58
5	0	0	0	8	2	10
6	63	101	123	207	62	556
7	24	19	22	136	248	449
8	23	25	29	61	52	190
9	224	226	239	710	795	2194
10	55	76	71	125	135	462
11	12	14	15	19	25	85
12	87	83	69	131	159	529
13	11	13	26	50	35	135
14	20	25	27	49	39	160
15	0	1	0	0	0	1
16	0	0	0	0	1	1
17	0	0	0	0	0	0
TOTAL	571	616	667	1568	1626	5048

Note: BM = Basketmaker; P = Pueblo

BM III sites are known from the Navajo Reservoir region, Animas-La Plata Basin, Red Rock Valley, Arroyo Hondo, Middle Chuska Valley, the Chaco Canyon region, near the confluence of the Rio Grande and Santa Fe River, and southward into the Puerco Valley and along the floodplain of the Rio Grande south of the Rio Puerco (Marshall and Walt 1984:35; Scheick et al. 1991:120; Vivian 1990). Relative to earlier periods, BM III sites are far more visible due to longer occupations and, compared to earlier times, BM III sites are disproportionately oriented toward areas containing arable land. Agriculture during this period relied exclusively on direct rainfall; technologies such as irrigation to supplement water supplies have not been found.

There is evidence that BM III was not the same across all parts of the San Juan Basin. Early BM III groups in the southwestern and western portions of the basin continued to practice hunting-and-gathering to a much greater extent than agriculture. In contrast, there is evidence of greater agriculture in the Navajo Reservoir, accompanied by substantially higher populations.

This dichotomy between “more agricultural” and “less agricultural” groups may have formed the basis for simple exchange systems that, in later times, became far more elaborated. Such early exchange systems

would have focused on trade of agricultural products for wild resources. By late BM III times, however, reliance on agriculture appears to be general across the entire project area.

1.2.5.2 Pueblo I (ca. A.D. 700-900)

The Pueblo I (P I) Period on the Colorado Plateau is typified by an increase in the number of sites, an increase in average site size, the appearance of above-ground jacal and stone architecture alongside semi-subterranean pithouse structures, and larger storage facilities. Above-ground structures typically exhibit linear or oval configurations and contain about 8 rooms per site. Proto-kivas first make their appearance at some P I sites in the project area. With the exception of the Chaco region, these trends are not thought to reflect population growth, but rather consolidation of previously distinct residential groups into larger villages.

In the San Juan Basin, the overall number of Pueblo I sites is relatively low. This is attributed, in part, to deteriorating environmental conditions on the Colorado Plateau—specifically, reduced rainfall and an increase in the overall variability of rainfall. Rainfall estimates appear relatively high between A.D. 700-750, but began a steady decline through the early A.D. 800s. Between A.D. 830 and 900, drought conditions are thought to have prevailed over much of the project area.

The highest concentrations of P I sites are situated in the Mesa Verde region, in the Middle Chuska Valley, Chaco Canyon, Lower Chuska Valley, the Navajo Reservoir region, the Taos Basin, the Santa Fe Basin, and south into the Albuquerque area (Wendorf 1953:94-95). The easternmost manifestation of P I, termed the Rosa-Loma Alta phase of the Gallinas region, differs slightly from sites situated further west. Here, settlements tend to be distributed not only along drainages, but also on outwash fans to maximize agricultural production. Over much of the northern San Juan basin, sites tend to be situated on mesas, broad ridges, or floodplain terraces overlooking drainages. To the south, sites of this period are less common in the Rio Puerco and southward toward Elephant Butter Reservoir (Marshall and Walt 1984:47).

As in BM III times, there is evidence for regional differentiation in subsistence patterns. In the southwestern portion of the San Juan Basin, sites assigned to the White Mound-Kiatuthlana phases contain food remains indicating reliance on a mix of horticulture, hunting, and gathering. In the northern San Juan Basin, Piedra phase sites tend to contain relatively larger amounts of cultigens. In the center of the San Juan basin, in Chaco Canyon, P I sites contain a similar mix of domesticated and wild resources, suggesting that drought conditions during this period caused subsistence strategies to remain diversified. To the east, reliance on domesticates appears to have been greater than in other parts of the basin.

1.2.5.3 Pueblo II (ca. A.D. 900-1050)

The Pueblo II Period is characterized by an increase in the number of sites, an increase in average site size, a shift toward above-ground, coursed masonry architecture, the appearance of larger numbers and larger sizes of storage facilities, and the appearance of formal kivas, particularly at sites in the Chaco Basin. Habitation sites typically contain between 6 and 9 rooms per site, most arranged in a linear fashion oriented north-south. Larger sites containing more numerous rooms are often laid out in a quadrilateral pattern with central plazas.

During P II times, the Chaco phenomenon truly flourishes, characterized by the establishment of very large towns, the appearance of multistoried room blocks, increasingly complex architectural elaboration of kivas, the advent of field systems in an effort to boost agricultural production, and the development of road systems to facilitate trade and exchange.

These changes signal a return to accelerating population growth in response to dramatically improved climatic conditions, specifically a return to higher rainfall levels, accompanied by episodic droughts whose intensity varied from place to place. In areas less affected by droughts, settlements pushed into

areas that would have been marginal in P I times. Differential spatial distributions of critical resources probably became more pronounced in P II times over much of the San Juan Basin.

In short, much of the P II Period is typified by imbalances between people and resources, both temporally and geographically. These imbalances necessitated the introduction of various buffering mechanisms in an effort to offset them, including improved storage facilities, expansion of regional exchange networks, and more frequent abandonment and reestablishment of large villages in areas better suited for agriculture. One consequence is that P II sites often were occupied for relatively short periods of time.

Subsistence practices indicate greater reliance on cultivated plants, although evidence of use of wild resources persists at most P II sites. Maize, beans, and squash are quite common at both large and small sites. The first water control structures in the San Juan Basin date to this period. These structures were designed to augment rainfall, thereby increasing overall productivity of given plots of land. Many of these water control devices seem to provide water to outwash fans, areas that are often marginal for direct rainfall agriculture.

P I sites are situated in the Mesa Verde region, in the Middle Chuska Valley, in the Española and Santa Fe Basins, Chaco Canyon, Lower Chuska Valley, the Navajo Reservoir region, and south from the Rio Puerco to near Truth-or-Consequences, New Mexico (Scheick et al. 1991:122-123, 126; Marshall and Walt 1984:47). Sites are found in riverine areas along the Rio Chama, Rio Grande, Rio Santa Cruz, Tesuque Valley, and the Santa Fe River Basin, as well as upland areas along the escarpment of these drainages. Sites of this period are also found in riparian environments in southerly tributaries such as the Rio Puerco (Marshall and Walt 1984:75).

Earlier dissimilarities between sites in the southern San Juan Basin and those in the northern basin largely disappear during P II times. The emergence of region-wide homogeneity in ceramics, architecture, subsistence practices, and settlement patterns supports the inference that region-wide trade and exchange systems emerge and in full force during P II times.

One notable exception to this homogeneity is found in the Chaco Canyon region, where Great Kivas and Great Houses are common. Kivas of this type are generally absent in the northern part of the San Juan Basin and are quite rare in the southern part. Similarly, Great Houses are also restricted largely to the Chaco Canyon region. Settlements in the Chaco heartland typified by numerous small habitation sites distributed around fewer, but very much larger and more complex, towns (central places) containing kivas, reservoirs, dams, and roads. Nonlocal materials were imported from other parts of the Southwest.

These facts, combined with the pan-regional distribution of ceramics that are virtually identical, suggests that Chaco Canyon may have been the primary focal point for trade and exchange networks whose limits extended into northeastern Arizona, southern Colorado, and west-central New Mexico (Scheick et al. 1991:127). Analyses of ceramics and chipped stone indicate that source areas for such critical resources gradually shifted over time from the southeastern part of the basin (Zuni) toward the western (Chuska) region and, finally, to the northern portion of the San Juan Basin. It is likely that these regions approximate the outer limits of this exchange and trading network. There is some evidence suggesting that turkeys and corn were among the crucial subsistence resources imported into the Chaco region. Reliance on imported foodstuffs underscores the tenuous agricultural conditions that seem to have prevailed across the central San Juan Basin during P II times.

1.2.5.4 Pueblo III (ca. A.D. 1050-1300)

The P III Period is typified by the aggregation of populations into progressively larger centers, accompanied by the gradual collapse of the Chaco phenomenon that defines early and middle P II times. Populations may have begun to move northward into the northern San Juan Basin near Aztec and southward out of the Mesa Verde region during this period.

Concurrent with Chaco's gradual decline in importance is a realignment of social interactions northward toward Mesa Verde. For example, sites along the Chuska Mountains evidence a period of increased building events, accompanied by the replacement of Chacoan ceramics with those more typical of Mesa Verde. The appearance of bi- and tri-wall buildings—nominally characteristic of the Mesa Verde region—at sites in the San Juan Basin suggests the gradual outward expansion of Mesa Verde peoples into areas formerly containing Chaco components. Over much of this period, sites contain between 13 and 30 rooms, with larger sites exhibiting as many as 200 rooms.

These changes are attributed to the onset of a period of dramatically decreased rainfall after around A.D. 1220, accompanied by increased spatial variability in rainfall across the basin as a whole. Areas adversely affected by reduced rainfall—the central and southern San Juan Basin—acted as donor areas for population out-migration. Areas less subject to reduced rainfall the Mesa Verde and McElmo regions become recipient areas for immigrants (Scheick et al. 1991:133). Although the central and southern portions of the San Juan Basin were occupied to a limited extent by Mesa Verde elements, many parts of the basin appear to have been abandoned toward the terminal portion of the P III Period.

P III sites are found in the Mesa Verde region, in the Middle Chuska Valley, in the Española, Tesuque, and Santa Fe Basins, in Chaco Canyon and the Lower Chuska Valley, north into the Navajo Reservoir region and south from the Rio Puerco to near Truth-or-Consequences, New Mexico (Marshall and Walt 1984:75, 95; Scheick et al. 1991:128). Sites are found in both riverine and upland areas along the escarpment of the Rio Grande, as well in outlying districts far from major tributaries.

1.2.5.5 Pueblo IV (ca. A.D. 1300 - 1540)

The Pueblo IV Period is typified by yet further movements of peoples into parts of the northern project area, again in response to deteriorating climatic conditions elsewhere in the region. The region around Abiquiu, New Mexico, experienced a decline in settlements toward the end of this period; populations withdrew downstream toward the confluence of the Rio Chama and Rio Grande (Schaafsma 2002:199, 1976; Whitten and Powers 1980:20). As a result, parts of the lower Rio Chama experienced a concomitant increase in the number of late P IV sites, perhaps because more reliable surface water supplies were found in this stretch of the river. At the same time, continued reliance on, and expansion of, rainfall dependent agricultural systems (e.g., bordered fields gravel mulch gardens) suggests that surface water availability was not particularly crucial in settlement decisions during this period (Scheick et al. 1991:135; Whitten and Powers 1980:21).

Sites dating to this period are generally small, containing between 1 and 4 rooms. A minor subset of sites contains 100 rooms, while an even more minor subset of the largest sites exhibit up to 500 rooms. Current notions suggest that the bulk of the region's population resided in larger villages, while smaller sites were used for seasonally-specific gathering of wild plant and animal resources (Scheick et al. 1991:139). This shift was accompanied by a dramatic increase in the appearance of water harvesting structures such as terraces, rock pile grids, gravel mulch gardens, check dams, and small reservoirs. This implies that crop production became more feasible in areas that previously were unsuited for rainfall agriculture (Scheick et al. 1991:139-140).

Major settlements dating to this period are situated primarily in the upper terraces of floodplains along the Rio Chama, Rio Grande, Santa Fe River, Rio San Jose, Rio Puerco, and Rio Salado (Marshall and Walt 1984:135; Schaafsma 2002:199), with rainfall agricultural sites located in adjacent upland areas (Scheick et al. 1991:141-142).

There are pueblos that are likely ancestral to modern Tewa pueblos in the Rio Chama portion of the northern project area. These include Tsankawi, Tsirege, Puye, and Potsuwi'i (Schaafsma 2002:202). Petroglyphs support a Tewa presence in the area around the confluence of the Rio Grande and Rio Chama during late P IV and early historic times (Boyd and Ferguson 1988:5-71).

Protohistoric P IV Navajo occupations are also found in the upper Rio Chama (Schaafsma 2002). Many of these sites were occupied between *ca.* A.D. 1650 and 1710 (Schaafsma 2002:187), suggesting that Navajo occupations may have supplanted Tewa occupations in the Rio Chama at the beginning of the seventeenth century.

1.2.6 The Southern Area (Reaches 13 through 17)

The succeeding periods in the occupational prehistory of the southern portion of the planning area (Reaches 13 through 17) are generally termed *Mogollon*. Archaeological research was first intensively done in the Mogollon area of southern New Mexico and west Texas by Donald Lehmer in the late 1940s. This early research has since served as a baseline for subsequent researchers.

According to the phase sequence first postulated by Lehmer, there was a shift away from nomadic hunting-and-gathering around 2,000 years ago. This shift toward a more sedentary settlement system is reflected in progressively greater emphasis on the cultivation of crops such as maize and beans and may have been prompted by increasing population growth. The phase system defined by Lehmer (1948) postulates a linear increase from simple to more complex strategies and technologies through time. However, recent research has shown that the assumptions of increased complexity inherent in the phase system may be erroneous and that they do not account for much of the variability present in the archaeological record (Kauffman and Batcho 1983, Stuart and Gauthier 1981; Upham 1984).

In the southern New Mexico area, the Formative Period has been subdivided into three phases: the Mesilla (A.D. 900-1100), Doña Ana (A.D. 1100 -1200), and El Paso (A.D. 1200-1400) phases. **Table O-1.7** shows the frequency of components by reach for each of these time period.

The Mesilla Phase is defined by the presence of undifferentiated brownware ceramics and a subsistence base composed of a mixture of hunting and gathering and agriculture (Kirkpatrick et al. 2000:70). Pithouses and plain brownware ceramics were present in the area from as early years as A.D. 200 (Carmichael 1985; O’Laughlin 1980) so that, in this part of the project area, the Mesilla Phase appears to span the years A.D. 200 to 1100 (Moreno and Hayes 1984; Whalen 1980a). The presence of pithouses and plainware ceramics indicates a more sedentary lifestyle and a greater energy investment in dwelling construction and maintenance.

In most other respects, however, Mesilla phase artifact assemblages and settlement patterns do not appear to have undergone significant modification from those associated with Archaic groups. This may be due, in part, to the possibility of heterochroneity in the adoption and expansion of agriculture among groups across southern New Mexico (LeBlanc and Whalen 1980:451). Toward the end of this phase, large pithouse villages commensurate with increases in population concentration and the presence of purported trade wares consistent with more widespread regional interaction begin to characterize the archaeological record.

Table O-1.7. Summary of Mogollon Phase Occupations in the Southern Project Area

Reach	Mesilla	Doña Ana	El Paso	TOTAL
3	0	0	0	0
4	0	0	0	0
5	0	0	0	0
6	0	0	0	0
7	0	0	0	0
8	0	0	0	0
9	0	0	0	0
10	0	0	0	0
11	0	0	0	0

Reach	Mesilla	Doña Ana	El Paso	TOTAL
12	0	0	0	0
13	0	0	0	0
14	39	26	21	86
15	62	32	31	125
16	395	230	228	647
17	0	0	0	0
TOTAL	496	288	280	858

1.2.6.1 Mesilla Phase (A.D. 400-1200)

Mesilla phase sites have been located in a variety of environmental settings. Sites from this period have been found in riverine settings and at the confluences of tributaries with the mainstem of the Rio Grande (Marshall and Walt 1984:75). At the same time, the availability of permanent water sources seems to have been an important factor in settlement location. The use of domesticated plants continued to be a major subsistence source throughout this phase.

Mimbres Black-on-white ceramics may indicate an interaction with Mimbres Mogollon groups to the west. Additional studies are needed to confirm this tenuous evidence for long-distance trade and interaction.

1.2.6.2 Doña Ana Phase (A.D. 1200-1300)

As proposed by Lehmer (1948), the Doña Ana phase represents a short-lived occupation and transition from the Mesilla to El Paso phases. Both pithouse and adobe pueblos are known from this phase. Doña Ana ceramic assemblages consist of El Paso Brown, El Paso Red-on-brown, El Paso Polychrome, Mimbres Black-on-white, Three Rivers Red-on-terracotta, Playas Red, and Chupadero Black-on-white types (Carmichael 1985).

The number of large sites or pueblos recorded in this phase suggests increasing population and a more structured regional social organization than was previously observed during the Mesilla phase (Whalen 1981). During this phase, the inhabitants of the Mogollon may have been in direct contact with large social networks in northern Mexico (Schaafsma 1979). Sites from this period have been found along the upper terraces of floodplains and adjacent bluff escarpments along the Rio Grande (Marshall and Walt 1984:95).

Large adobe pueblos assigned to the Doña Ana phase are found both in riverine and nonriverine areas of the project area. Although sites dating from this period are usually ephemeral and not well documented, they have been recorded in the Rio Grande valley, the Hueco Bolson, and the Tularosa Basin (Carmichael 1983; Miller 1989; O'Laughlin 1981).

1.2.6.3 El Paso Phase (A.D. 1300-1450)

The El Paso phase represents the terminal portion of the Mogollon phase sequence in the southern part of the project area (Kirkpatrick et al. 2000:77). Architecture consists of above-ground, linear-roomed adobe pueblos (Kirkpatrick et al. 2000:77). Site locations are varied, but alluvial terraces and playa margins appear to be preferred settings for sites of this period. The ceramic assemblage is also varied and contains El Paso Polychrome, Mimbres Classic Black-on-white, Chupadero Black-on-white, Three Rivers Red-on-terracotta, Gila and Tonto Polychrome, and a variety of Chihuahuan wares.

Agricultural pursuits may have intensified during this phase, partly in response to increased population growth. Maize, beans, squash, and bottle gourds were the primary domesticated plants (Ford 1977). The

continuing recovery of wild plant and animal resources from El Paso phase sites suggests that the production of domesticated crops had to be augmented with wild resources. Varieties of *Zea* having different maturation rates may have been grown in different environmental zones (Stuart and Gauthier 1981:218; Mauldin 1986).

Regional interaction during this phase reached a maximum, best indicated by the presence of nonlocal ceramics, such as Mexican Polychromes and Tucson Polychrome (Elyea 1987:37-38). Regional interaction is also seen in the presence of ornaments manufactured from marine shell originating from the Pacific and Gulf Coasts and copper bells from Mexico (Duran 1984; LeBlanc and Whalen 1980:382; Lehmer 1948; Stuart and Gauthier 1981:214).

Chipped stone and groundstone assemblages from the last two phases of the Formative Period underwent significant modifications. Groundstone expanded to include slab, basin, and trough varieties. Lithic assemblages included locally obtainable materials and centered around the production of expedient tools and flakes (Anyon and LeBlanc 1984; Chapman 1977; Laumbach 1980b). In general, projectile points were much smaller and even more varied during this phase.

Sites from this time period are located in a variety of settings including riverine and bluff escarpments adjacent to the Rio Grande (Marshall and Walt 1984:137). Studies further south have found sites of this period situated in nonriverine bolsons located north of El Paso.

The Formative Period is thought to end around A.D. 1400-1450. Causes underlying the abandonment of southern New Mexico remain obscure.

1.3 HISTORIC PERIOD

As with its prehistory, the character of Historic Period occupations varies considerably between the northern and southern parts of the planning area. Beginning with the arrival of the earliest Spanish explorers in 1598; the northern reaches of the Rio Grande remained occupied through the Spanish Colonial, Mexican, and Euro-Anglo Periods. In contrast, much of the southern project area was not occupied until the close of the Mexican Period and settlements did not really expand until after 1848 with the arrival of Euro-Anglo settlers. For this reason, the discussion of the Historic Period is divided into the northern and southern portions of the project area.

1.3.1 The Northern Area (Reaches 1 through 12)

There is overlap between events that occurred during the preceding Navajo Historic Periods and events more closely associated with Euro-Anglo occupations of the project area. While reference is made to related Navajo events, the primary focus of this section is on events related to post-contact (i.e., A.D. 1540) Euro-Anglo activities. This general period, in turn, is segmented into Spanish, Mexican, and Euro-American Periods.

1.3.1.1 Spanish Period (A.D. 1540-1821)

In the northern reaches of the planning area, the earliest evidence of Spanish entry (*entrada*) into New Mexico is associated with the appearance of Coronado's expedition in 1540 (Winship 1990). Initial contacts with the inhabitants were not promising insofar as the Spaniards, prompted by reports of great wealth, viewed the region's inhabitants as potential sources of wealth (Winship 1990:18). Greeted by showers of arrows at some pueblos, Coronado's men soon found that reports of gold were overstated (Winship 1990:46). In 1542, after smaller expeditions into the surrounding country revealed no great wealth, Coronado's expedition withdrew to Mexico (Scurlock 1998:106). Other expeditions, including those of Chamuscado-Rodriguez (1581), Espejo (1583), Costañón (1590), and Bonilla-Humaña (1593), penetrated New Mexico territory but did not stay for any length of time (Bartlett 2002:5; Hammond and Rey 1938:20-25).

Spanish Conquistadores first visited New Mexico's lower Rio Chama Valley in the summer of 1541 when followers of Francisco Vásquez de Coronado explored the region. Anticipating a need for winter supplies, the foraging party intended to requisition grain stockpiled by pueblo farmers. At the junction of the Rio Grande and the Rio Chama, Barrionuevo camped at Yuque-Yunque, a Tewa community composed of two villages, divided by the Rio Grande. When horsemen approached them, the Indians fled toward the Rio del Oso, a tributary of the Chama, and took refuge in "four strong towns," inaccessible to mounted men because of the rugged terrain. Given a free hand, the intruders helped themselves to the provisions stored in the deserted villages before continuing on to Taos (Bolton 1949: 309-10). Discouraged by failure to find gold and silver or other riches after extensive explorations, Coronado's expedition returned to New Spain in the spring of 1542.

After Barrionuevo's brief entrada, almost fifty years passed before Spaniards returned to the confluence of the Chama and the Rio Grande. At the end of December 1590, a party of adventurers commanded by Gaspar Castaño de Sosa arrived at the great Pueblo of Pecos, ending an arduous journey from the province of Nuevo León in New Spain. Misguided from the outset, Castaño's followers hoped to settle in New Mexico, but lacked authorization from officials in New Spain. After receiving a chilly reception at Pecos, an advance guard pushed on for a reconnaissance of the Tewa villages to the northwest. Despite deep snow and frigid temperatures, the Spaniards spent ten days among the Tewas, beginning with the pueblos of Tesuque, Cuyamungué, Nambé, Pojoaque, and Jacona. Castaño's scribe observed with surprise that all these small communities raised bountiful crops that were irrigated from the Tesuque and Pojoaque rivers. The party proceeded to San Ildefonso on the Rio Grande and then continued upstream to Yuque-Yunque and the Tiwa village of Picurís. After returning to Pecos, the adventurers moved their camp to Santo Domingo. There, representatives of the viceroy arrested Castaño for illegal entry into New Mexico and took him back to Mexico City in chains (Schroeder and Matson 1965: 117, 172-75).

When Spaniards next returned to northern New Mexico, they came to stay. In 1598, Juan de Oñate led a large expedition out of Santa Bárbara in present Chihuahua to found a permanent colony on New Spain's farthest frontier. On January 8, Oñate's followers set out—129 citizen soldiers, many with families, accompanied by ten Franciscan friars, and a large number of Mexican Indian auxiliaries, an assortment of livestock, pack animals, baggage carts, and supply wagons. By July 11, the vanguard had ascended the Rio Grande as far as Ohke, one of the twin villages visited by Barrionuevo in 1541. Renamed "San Juan Bautista" in honor of Oñate's patron saint, the east-bank town of Ohke became temporary headquarters for the expedition. Situated on a fertile flood plain near the confluence of the two rivers, the location seemed to be well chosen. To celebrate Roman Catholic services, an interim church was soon erected; dedication ceremonies took place on September 8, birth date of the Blessed Virgin (Hammond and Rey 1953: 14-17; Kessell 2002: 78).

Overcrowded and unsanitary, Ohke soon proved to be unsuitable for the colonists. Since they had failed to build new quarters for themselves, the colonists persuaded the Tewas to evacuate Yuque-Yunque, the village on the west bank. Sometime before Christmas 1600, the Tewas moved across the river into the new location that Oñate called "San Gabriel" (Ellis 1987: 10-39). The settlers lost no time in establishing farmlands and an irrigation system. In letters to the viceroy and others, Oñate reported bountiful harvests of wheat, maize, and other crops. His enthusiasms seemed to be confirmed by a visiting ecclesiastic, Fray Juan de Torquemada (1723, reprint 1975: 672), who described agricultural production at the new colony as follows: "San Gabriel is situated between two rivers, and with water from the smaller [the Chama], they irrigate wheat, barley, maize, and other things that they plant in gardens." Cattle and sheep imported from New Spain yielded beef and mutton and also provided wool for textiles and hides for leather goods.

Crop production seemed to be proceeding nicely in the colony, but Oñate's overly optimistic reports ignored the deep discontent spreading among the settlers. Accustomed to an urban existence, many of them were unable to cope with the rigors of life on the frontier. Complaints of food shortages and

mistreatment of native people began to reach authorities in New Spain. During the summer of 1601, while Oñate explored the vast buffalo plains far to the east, four hundred men, women, and children gathered their belongings and fled from San Gabriel. Once the refugees had made their way to Santa Bárbara, officials in Mexico City launched a lengthy investigation into Oñate's conduct as governor of New Mexico. After considering testimony from the adelantado's friends and foes, agents of the king decided that New Mexico would not be abandoned. No mines or other sources of wealth had been discovered, but Franciscan friars related that they had baptized several thousand Indian converts. Although the report was greatly exaggerated, King Phillip III ruled that the colony would be maintained by royal subsidies to support the missionary program among the indigenous population (Kessell 2002: 85-86, 94-95).

The decision failed to vindicate Oñate, however. Tired and discouraged, he resigned his position as governor on August 24, 1607, and subsequently returned to Mexico City. As his replacement, the king chose Pedro de Peralta, an experienced civil servant, who arrived early in 1610 to serve a three-year term as New Mexico's governor. Acting on orders from the viceroy, Peralta immediately laid out a new capital city, to be known as "La Villa de Santa Fe," which represented a new beginning for the troubled province. Located about twenty-five miles south of San Gabriel on the west slope of the Sangre de Cristo Mountains and, unoccupied by Pueblo Indians, the town site adjoined a reliable stream and was well endowed with timber and pasture. After he had selected an appropriate position for a central plaza and public buildings, the governor distributed lots for houses and gardens to each citizen. According to Spanish law, every resident was also entitled to sufficient farmland to sustain his family, with water for irrigation. Once the new villa had been established, the colonists abandoned Oñate's old headquarters at the junction of the Rio Grande and the Chama (Kessell 2002: 95; Hammond and Rey 1953: 1085-88).

At the time of first Spanish contact, there were—according to Spanish chronicles—at least 93 pueblos located along the Rio Grande between Taos and Socorro (Bartlett 2002:10, 25, 45). Most were located along the margins of the Rio Grande floodplain (Bartlett 2002:10). The exact locations of many of these pueblos is uncertain, although a comprehensive index of named places has been extracted from Oñate's chronicle (Hodge 1935), as well as from other sources (e.g., Bartlett 2002:19, 23, 25; Marshall and Walt 1984:235-287). There were also many other pueblos along major tributaries of the Rio Grande. These included (Bartlett 2002:22-23, 33-44, Table 11):

- 1. Acoma along the Rio Puerco.
- 2. Santa Ana, Zia, Unshagi, Nanishagi, Guisewa, Kiatsukwa, Seshukwa, Amoxiumqua, Kwastiyukwa, and Tovakwa along the Rio Jemez.
- 3. Cochiti, Santo Domingo, La Bajada/Talaván, Gipuy, La Vega, Katishtya, Old San Felipe, and Tunque in the Santo Domingo Basin.
- 4. Paa-ko, San Antonio, and Silva in the Sandia region.
- 5. San Marcos, San Lazaro, Galisteo, and San Cristóbal in the Galisteo Basin.
- 6. Chilili, Tajique, Quarai, Abó, Tenabo, Pardo, Blanco, and Colorado in the Estancia Basin.

Archaeological investigations, particularly at Cochiti Reservoir, have encountered still other pueblos dating to the 1525-1539 contact period (Biella and Chapman 1977:14-128), suggesting that the extent of contact-period occupations may be much greater than that indicated by documentary sources alone.

In the years immediately following Oñate's arrival, the capital was moved to Santa Fe and outlying settlements established to the north near at Taos, near San Juan Pueblo and in the Santa Cruz de la Cañada and to south near Bernalillo and Socorro (Espinosa and Chavez 1966:8-9). Missions were also established at Socorro (1626), Abo (1629), Gran Quivira, Quarai, Chilili (1629), and Tajique (1629), although many of these places were abandoned by 1677 due to persistent raiding from the east (Espinosa and Chavez 1966:11).

Explorations of areas to the west of Santa Fe by Saldivar in 1618 encountered the Hopi and went as far as the upper reaches of the Colorado River (Shea 1964:78-79). Expeditions to the east, notably that undertaken by Peñalosa in 1662, found Plains Indians and the buffalo (“cows of Cibola”) on which they depended (Hammond and Rey 1953:484, Schaafsma 2002:210-211, Shea 1964:58). In no case were conditions such that the Spanish contemplated establishing permanent settlement in these regions.

Traveling through much of New Mexico, Benavides, in his 1630 narrative, provided the most accurate descriptions of the tribes that inhabited various parts of the state. Between Oñate’s arrival in 1598 and the mid-1600s, the overall number of pueblos in the middle Rio Grande near Albuquerque declined from 23 to about 15 to 16 (Bartlett 2002:61-62). In the Estancia Basin, the number of occupied pueblos declined from 11 to six (Bartlett 2002:62). By 1643, the overall number of pueblos had declined from 93 at the time to contact to only 38 (Bartlett 2002:62). Bartlett speculated that this decrease may have been due to the combined effects of (a) inter-pueblo strife; (b) the deleterious effects of the encomienda system whereby tribute (e.g., goods and labor) were forcibly obtained from the pueblos; (c) usurpation of pueblo lands by Spanish colonists; (d) disruption of trading relations whereby agricultural goods from the pueblos were exchanged for meat obtained by Plains tribes (Bartlett 2002:60, 68-72), and Apache raiding, which intensified throughout the 1600s (Bartlett 2002:72-74; Scurlock 1998:41). By the 1670s, the pace of pueblo abandonment had accelerated considerably. All of the pueblos in the Estancia Basin had been abandoned, as had the pueblos in the southern reach of the project area (Bartlett 2002:63, 65).

There is relatively little documentation regarding Spanish activities in the region between 1610 and 1680 (Bandelier and Hewett 1978:133). There were only scattered Spanish settlements during the seventeenth century in the project area, with populations concentrated at the towns of San Gabriel, Santa Fe, Cienega, Bernalillo, Atlixco, and Varela [Barelas] (Scurlock 1998:108). Most of these settlements were concentrated along the Rio Grande corridor, with a few settlements extending into the lower reaches of major tributaries of the Rio Grande (Williams 1986). Others, such as Santa Rosa de Lima de Abiquiu—situated downstream from the modern town of Abiquiu—were occupied after 1692, but were abandoned in 1740 due to raiding (Weigle 1975:154; Whitten and Powers 1980:24). By 1782, raiding along the frontier throughout this period caused the partial or complete abandonment of some outlying towns—notably Pecos, San Marcos, San Lazaro, San Pedro, and San Cristobal—with the populations taking refuge in larger, more well-protected towns such as Santa Fe (Morfi in Thomas 1932:91, 93, 96).

Activities during this early period seem to have focused primarily on ranching, with officers being allotted large parcels (*estancias*) situated between what is today Española and Albuquerque (Carlson 1990:6). The advent of encomienda practices, by which Spaniards were entitled to the use of Indian labor and access to goods produced by them in return for protection from raiding, caused large parcels to be concentrated in the hands of a few landowners (Knaut 1995:62-64, 66-68; Weber 1992:124-125). According to Benavides, the usual tribute paid by the Indians was one cotton *manta* (man’s shawl or blanket) and a *fanega* (approximately 2.6 bushels) of corn per house (Ayer 1965:23; Bartlett 2002:68-69; Weber 1992:125). In being subsidized by the Indians, all impetus for Spanish self-sufficiency was removed (Carlson 1990:6).

Because property records were almost completely destroyed in the Pueblo Revolt of 1680, information concerning the pattern of Spanish settlement in seventeenth-century New Mexico is limited. Church documents indicate, however, that by the mid-1620s, a few hardy frontiersmen had begun farming at “La Cañada,” a river valley about twenty miles north of Santa Fe. Later called the Rio Santa Cruz, the river flowed west from the Sangre de Cristos, meeting the Rio Grande at present Española. Consisting of scattered ranchos, the Cañada community eventually extended up the Santa Cruz as far as Chimayó and down the east bank of the Rio Grande toward the Pueblo of Pojoaque. Early settlers included Juan Griego, who had passed muster with Oñate in 1598, and Pedro Márquez, a young officer at the Santa Fe presidio. Both claimed lands near the Pueblo of San Juan (AGN, Inquisición, 304, f. 186; 372, f. 7). Further

downstream, across the Rio Grande from San Ildefonso's Black Mesa, some six or seven estancias (small ranches) had been established by mid-century. Prominent among the owners was Francisco Gómez Robledo, one of New Mexico's most affluent citizens, who owned lands in several parts of the colony. In 1662, church authorities accused Gómez of "Judaical tendencies" and confiscated all of his assets pending trial. After lengthy proceedings in Mexico City, he was cleared of all charges. He returned to New Mexico and reclaimed the sequestered lands and personal property (SANM I: 882, ff. 2-3, 8-12; Chávez 1954: 36).

Although settlement east of the Rio Grande is fairly well documented, colonial archives reveal only one instance of settlement on the opposite bank during this period. Early in the eighteenth century, after the Reconquest of New Mexico, Antonio de Salazar petitioned Governor Juan Ignacio Flores Mogollón for lands west of the river at Corral de Piedra, a site located a few miles below the Rio Chama junction. According to Salazar, the tract requested had been granted previously to his great-grandfather, Captain Alonso Martín Barba, one of the original Oñate colonists (SG 132, Antonio de Salazar Grant). Scattered sources suggest that permanent occupation in the Chama Valley was curtailed by hostile Navajos, who began stealing livestock and harassing colonists at San Gabriel before the founding of Santa Fe (Worcester 1951: 103-4).

After the arrival of newcomers from Mexico City in 1694, Vargas decided to strengthen his northern frontier by founding a new community at La Cañada, a river valley about 20 miles north of Santa Fe. Abandoned in 1680, the valley had been partially occupied by Tano Indians from Galisteo during the Spanish hiatus. With great fanfare, the governor issued a decree on April 19, 1695, announcing plans to create a town grandly identified as "La Villa Nueva de Santa Cruz de La Cañada de Españoles-Mexicanos del Rey Nuestro Señor Carlos Segundo." Two days later, he personally escorted some sixty families out of Santa Fe to a site on the south side of the Rio Santa Cruz. There, he laid out a plaza and conducted the traditional possession ceremony. After placing Fray Antonio Moreno in charge of a makeshift chapel, Vargas appointed officials for the administration of civil and military affairs. Before departing, he ordered that each family receive sufficient land to plant one-half fanega of maize (approximately 4.4 acres). Once established, Santa Cruz de la Cañada became the center of government for northern New Mexico and served as the starting point for future settlement along the upper Rio Grande and the Chama Valley (Kessell et al. 1998: 617-24).

Two years after Vargas founded the new villa, New Mexico experienced an important change in administration. On July 2, 1697, Don Pedro Rodríguez Cubero, a Spanish-born bureaucrat, arrived in Santa Fe to take office as governor of the province. As chief executive, Rodríguez Cubero made several land grants south of Santa Cruz de la Cañada in the Pojoaque Valley. Some were situated near the Tewa villages of Pojoaque and Jacona, which had been abandoned in 1696 during the last phase of pueblo resistance. The governor also approved grants further west along the Rio Grande that encroached on lands claimed by the pueblos of San Ildefonso and Santa Clara. In the spring of 1700, José Trujillo, a native New Mexican soldiering at the Santa Fe presidio, received a large tract east of the Rio Grande suitable for irrigation. Bounded north and south by Arroyo Seco and the *mesilla* of San Ildefonso, the lands had been occupied before 1680 by Francisco Gómez Robledo, Ambrosio Saiz, and Francisco Jiménez (Twitchell 1976: 331, 336). At about the same time, Rodríguez Cubero was handed a similar petition for a grant on the west bank from Mateo Trujillo, a pre-Revolt settler who had narrowly escaped death in 1680. In 1702, Matías Madrid asked for a third grant impinging on San Ildefonso at the site of present-day El Rancho. Rodríguez Cubero approved all three, but subsequently, the Indians at San Ildefonso and Santa Clara frequently disputed boundary locations with the successors to the original grantees (Jenkins 1972: 122-29). South of the Rio Pojoaque, no Hispano settlement took place along the Rio Grande until the mid-eighteenth century.

The *encomienda* system imposed significant burdens on Rio Grande pueblos and, combined with a succession of years that saw low rainfall and high temperatures and accelerating attacks from both Navajo

and Plains tribes, culminated in the Pueblo Revolt of 1680 (Bartlett 2002:74-77; Knaut 1995:156-162; Sando 1979; Scholes 1937:99-100; Weber 1992:133-136). Although there had been rebellions in 1639, 1650, and 1667, the 1680 revolt was unusual in that, for the first time, most of the pueblos were able to effectively coordinate simultaneous uprisings, led initially by Popé, from San Juan Pueblo (Ortiz 1979:281). The small number of Spaniards was insufficient to prevent the rout and the colonists were forced to withdraw to El Paso, leaving some 400 dead behind (Weber 1992:135; Knaut 1995:133-134). To make matters worse, the revolt in New Mexico presaged far more widespread uprisings, lasting through much of the 1680s, that eventually extended to include indigenous peoples of Coahuila and Sonora (Espinosa 1988:80; Weber 1992:137).

As a consequence of the results, there is almost no information about the intervening years between the 1680 Revolt and the 1692 Reconquest (Bandelier and Hewett 1978:128-129). Scholars have concluded that, aside from expunging all traces of Spanish political and religious institutions, the pueblos largely continued the economic activities of farming and ranching that had typified pre-Revolt times (Forbes 1960:189).

One notable exception to this dearth of information was the development of El Camino Real de Tierra Adentro, the Spanish Royal Road that connected Mexico City with the far-flung colonies in New Mexico (**Figure O-1**). Situated at the end of a long supply line, one of the first tasks that befell the Franciscan missionaries was to make supply trains into New Mexico routine. In 1631, contracts were drawn up specifying that supply trains would consist of 32 wagons driven by 32 freighters and accompanied by Indian scouts and cooks, as well as military escorts of varying size (Ivey in Palmer 1993:42-67). These trains traveled back and forth between Santa Fe and Mexico City every 18 months; the journey across the 1600 mile distance usually took about six months (Ivey in Palmer 1993:45). During the Pueblo Revolt of 1680, the Camino Real became the main route by which Spanish colonists and their Indian allies fled to escape to El Paso (Hendricks 1993). Once El Paso became the staging ground for Vargas' efforts to re-conquer the region (1692), the Camino Real became the main route for his expedition's travel northward.

The Camino Real remained one of the primary supply and communication routes in New Mexico well into the nineteenth century (Schroeder 1993). Following the Rio Grande, the Camino Real passes through the entire planning area. Moreover, it has recently been designated as a National Historic Trail. Although its precise location relative to the project boundaries remains uncertain, it is nonetheless an important property whose historic significance to New Mexico is without parallel.



In 1692, a new governor, Diego de Vargas led an exploratory expedition up the Rio Grande to persuade the pueblos to accept Spanish sovereignty once more. During a four-month tour, Vargas visited all the pueblo villages and secured submission by combining bravado with diplomacy. After he returned to New Spain, royal officials applauded Vargas' peaceful reentry, but his triumph proved ephemeral. When he arrived the following year with settlers to restore the colony, he encountered widespread resistance. Santa Fe was soon recaptured, but sporadic fighting continued until 1696. Undaunted, the governor launched a comprehensive program to rebuild New Mexico while hostilities persisted in some localities. Realizing that the colony needed additional settlers for survival, Vargas recruited families in Mexico City and Zacatecas willing to emigrate far to the north (Jenkins and Schroeder 1974: 22-23).

The Pueblo Revolt of 1680 and the 1694 and 1696 rebellions that followed Vargas' 1692 re-conquest of New Mexico were accompanied by the relocation of the inhabitants of some Rio Grande pueblos (Espinosa 1988:50-51; Weber 1992:139). For example, during this period Tanoan-speakers from some Rio Grande pueblos moved to Hopi, eventually forming the separate Pueblos of Payupki and Hano in that country (Bartlett 2002:93-94; Brant 1979:354; Brew 1979:522; Schaafsma 2002:294; Weber 1992:140). Others from the northern reaches of the project area took refuge for a while at Taos Pueblo (Bartlett 2002:113). Some residents from San Felipe and Cochiti also abandoned their pueblos, fleeing to Horn Mesa until 1692 (Strong 1979:393). Some residents of Picurís and nearby pueblos also left, heading east to join Apache (Plains) settlements in Kansas (Bartlett 2002:106; Brown 1979:271; Hackett 1937:374; Knaut 1988:126; Weber 1992:140). Elements from other pueblos fled west, taking refuge with the Navajo in the headwaters of the Rio Chama (Bartlett 2002: 110-111; Kessel et al. 1998:1001-1028; Knaut 1988:210) or among the residents of Zuni and Acoma (Schaafsma 2002: 295). Indeed, Laguna Pueblo was founded between 1697 and 1699 by refugees from other Rio Grande pueblos (Ellis 1979:438; Forbes 1960:265-267) and portions of Old Zuni were abandoned (Woodbury 1979:472). The residents of Pojoaque also scattered and the pueblo was not resettled until 1706 (Lambert 1979:325). Despite these moves and the passage of centuries, it is plausible that many descendants of those who fled their homelands continue today to maintain connections with pueblos in the Rio Grande Basin.

Following on the heels of the gradual withdrawal of Navajo elements from the Rio Chama Basin (Schaafsma 2002:303), Spanish settlements began to appear in the Rio Chama Basin, first at Chamita in 1714 (Schaafsma 2002:303; Swadesh 1974:32; Whitten and Powers 1980:23). Settlements gradually extended upstream along the Rio Chama during the 1730s with the founding of Abiquiu (1734), Barranca (1735), Plaza Colorada (1737), Plaza Blanca (1737), Lobato (1744), Ojo Caliente (1754), Cañon de Chama (1806) and other small villages (Brayer 1949:253; Swadesh 1974:33-39). Although these settlements were briefly abandoned between 1747 and 1750 due to raids, they were eventually resettled and have continued to be occupied for many years (Swadesh 1974:36-37). At the beginning of the nineteenth century, population growth leading to land scarcity caused additional land grants to be made at San Joaquin (1808), Vallecito (1807), and Tierra Amarilla (1814, but not finalized until 1832) (Swadesh 1974:49-50).

Spanish activities during the eighteenth century focused primarily on consolidating their holdings in the Rio Grande valley. During this period, pre-Revolt land grants were reaffirmed and new land grants were awarded (Williams 1986:105; Scurlock 1988: Table 34). Land grants to all of the pueblos along the Rio Grande—Taos, San Juan, Santa Clara, San Ildefonso, Tesuque, Cochiti, Santo Domingo, San Felipe, Santa Ana, Sandia, and Isleta—were reaffirmed and residents who had fled possible Spanish retributions were encouraged to return (Brayer 1939). A general trend surface map showing time-sequent expansion of Spanish and Mexican land grants is shown in **Figure O-1.2**.

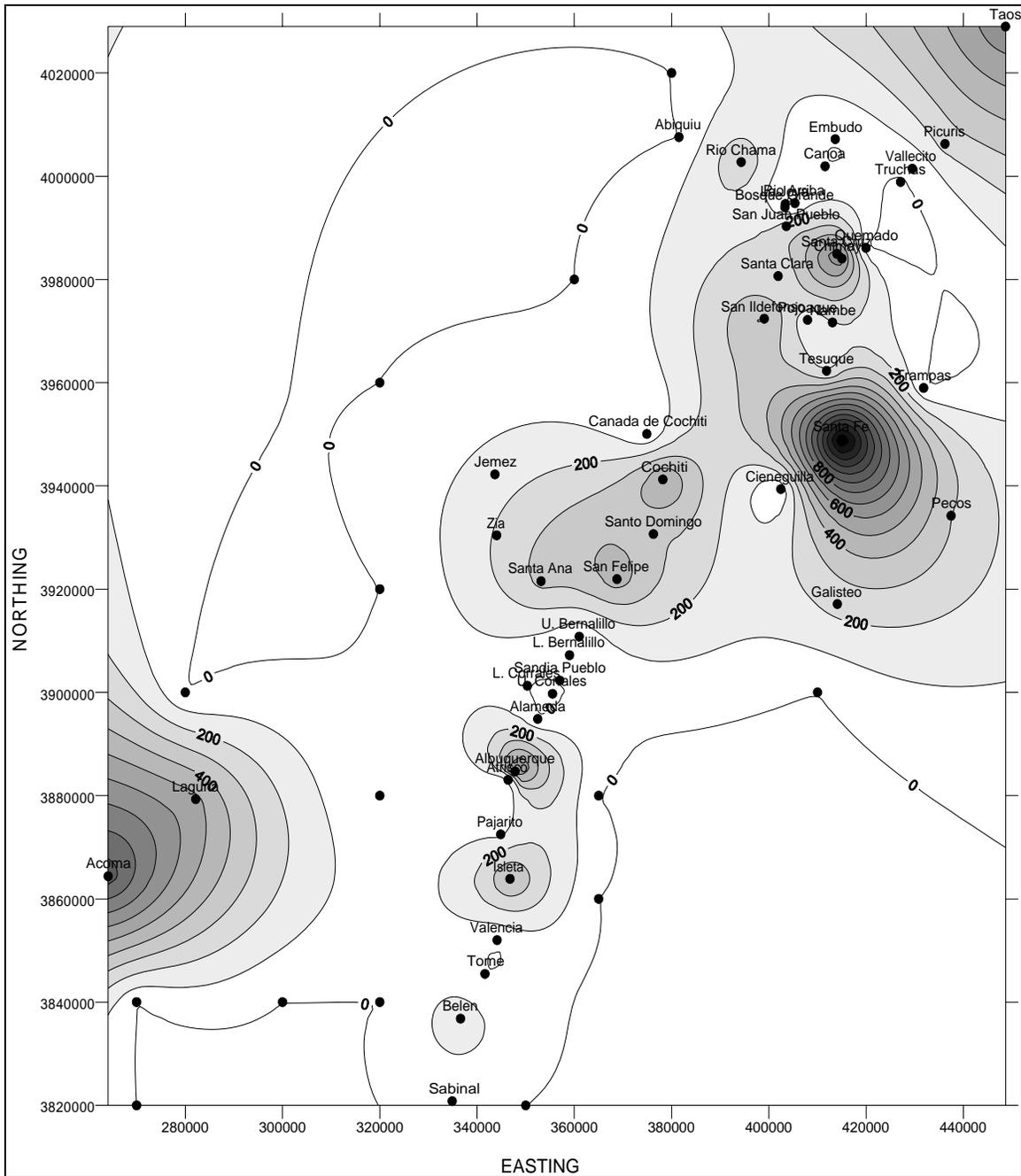


Figure O-1.2. Population Distribution in 1750.

Elsewhere along the Rio Grande mainstem, numerous land grants were awarded to settlers at such recognizable localities as Cieneguilla (1693), Bernalillo (1701), Albuquerque (1706), Alameda (1710), Ignacio de Roybal (1702), Plaza Colorado (1739), Plaza Blanca (1739), Tomé (1739), Belen (1740), Cañada de Cochiti (1740), Los Luceros (1742), Black Mesa (1743), Trampas (1751), Abiquiu (1754), Polvadera (1766), Piedre Lumbre (1766), Santa Cruz (1767), San Ysidro (1786), Los Cerillos (1788), Ojo Caliente (1793), and San Fernando de Taos (1799) (Brayer 1949:161; Julyan 1996; Williams 1986:105). There were three types of land grants during this period: grants to individuals, community land grants

given to ten or more Spanish families or to specific pueblos, and sitio (ranch) grants ranging from 4326.4 to hundreds of thousands of acres (Schutt and Chapman 1992:36). Further south, in the Rio Puerco Basin, Spanish settlements (*ranchos*) were established in 1753, but were abandoned by 1774 due to Navajo raids (Widdison 1958:56). Most of the grants awarded during post-Revolt times were either individual or community land grants.

According to a trend surface map showing time-sequent appearance of Spanish and Mexican land grants (**Figure O-1.3**), the earliest Spanish Colonial grants are concentrated in the Rio Grande valley. Later Mexican period land grants are located along the southern and eastern periphery of the state.

Throughout Spanish Colonial times, sheep raising was one of the primary economic activities since sheep provided wool for clothing, tallow for candles, and meat for consumption (Carlson 1969:26; Morfi in Thomas 1932:111). Sheep production in New Mexico was promoted, in part, due to the high demand for meat at Spanish mines in northern Mexico, notably the Durango and Viscaya regions (Carlson 1969:26). This high demand also acted as a catalyst for the appearance of new settlements in areas suited to sheep raising. Drives occurred annually down the Camino Real, with nearly 40,000 sheep being delivered to Spanish mines in northern Mexico (Baxter 1993:105-109; Carlson 1990:79). In addition, since much of the Spanish economy operated on the barter system, sheep came to be used as a medium of exchange over much of the state (Carlson 1969:26; Morfi in Thomas 1932:113; Weber 1992:196).

Despite the presence of so many settlements, the overall population of the northern reach of the planning area remained quite small through the eighteenth century (Weber 1992:195). The 1750 census (Olmstead 1981), summarized in **Figure O-1.2**, shows that most villages consisted of fewer than 300 people and only a few villages—notably Santa Fe—exceeded 1200 people. With the exception of the outlying pueblos of Pecos, Acoma, and Laguna, most settlements were restricted to the mainstem of the Rio Grande basin and its major tributaries.

As before, New Mexico's post-Revolt economy depended largely on subsistence farming and livestock production. To make land available for a growing population, colonial officials adopted a well-defined procedure to make grants from the royal domain to worthy citizens as individuals or in groups. Landless persons began the process by submitting a petition for a specific tract to the governor, who then ordered an investigation by the local alcalde. If no adverse claim resulted, the governor gave his approval and directed the alcalde to assemble the grantees and place them in possession of the lands. In community grants, each family received a parcel of irrigated farmland and a house lot facing an enclosed plaza. Every grantee enjoyed access to a large area of commons for grazing animals and collecting wood for heating or construction. By establishing new settlements on the margins of the colony, governmental officials hoped to extend hegemony and prevent incursions from hostile tribes (Westphall 1983: 17-19).

To the northwest of Santa Cruz, one of the ubiquitous Trujillos initiated attempts to settle lands across the Rio Grande beside the Rio Chama. In January 1701, Diego Trujillo made an appeal to Rodríguez Cubero for an unoccupied tract para labrear y fabricar casa para vivir (to farm and build a house to live in). Located close to the former site of San Gabriel in the Yuque-Yunque cañada, the property extended upstream from the junction of the two rivers to the narrows west of San Juan Pueblo, including the present communities of Hernández and El Duende. Noting the adjacent pastures must remain in common, the governor assigned a generous four fanegas of planting land to the grantee, but no possession ceremony took place because of Trujillo's sudden death (SANM I: 926). After his demise, no one occupied the lands for some years, although other settlers coveted the same location. On July 27, 1707, Sergeant Bartolomé Sánchez, a presidial soldier, requested vacant land north of Santa Clara's boundary "at the place called Zhama." Ignoring a large overlap with Trujillo's concession, Governor Francisco Cuervo y Valdés acquiesced, but military duties prevented occupation by Sánchez (SANM I: 824). Trujillo's heirs failed to protest, probably because neither family had established residence. Thus, settlement was delayed, but not for long.

Early in 1710, six family heads from Santa Cruz de la Cañada asked for lands in the same area previously awarded to Trujillo and Sánchez. At first, a new governor, the Marqués de la Peñuela, gave tentative approval, but later changed his mind after a protest from Sánchez. The decision outraged the petitioners, then increased to ten, who complained that their greater numbers would provide a more effective barrier to Indian attacks than a single family. Officials in Santa Fe remained obdurate, however, fearing that the departure of so many defenders would seriously weaken the villa of Santa Cruz.

Policy changed with the arrival of a new governor, however (SANM I: 1020). In May 1714, Diego Trujillo's heirs asked for revalidation of the four-fanega grant made in 1701 on behalf of Salvador Santistevan and Nicolás Valverde, veterans of the Reconquest. The new executive, Governor Juan Ignacio Flores Mogollón, obliged and authorized Sebastián Martín, the Santa Cruz alcalde, to perform a possession ritual, which took place on August 8 (SANM I: 926). Later in the same month, Flores Mogollón received petitions from more potential settlers, including Antonio Salazar and Antonio Trujillo, son of Diego. The former asked for his great-grandfather's lands at Corral de Piedra, as discussed above; Trujillo wanted a tract lying within the fork formed by the two rivers that later became known as the "Town of Chamita Grant." Eager to promote agricultural development, the governor approved all the requests (SG 132; 36, Town of Chamita Grant). Evidently, the grantees had already taken out an acequia from the Rio Chama (the present Hernández ditch), suggesting that they expected little opposition from Flores (SANM I: 167). Curiously, none of the grant documents mentioned those lands claimed by Bartolomé Sánchez.

Gradually, land-hungry frontiersmen pushed the line of settlement up the Chama Valley. Although original documents are missing, officials apparently made another grant near the present village of Chili to Juan de Mestas in 1715. A native of Santa Fe who had returned to New Mexico with Vargas, Mestas had previously obtained lands at Jacona from Governor Rodríguez Cubero, but sold them before moving north. Located above the grants authorized by Flores Mogollón, his Chama lands lay near the junction of the Rio del Oso, the Rio Ojo Caliente, and the main stream. Soon after arriving, Mestas was drawn into a lengthy dispute concerning land titles that involved all the recent grantees. Trouble arose in November 1715, when the absent Bartolomé Sánchez made a deal with Captain José Trujillo, the Arroyo Seco rancher, to pasture stock on the tract claimed by Sánchez. Charging trespass, the grantees appealed to Flores, who ordered Trujillo off the lands, but suddenly, Sánchez reappeared to file trespass charges of his own. Hoping for a settlement, the governor directed all of the parties to present their grant papers for inspection, but the issue was not resolved for several years until a change in administration took place (SANM I: 167, 834). In 1722, Governor Juan Domingo Bustamante, a strong executive, decreed a partition in which the Chamita grant was confirmed to Antonio Trujillo, Antonio Salazar retained his ancestral lands at Corral de Piedra, and the Sánchez heirs received part of the grant claimed by Bartolomé, then deceased (SG 36, 132). Disposition of the other interests was not recorded, although the Mestas family managed to retain their lands.

Governor Juan Domino Bustamante encouraged new settlement during his tenure as governor. In 1724, he ceded a huge tract adjoining the Mestas property to Cristóbal Torres, a former alcalde mayor of Santa Cruz, who had served in the military for forty years. Stretching up the valley towards Abiquiú, the lands were bounded on the north by the Sierra de las Grullas beyond today's El Rito, and on the south by Santa Clara peak in the Jémez range. After he had received possession, Torres invited other families to inhabit his lands as protection against raids by hostile Utes and Comanches. Working together, they plowed fields, planted wheat and corn, and dug acequias to water their crops. All shared equal rights in the grant as long as they remained on the land. To maintain manpower for defense, the settlers agreed to sell only to outsiders, thus preventing property consolidation and population decline (SANM I: 943, 950).

Unfortunately, continuing Indian harassment caused the little settlement to disintegrate after Cristóbal Torres died sometime in the winter of 1726-27. Within a few years, however, some of the Torres heirs

wished to return. In August 1731, Diego Torres and Bartolomé Trujillo petitioned Governor Gervasio Cruzat y Góngora for revalidation of their grant. They demanded that the other landholders join them in reestablishing the community or forfeit all property rights, but their efforts proved premature. Most of the settlers decided not to return and relinquished their titles. On November 24, 1733, the governor ordered the alcalde of Santa Cruz to post a decree that restored the lands to the royal domain and made them available for settlement by others. Deeply disappointed, the Torres heirs refused to give up and continued to pressure officials in Santa Fe. Unmoved, Cruzat y Góngora ignored their pleas, possibly because of the grant's enormous size (SANM I: 943).

Despite official opposition, Bartolomé Trujillo initiated a new strategy to recover a portion of the Torres grant in the summer of 1734. Together with nine other household heads, he petitioned the governor for small pieces of irrigable land (*tierras de pan llevar*) along the Chama at Abiquiú. Surprisingly, Cruzat y Góngora agreed and ordered that each of the ten settlers receive possession of parcels ranging in size from 1 to 2½ fanegas. Most of the plots were located in a row south of the river, but Trujillo obtained a site on the north bank just west of the junction of El Rito and the Chama, where he had resided before. During the ceremony, no commons was designated for grazing, a curious omission. In 1737, don Martín Elizacochea, the bishop of Durango, issued a license to the settlers for construction of a chapel during an episcopal visitation of New Mexico. Once completed, the chapel was dedicated to Santa Rosa de Lima, and the little village assumed the name of its patroness. Ruins of the structure are still visible on the Chama's south bank east of Abiquiú (SANM I: 954; Salazar 1976: 13-19).

A few months after the founding of Santa Rosa de Lima, several more settlers asked for farmlands in the Abiquiú area. Between January and April 1735, authorities in Santa Fe received petitions from six individuals and groups of families seeking small tracts of irrigable land near those granted to Bartolomé Trujillo and his friends. Because Governor Cruzat y Góngora had left the capital for an inspection of the El Paso region, responsibility for reviewing the requests fell to the lieutenant governor, General Juan Paéz Hurtado. Acting on his own authority, Paéz approved all the petitions from sixteen household heads for locations north and west of the sites granted in 1734 (SANM I: 320, 322, 518, 955, 1022, 1077). Local officials put the newcomers in possession during the spring, but their efforts to establish themselves on the land ended abruptly when the governor returned from El Paso. Angered by the actions of his subordinate, Cruzat y Góngora voided all the grants and demanded that the title documents be returned. He also decreed that the lands ceded had reverted to the public domain and that any houses erected must be demolished under penalty of a one hundred peso fine (SANM I: 524). Since the governor offered no explanation for his rulings, his motives remain shrouded in mystery. Additional settlement would have greatly increased Abiquiú's population and made a stronger barrier against attacks by hostile Indians.

Despite Cruzat's orders to vacate, it seems unlikely that all the settlers actually left the grants made by Paéz Hurtado. Some, like Manuel Bustos, obtained new grants within a few years; others, notably Gerónimo Martín, remained as squatters. Later records indicate that Martín and his large extended family continued to occupy his grant west of Abiquiú, which included the plazas of San José del Barranco and Los Silvestres (SANM I: 561). Although official policy discouraged frontier expansion for a few more years, the situation changed significantly following the arrival of a new executive, don Gaspar Domingo de Mendoza, early in 1739. During the next summer, Governor Mendoza approved two new grants at Abiquiú to Manuel Bustos and three members of the Valdés family, Rosalía, Ignacio, and Juan Lorenzo, who had previously attempted to settle near the headwaters of the Rio del Oso. Situated on the Chama's north bank west of Bartolomé Trujillo's rancho, the two grants became known as Plaza Blanca and Plaza Colorado in later years (SG 148, Plaza Blanca Grant; 149, Plaza Colorado Grant).

The two concessions did not go unchallenged, however. Soon after Mendoza had given approval, claimants to the Cristóbal Torres grant raised objections to the Valdés possession, which comprised part of the lands ceded in 1724. In their petition, the Torres heirs argued that, under Spanish law, damage suffered by a third party nullified a subsequent claim. While admitting that Cruzat y Góngora had restored

the grant to the royal domain, the heirs asserted that the governor had later recognized their rights and made a verbal retraction. To avoid embarrassing himself, he allegedly suggested that a later incumbent could confer a new grant (SANM I: 1004). Evidently, Mendoza accepted their reasoning. On August 24, 1740, he revalidated the grant to Diego Torres and Juan José Lovato, a prominent citizen of the Rio Arriba region who served as *alcalde mayor* of Santa Cruz for many years. On September 11, the grantees received possession of the enormous grant from *Alcalde* Juan García de la Mora, who designated the old landmarks as boundaries. In later years, the property became known as the Juan José Lovato Grant, although the means by which Lovato secured a controlling interest is unknown. Subsequently, the new owner called his rancho “Santa Bárbara de Chama” and established headquarters on the vega near present Medenales (PLC 140, Juan José Lovato Grant). Surprisingly, the grant papers made no reference to Bartolomé Trujillo or the other heirs. Despite the oversight, Trujillo, the other grantees of 1734, and some of the claimants to the invalidated tracts of 1735 remained on the Lovato/Torres grant, oblivious to the change in ownership.

In May 1744, the Chama Valley received a brief visit from a distinguished member of the Franciscan order. Hoping to reinvigorate the missionary program in New Mexico, Fray Juan Miguel Menchero had traveled north from New Spain to inspect the far-off province and study conditions there. In a comprehensive report prepared for the viceroy, the Count of Fuenclara, Menchero included population figures compiled during his tour. At the lower end of the valley, in an area that he called “El Rancho de Chama y Rio del Oso,” Fray Juan Miguel enumerated seventeen Spanish families; at Santa Rosa de Abiquiú he found twenty more. In contrast to these tiny communities, Menchero counted one hundred households at Santa Cruz de la Cañada, the administrative center of northern New Mexico (Hackett 1937, 3: 399). Because of their small population, the frontier settlements faced a continuing threat from belligerent Utes and Comanches, who bitterly opposed Spanish expansion of the Chama Valley. Although the two tribes had occasionally attacked Hispano villages in the early eighteenth century, during times of peace they also engaged in trade, exchanging hides, meat, and captives for horses and firearms. Although stringently regulated by Spanish authorities, commercial relations frequently caused hard feelings that led to combat, as the Indians sought revenge for unfair treatment. Hostilities escalated in the late 1740s, reaching a climax in August 1747, when Comanche warriors abducted twenty-three women and children during a massive attack at Abiquiú (John 1975: 243, 312-13; Hackett 1937, 3: 476-77). In October, Governor Joaquín Codallos y Rabal belatedly assembled five hundred soldiers, militiamen, and pueblo auxiliaries, who overtook the enemy, killing 107 Indians and capturing 206 Indians and 1,000 horses (Bancroft 1889 reprint 1962: 249).

Although Codallos seemed to have scored a notable victory, his triumph did nothing to restore morale on the northern frontier. Fearing renewed loss of lives and property, citizens of Abiquiú, Ojo Caliente, and Pueblo Quemado (today’s Córdoba) asked the governor for permission to abandon their settlements early in 1748. On March 30, Codallos reluctantly agreed to a temporary withdrawal (SANM I: 28). Eighteen months later, when conditions had not improved, panicky residents of Chama proposed a further retreat to Santa Fe or the Rio Abajo, but a new governor ordered the petitioners to stay on their lands. Fearing a general collapse in the north, tough-minded Tomás Vélez Cachupín imposed a stiff fine of two hundred pesos and four months in jail for those who tried to flee. To turn the tide and reinforce New Mexico’s northern flank, Vélez commanded the timorous landowners from Abiquiú to reoccupy their ranchos in time for spring planting. As protection, the governor sent a small detachment of soldiers with the returnees and directed them to build adjoining houses around a defensive plaza. Any recalcitrants unwilling to go back would lose their lands (SANM I: 1100).

Not surprisingly, the decree aroused a storm of protest from the refugees. Several, including Bartolomé Trujillo, decided to give up their grants rather than return to Abiquiú. Members of the Valdés family, who had received lands north of the river in 1739, composed a long statement to Vélez Cachupín, explaining the many difficulties inherent in an immediate return. The governor stood firm, however, which caused

the Valdés clan to reluctantly assemble their scanty possessions, gather a few livestock, and start back up the Chama. Other returnees included Manuel Bustos, Gerónimo Martín, and Miguel Martín, a captain of militia. Further support for the recolonization of Abiquiú came from thirteen families of *genízaros* (detribalized Indians living among the Spanish), forerunners of a larger group settled in the area by Vélez Cachupín in 1754 (SANM I: 1100). As conditions improved, other settlers slowly returned to their homes. In 1752, the governor conducted a census indicating that Abiquiú's Hispano population numbered seventy-three men, women and children grouped in eleven families. During the same year, Bartolomé Trujillo, one of the area's first settlers, paid a fine of sixty pesos for recertification of title to his rancho when Vélez suggested he might award it to someone else (SANM I: 976).

By that time, an uneasy peace had settled on the Chama Valley. Despite the settlers' fears, the danger of Indian attack at Abiquiú abated considerably in the 1750s. Using a judicious balance of threats and diplomacy, Vélez Cachupín maintained fairly good relations with both Comanches and Utes during his administration. He remained vigilant, however, recognizing the difficulty of persuading all *indios bárbaros* to give up war at the same time (John 1975: 323-29, 334). To bolster defenses at Abiquiú, he devised an unusual plan for establishment of a *genízaro* colony on the site of a prehistoric pueblo above the river. Following regulations found in the *Recopilación de Leyes de los Reynos de los Indios*, the magisterial Spanish legal code compiled in 1680, the governor allotted sufficient farmland, woods, and pasture for the *genízaros* to support themselves comfortably. Early in May 1754, near the end of his first term in office, Vélez rode up the Chama Valley to Abiquiú. Besides the usual soldiers and retainers, his followers included Juan José Lovato, alcalde mayor of Santa Cruz de la Cañada, and Fray Félix José Ordoñez y Machado, a Franciscan entrusted with spiritual supervision of the new colony. At the top of a small hill southwest of Santa Rosa, Vélez gave formal possession of the "Pueblo de Santo Tomás Apostol de Abiquiú" to Ordoñez as representative of his flock. With the formalities properly observed, Lovato began the serious business of designating boundaries for the lands, which became known as the Town of Abiquiú Grant (SG 140).

Because of the governor's careful planning, the reconstituted community seemed to promise a bright future for Hispanos and *genízaros* alike. In June 1760, when don Pedro Tamarón, bishop of Durango, made his famous visitation of New Mexico, high water prevented him from crossing the Rio Grande to inspect Abiquiú and Chama. Nevertheless, he reported that fifty-seven *genízaro* families, comprising 166 persons, resided at the new pueblo. According to the bishop, the Hispano population of Abiquiú had grown enormously since 1752: 104 households totaling 617 individuals (Adams 1954: 64). Before long, however, renewed warfare with nomadic Indian tribes caused the numbers to decline. At the end of his first term in 1754, Vélez Cachupín's well-crafted peace policy began to unravel; his successors simply lacked the political acumen needed to continue it. Fortunately, Vélez returned in 1762 for a second term in which he managed to stop the fighting through skillful diplomacy, but the respite ended five years later with the arrival of Pedro Fermín de Mendinueta, a new governor who remained in office for eleven years (John 1975: 329-32, 465-70).

Widespread violence swept over the Rio Arriba in the spring of 1768 following clashes with Comanches at Ojo Caliente and Taos. Several frontier villages, including Chama and Abiquiú, were deserted as before. When conditions improved slightly late in 1770, Mendinueta ordered the refugees to reoccupy their lands, just as Vélez had done two decades earlier. Like his predecessor, Mendinueta urged construction of defensive plazas enclosed by contiguous dwellings, noting that, in 1750, the settlers had left themselves vulnerable to attack by returning to their scattered ranchos (SANM I: 36). In spite of official pressure, it seems unlikely that any significant changes took place.

In 1776, valley residents greeted another high-ranking cleric, Fray Francisco Atanasio Domínguez, who was conducting an official visitation of New Mexico's missions for the Franciscan order. After his return to Mexico City, Domínguez wrote a detailed account of conditions he encountered that provides an intriguing picture of colonial life toward the end of the eighteenth century. As he rode north from Santa

Clara Pueblo, he counted four Hispano settlements along the Chama's west bank. Extending for three leagues (approximately 7½ miles), they approximated the present villages of Guachapangue, El Guache, Hernández, El Duende, and Chili. Each placita had a name of its own, an arrangement that Fray Francisco described as "a whim," since all the communities blended together without any visible separation between them. According to the friar's calculations, the chain of settlement boasted a population of 340, presumably including Chamita on the east bank. Farms in the area raised "good crops of everything," thanks to ample water for irrigation (Adams and Chávez 1956: 119).

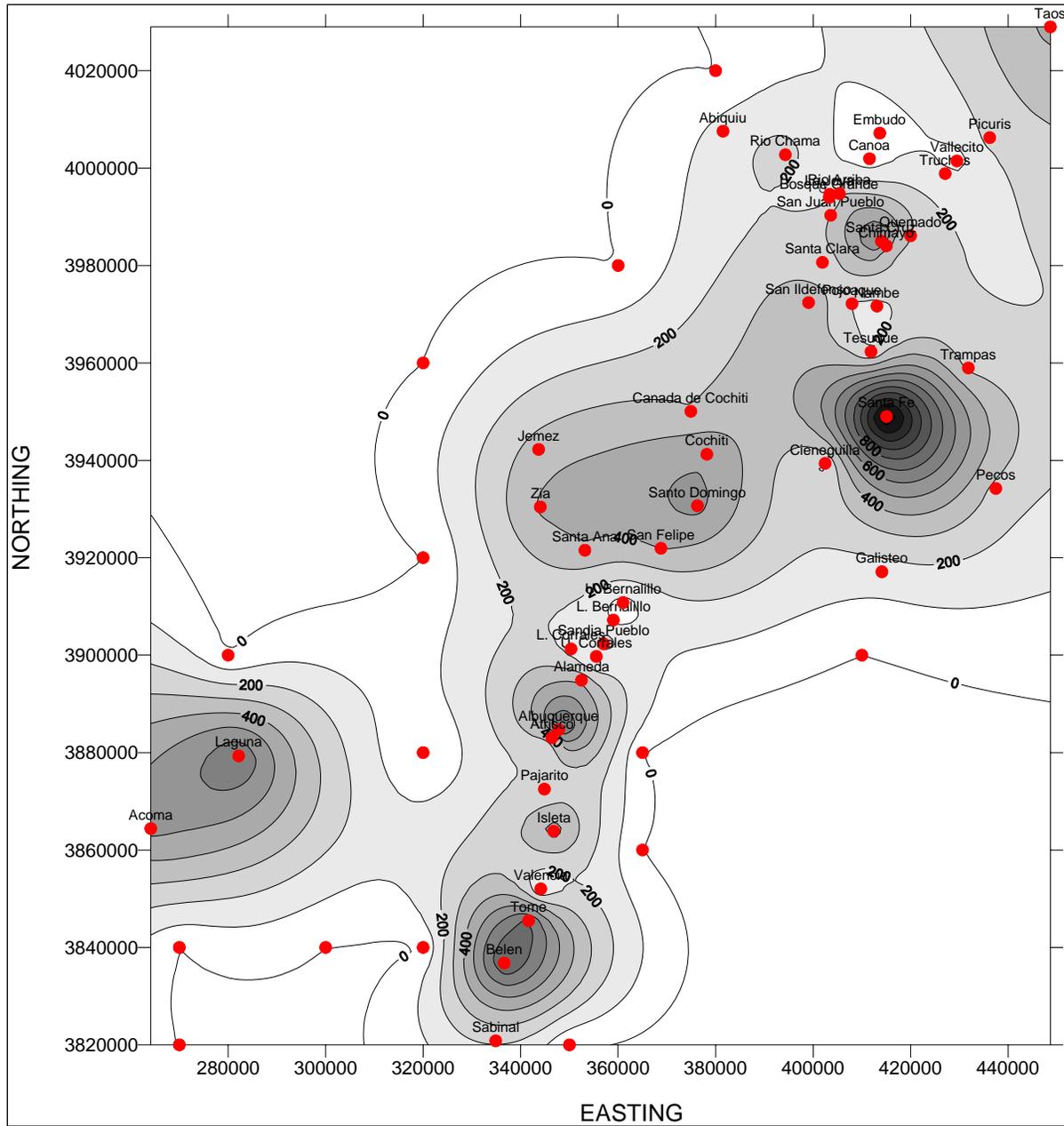


Figure O-1.3. Population Distributions in 1775.

Proceeding upriver over a rough road, Domínguez noted the Chama's dark red color that resulted from serious soil erosion. Eventually, he reached Abiquiú where he inspected the adjoining Hispano and genízaro communities. While resting at the pueblo, Domínguez admired the mission church, with its thick walls surmounted by a medium-sized bell hanging from an arch over the front door. As in most New Mexico churches, the interior was plain, but the building contained a choir loft in the rear, a noteworthy feature. Below the pueblo, Fray Francisco surveyed fertile fields and lush meadows bordered by groves of cottonwoods. Farmers from both ethnic groups irrigated from the river and from Abiquiú Creek, raising substantial crops in good years. Lacking experience, the genízaros lagged behind their Hispano neighbors in agricultural production. To supplement farm income, both groups eagerly engaged in Indian trade. Each year in October, the Utes came to Abiquiú for a fair in which they exchanged deer skins, dried buffalo meat, and captive children for knives, flour, and horses. Anxious to try out the trading stock, Indians and Hispanos organized impromptu horse races during the fairs, which caused great excitement. Abiquiú's citizens also enjoyed a yearly fiesta, which honored Santa Rosa, the community's original patron, instead of Santo Tomás, namesake of the pueblo (Adams and Chavez 1956: 120, 123, 125-26, 252-63).

In the years following the Domínguez visitation, Rio Arriba residents began to enjoy a period of relative stability, as Indian hostilities decreased significantly. In September 1779, Governor Juan Bautista de Anza, Mendinueta's successor, scored a great victory over the famous Comanche Chief Cuerno Verde during a campaign east of the Sangre de Cristo range near present Pueblo, Colorado. The defeat shocked the Comanche tribe, causing them to negotiate a treaty of peace at Pecos Pueblo early in 1786. Lasting many years, the agreement brought an unaccustomed calm to much of New Mexico (John 1975: 585-89, 670-76). A decade after Anza's triumph, a census enumerated more than eleven hundred people at Abiquiú residing in nine placitas between Medenales and Los Silvestres, just below the present Abiquiú Dam (N.M. Genealogical Society 1981: 111-24). Subsequent head counts showed continuing growth into the next century. Inevitably, population increases strained available land and water resources in the valley, causing emigration from Abiquiú to other locations, north and west, in the ensuing years.

After the Reconquest, settlement along the Rio Grande in White Rock Canyon was impeded by lack of arable land below San Ildefonso Pueblo. As livestock numbers increased, however, Hispano ranchers began to pasture sheep and cattle on the grasslands west of Santa Fe. In May 1742, Captain Nicolás Ortiz, a former commander of the villa's presidio, petitioned Governor Mendoza for a large tract of rangeland east of the Rio Grande. Known as the "Caja del Rio," the grant stretched south from the high mesa at the end of San Ildefonso's cultivation all the way to the escarpment at La Bajada. Well connected politically, Ortiz was the son of an important Mexico City family recruited by Vargas in 1693. As a teenager, he had been cited for bravery in combat with rebellious Indians during the Reconquest. Proudly declaring forty-nine years of military service, the captain requested land as compensation. The governor reacted favorably, but ordered Alcalde Antonio Ulibarrí to investigate possible adverse claims. Finding no opposition from neighbors at San Ildefonso and Jacona, Ulibarrí placed Ortiz in possession on June 18. Unexpectedly, the captain died soon thereafter, but his descendants retained the Caja del Rio for many years. As headquarters, they constructed a large hacienda with outbuildings and corrals in a broad valley called Cañada Ancha on the north side of the tract. In 1818, Navajo depredations forced the family to retreat to Santa Fe, but grazing operations continued on the grant's vast pastures whenever conditions were favorable (SG 63, Caja del Rio Grant).

In March 1742, Mendoza had approved another grant to Pedro Sánchez that was located across the river from the Ortiz grant and bounded on the north by San Ildefonso lands. Pleading extreme poverty, Sánchez hoped to obtain a tract big enough to support his huge extended family – a wife, twelve children, three orphaned nephews, and assorted retainers. Although Sánchez had made a poor choice, the easy-going governor agreed and ordered the Santa Cruz alcalde, Juan José Lovato, to handle the details. Once

notified, pueblo officials did not object, but to prevent future disputes, Lovato erected a large cross that marked the grant's north boundary with San Ildefonso (SG 38, Ramón Vigil Grant). Sánchez's tenure was brief, however. No documentation is available, but he probably discovered that the grant could not sustain his many dependents. In 1750, Sánchez attempted to claim the rancho below Abiquiú first occupied by Bartolomé Trujillo. As we have seen, his request surprised Trujillo and caused him to regain the property by paying a substantial fine. After Sánchez left the Rio Grande, those lands were unoccupied for many years, but were eventually used for grazing by Anglo cattle ranchers.

When Sánchez requested his grant in 1742, he identified the south boundary as "the lands of Andrés Montoya." Sometime prior to 1740, Montoya had claimed a tract known as the Rito de Frijoles grant, located on the west bank between the river and the Valle Grande. To the south, the Cañada de Cochití marked the property line. The grant included much of Frijoles Canyon, where the headquarters of Bandelier National Monument is today. Like many other grantees, Montoya was a veteran of several Indian campaigns and had later served as alcalde of the three eastern Keres pueblos: Cochití, Santo Domingo, and San Felipe. Evidently, the family maintained continuous occupation for two or three generations, irrigating small plots of farmland from Frijoles Creek. In 1780, a younger Andrés Montoya asked Governor Anza to transfer ownership of the grant to Montoya's son-in-law, Juan Antonio Luján, who had been residing there. Subsequently, title passed to Luján's daughter, Antonia Rosa Luján, and her husband, José Antonio Salas. The Navajo raids of 1814 forced the couple to evacuate and move closer to Cochití, but their descendants continued to farm in the canyon whenever possible (SG 133, Rito de los Frijoles Grant).

Below the Frijoles grant at the end of White Rock Canyon, the valley widens somewhat, allowing agriculture to become more practicable. As a result, settlement occurred earlier in this area than in the constricted canyon above. In 1728, Governor Bustamante received the usual petition from Antonio Lucero announcing his desire to settle lands on Cochití mesa where Indians from the pueblo had retreated during the rebellion. Including ten fanegas of wheat land and two more for maize, the tract also provided ample pasture in the western mountains for saddle horses and flocks of sheep. Since the governor made no objection, Lucero received possession of the grant on August 8 from the alcalde of the Keres pueblos, Captain Andrés Montoya (SG 135, Cañada de Cochití Grant). Although originally awarded to Lucero alone, the grant developed into a community enterprise with many families in residence. In June 1760, when Bishop Tamarón toured New Mexico, he found forty Hispano households comprising 140 persons west of the river in the Cañada settlement (Adams 1954: 65). Sixteen years later, Father Domínguez reported that the Spanish population had increased to 307 persons, who lived in scattered ranchos along a small stream. Farmlands were of good quality, he wrote, but crops were scanty because irrigation water usually dried up when needed most, leading to severe hardships for the settlers (Adams and Chávez 1976: 159). Domínguez may have exaggerated the problem somewhat, since Cañada de Cochití continued to be a viable community, in spite of continuing water shortages, until its abandonment early in the twentieth century.

To summarize, settling New Mexico's northern frontier proved to be a long and difficult process. Don Juan de Oñate established his first headquarters near the jurisdiction of the Rio Grande and the Rio Chama, but the colonists deserted that site in 1610 after his successor relocated the provincial capital to Santa Fe. Subsequently, a few pioneers began to cultivate small tracts of irrigable land at La Cañada, a valley extending east from the Rio Grande. Their farms were abandoned in 1680, however, when the Pueblo Indians rose in revolt, forcing the settlers to join the general retreat to the south. After twelve years at El Paso, Spanish rule was reestablished in New Mexico by Governor Diego de Vargas, a tough and resourceful leader. To protect the colony's northern frontier from incursions by nomadic Indian tribes, Vargas founded La Villa Nueva de Santa Cruz de la Cañada in 1695. Originally settled by newcomers from Mexico City, Santa Cruz became the jumping off place for families hoping to locate farmlands to the west in the Chama Valley.

Early in the eighteenth century, veterans of the Reconquest who hoped to find new homes along the Chama were hindered by conflicting land titles. Overlapping grants resulted in extensive litigation to resolve boundary disputes. During the administration of Juan Domingo de Bustamante, however, the governor mandated a compromise that facilitated establishment of a series of small placitas stretching upstream from Corral de Piedra near present Española as far as Rio del Oso. To further promote agricultural expansion, Bustamante also authorized the Cañada de Cochití Grant below Santa Fe on the Rio Grande's west bank.

During the 1730s, settlement on the Rio Chama advanced to Abiquiú, but Spanish intrusion into ancestral hunting grounds provoked violent opposition from Ute and Comanche war parties. Fearing for their lives, the settlers fled from Abiquiú in 1748, although most of them returned within a few years, on orders from Governor Tomás Vélez Cachupín. For some years, the Rio Arriba region enjoyed relative peace, thanks to the governor's adroit Indian policy. Conflict resumed in the 1760s and 1770s, but the Comanche threat ended after the decisive defeat of Cuerno Verde's warriors in 1779. As hostilities wound down at the end of the eighteenth century, the Rio Arriba experienced a remarkable increase in population. Like previous generations of New Mexicans, vecinos (citizens) of Abiquiú and neighboring villages began to search for vacant lands with water sources to sustain their families. As they developed new grants to the north and west at Piedra Lumbre, Cañon del Rio Chama, and Tierra Amarilla, the settlers sustained and nurtured the same traditional culture that first came to New Mexico with followers of Oñate and Vargas.

Conditions were not radically different at the time of Tamarón's (1760), Dominguez's (1775), or Morfi's (1782) visitations of New Mexico. Dominguez' census, summarized in **Figure O-1.4**, shows that settlements continued to be restricted to the mainstem of the Rio Grande. This assessment is confirmed by Morfi's narrative (Thomas 1932:87-120). Moreover, there is little evidence that new settlements had been established in outlying portions of the Spanish realm in New Mexico.

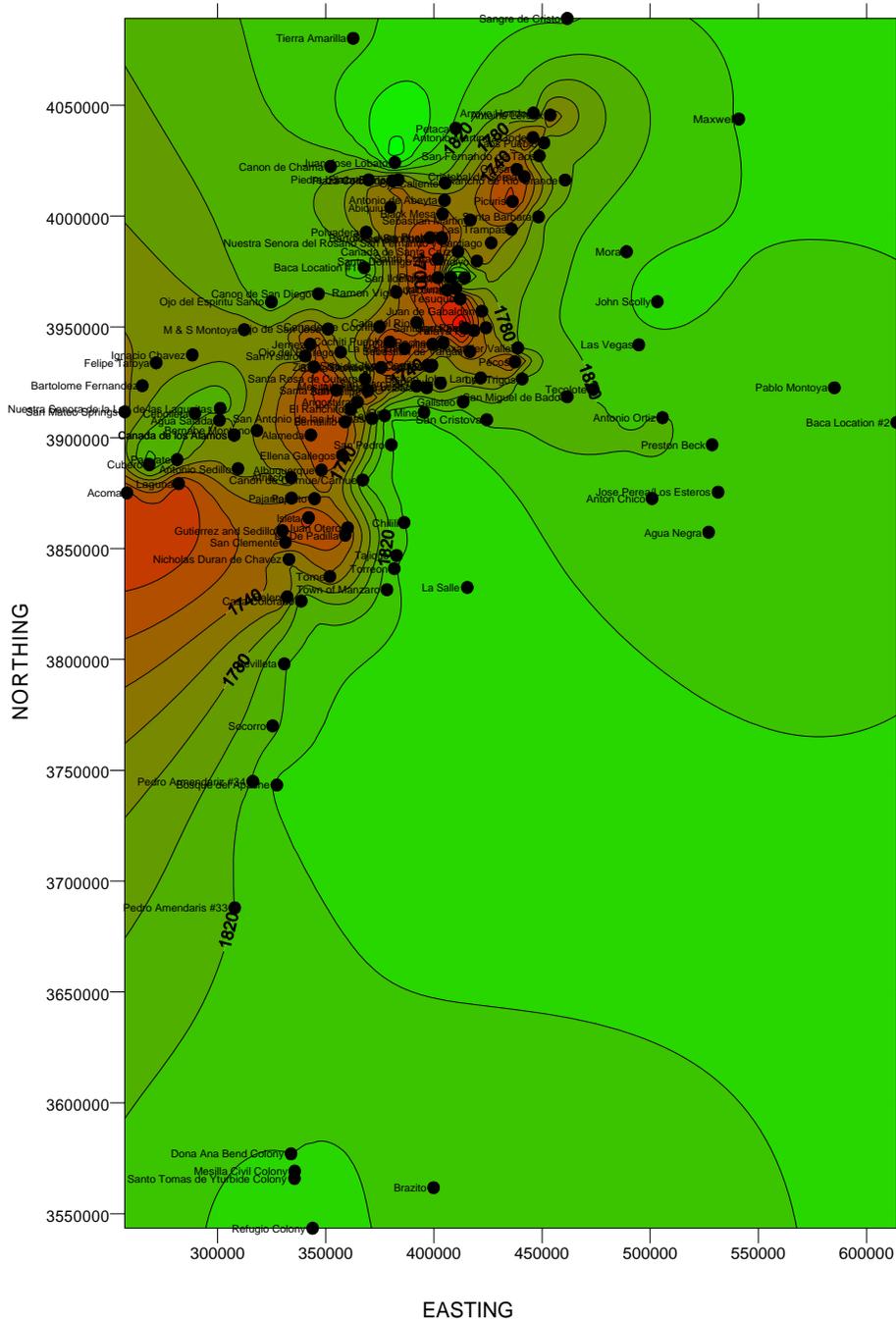
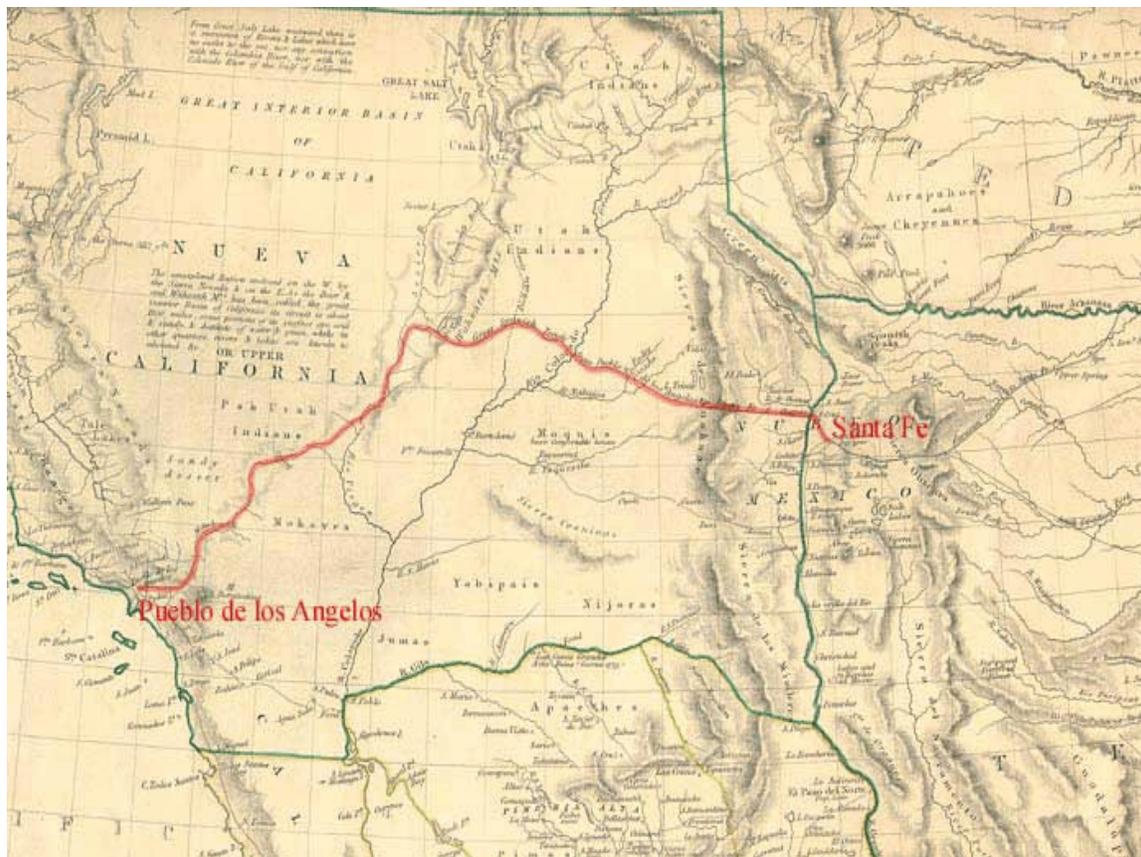


Figure O-1.4. Time-sequent Establishment of Spanish and Mexican Land Grants.

The general pace of land grant awards abated prior to Independence (1821), although some grants were made during this period (Williams 1986:105). Along the Rio Grande, early nineteenth century land grants included Galisteo (1814), Arroyo Hondo (1815), Socorro (1815), and Cañon de Carnué (1819). It was also during the eighteenth century that the Old Spanish Trail was established (Crampton and Madsen 1994). This southern branch of this trade route, first traversed by Rivera in 1765, almost certainly followed earlier Native American trading paths (Wendorf 1953:7). In 1776, the southern route was more firmly defined by the Domínguez-Escalante expedition (Chavez 1995; Wendorf 1955:7-8). Beginning at Abiquiu, and extending northwest up the Rio Chama, the trail diverged into the headwaters of the San

Juan River and then passed into southern Colorado and Utah (**Figure O-1.5**). By the beginning of the nineteenth century, the Spanish Trail had become one of the major trading routes connecting New Mexico with Spanish settlements in Arizona and California and Abiquiu became the primary point of departure for trading caravans heading west to California (Swadesh 1974:61, 63).



Source: Old Spanish Trail Association 2002

Figure O-1.5. Alignment of the Old Spanish Trail.

Through much of the Spanish Colonial Period, hostilities, epidemics, and other factors all served to limit the expansion of Spanish settlements in the region. This was due, at least in part, to substantial decreases in the size of puebloan populations and attendant impacts to the *encomienda* system on which Spanish settlement was based. By 1803, toward the close of the Spanish Colonial Period, the region was described by Chacón as having about 35,700 people (Simmons 1985:84). In the absence of readily accessible markets, its agricultural economy operated at subsistence-levels of production (Simmons 1985:84; Reeve 1961:1). Sheep herding, described above, was a notable exception, with Chacón indicating that 25,000-26,000 sheep were driven annually to presidios in northern Mexico (Simmons 1985:85). Yet, importation of manufactured goods—notably horses, mules, linen goods and cotton textiles—underscored the fragility of the region’s economy.

Spanish settlement brought new technologies and ways of life to indigenous peoples. Among the most important introductions was the use of metal, the introduction of domestic animals and, to the detriment of the region’s inhabitants, Old World diseases (Bartlett 2002:13, 77-80; Weber 1992:303-304). While the colonists entered the region with the notion that they would reconstruct Spanish society in these new

lands, in the end it was the settlers who were reconstructed by their pueblo neighbors. Very little of Spanish society was evident in the character of the region toward the end of the Spanish Colonial Period.

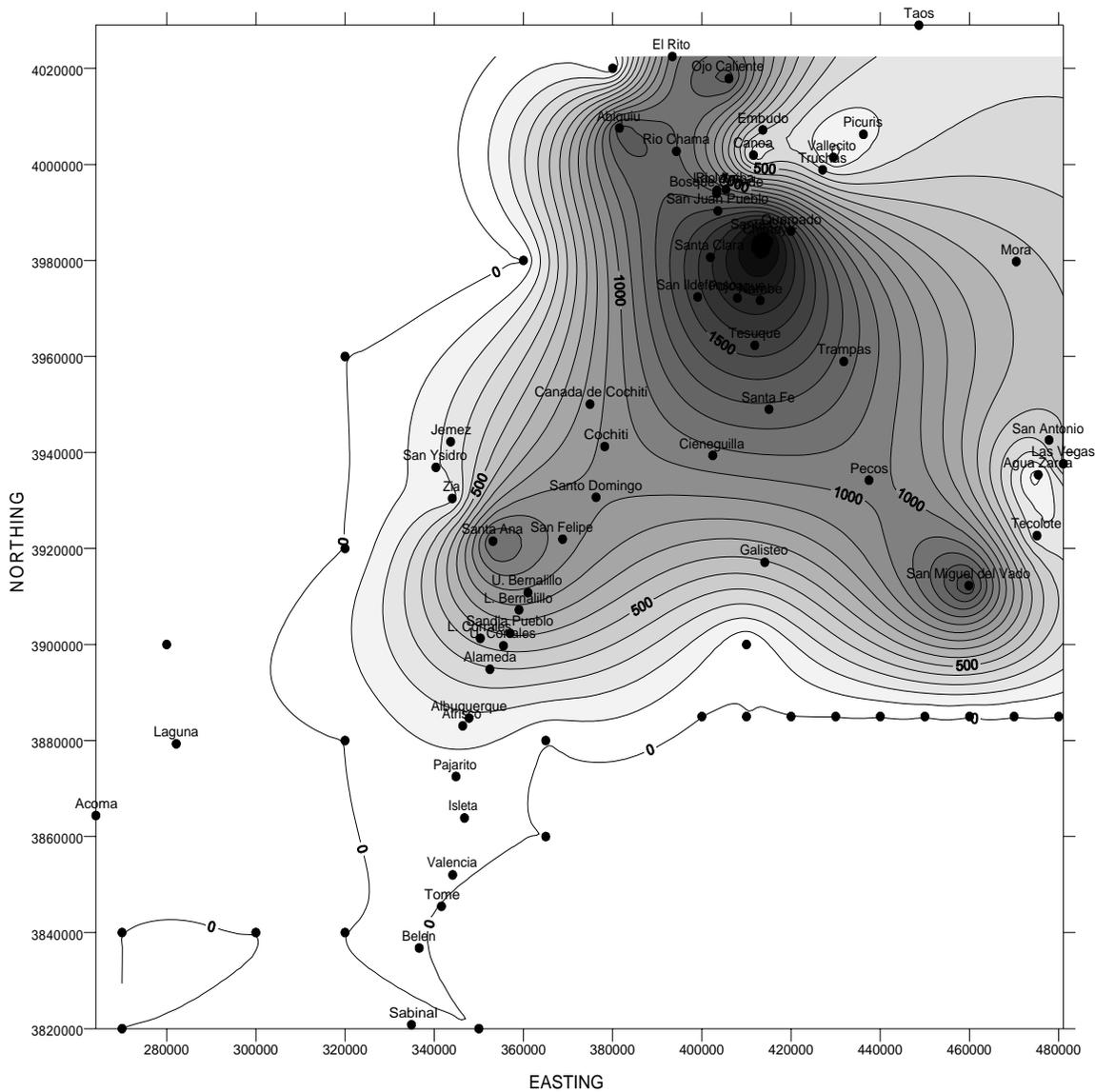
1.3.1.2 Mexican Period (A.D. 1821-1848)

Mexico's declaration of independence from Spain in 1821 was accompanied by the opening of the Santa Fe Trail. Yet, the change in administration had little or no effect on governmental policies nor on the lives of most residents of New Mexico during this period (Carlson 1990:13).

There were additional Mexican land grants awarded during this period including the Cañones del Riaño (1823), Vallecitos (1824), Petaca (1824), Tecolote (1824), Tierra Amarilla (1832), Baca Location #1 (1835), Chilili (1841), Sangre de Cristo (1843), Vigil and St. Vrain (1843), Cebolla (1845), and Bosque del Apache (1845) grants (Brayer 1949:60, 128, 156, ; Swadesh 1974:54-55, Williams 1986:105) . Other settlements, notably Mora, located to the east of Santa Fe were also established in the early nineteenth century (Chávez 1955:319-320).

The Mexican Period saw progressively greater interaction between Euro-Anglos from America and New Mexico's Native American and Hispanic residents. In recognition of increased trade with Americans from the east, Taos was made an official port of trade in 1837, while Socorro, New Mexico, remained on the edge of the Mexican frontier (Bloom 1913:13; Carlson 1990:75-78). The area between Socorro and El Paso continued, as it had during the preceding 200 years, to be devoid of Mexican occupations during this period (Bloom 1913:13).

In 1822, at the beginning of the Mexican Period, New Mexico's population totaled about 40,000 people, including both Mexicans and Indians (Bloom 1913:29). According to Narvon's 1827 census, New Mexico's population had increased to 42,217 people. Toward the end of the Mexican Period, in 1840, Manuel Armijo's reported population census indicates that 55,403 people were in the region. This roughly translates into a 2.1 percent annual population growth rate during the period between 1827 and 1840. The distribution of the population in 1845 is shown on **Figure O-1.6**.



(Note that no census of the pueblos was taken at this time)

Figure O-1.6. Population Distributions in 1845

The 1845 census, which does not include censuses of pueblos, is incomplete (Olmstead 1975). However, it does illustrate that Mexican settlements, consistent with the “budding” process described elsewhere, had spread eastward during the preceding few decades. The towns of Vado, Anton Chico, Tecolote, Las Vegas and others located northeast of Santa Fe all exhibit substantial population growth during this interval. In general, then, settlements were pushed eastward into the northeastern quarter of New Mexico. In the northwestern quarter, with the notable exceptions of settlements at El Rito and Ojo Caliente, Mexican settlements remained few in number due largely to on-going conflicts with the Navajo.

As was true during the Spanish Colonial Period, sheep raising remained one of the most important economic activities during the Mexican Period. According to Navrona’s 1827 census, approximately 247,000 sheep were managed by herders at the beginning of the Mexican Period (Bloom 1913:18, 40; Carroll and Haggard 1942: Report Number 1). Of these, 65 percent of the sheep were concentrated in the

Albuquerque *alcaldia*, while the remainder were divided between the Santa Fe (26 percent) and the La Cañada de Santa Cruz *alcaldias* (10 percent). The wool produced in these regions was cleaned and spun into a variety of textiles used both locally and as integral components of long-distance trade with California and northern New Mexico. Given the scarcity of horses and mules in New Mexico, which numbered only 2700 animals in 1827, New Mexico textiles and sheep-on-the-hoof were traded for horses and mules from California, so that sheep continued as a crucial component in the economy of the region during this period (Carlson 1990:79; Reeve 1961:13).

Trading across the Old Spanish Trail, discussed above, intensified during the Mexican Period and included both Mexican and Anglo traders (Swadesh 1974:60-61). Many of the alternate routes along the trail which shortened its distance were identified and used by traders traveling to California. According to the Frenchman, Dufлот de Mofras (Utah Bureau of Land Management 2002)

Caravans traveled once a year from New Mexico to Los Angeles. These consist of 200 men on horseback, accompanied by mules laden with fabrics and large woolen covers called serapes, jerzas, and cobertones, with are valued at 3 to 5 piasters each. This merchandise is exchanged for horses and mules on a basis, usually of two blankets for one animal. Caravans leave Santa Fe, New Mexico, in October, before the snows set in...and finally reach the outlying ranchos of California from where the trail leads into El Pueblo de los Angeles. This trip consumes two and one-half months. Returning caravans leave California in April in order to cross the rivers before the snow melts, taking with them about 2,000 horses.

By 1844, the Mexican government had suspended its annual gifts to many Indian groups. In the Rio Chama Basin, the Utes responded by inaugurating persistent raids against frontier towns, particularly Abiquiu and Tierra Amarilla (Swadesh 1974:62). Although temporary summer sheep camps seem to have continued throughout this period, the region was nonetheless subject to hostilities well into the Euro-Anglo Period. Despite hostilities, and the expansion of trade during the Mexican Period, settlements and associated populations remained largely restricted to the Rio Grande valley and its major tributaries.

1.3.1.3 Euro-Anglo Period (1848 - present)

Initial perceptions by Anglo-Americans upon their arrival in New Mexico were far from complimentary (Bloom 1959). One observer commented (Carlson 1990:57):

The population of New Mexico hitherto has not, unfortunately, been of the progressive kind. The Spanish and Mexican race, of whom until recently ten tenths, and at this time nine tenths of the population is composed, has caused the country to progress scarcely a move in the march of material improvement and wealth beyond what it was in the days of the Spanish vice-royalty in Mexico to which it was once subject.

The chaos that seemed to characterize the newly-acquired territory grew even worse with the outbreak of the Civil War. Between 1861 and 1862, Confederate forces seized a series of Union posts beginning in El Paso, Texas, and extending northward up the Rio Grande toward Santa Fe. Only after the Confederates were defeated at the Battle of Glorieta Pass in the spring of 1862 did any semblance of order return to the territory. By 1865, the Santa Fe-Durango stage route extending from Santa Fe northwestward through San Ysidro, Cuba, Haynes Station, Truby Stop, and Largo to Aztec had been established in an effort to improve communications and travel in the northern reaches of New Mexico (Williams 1986:18). This stage line was to remain in operation until 1881.

Much of the impetus for Anglo settlement in the project area can be traced to passage in 1862 of the Homestead Act. Intended to promote settlement of the American West, the Act provided 160 acres (later, 320 acres) to claimants once they “proved up” their claim by living and working on it for five years (Carlson 1990:53-54). Anglo settlements in the project area did not emerge until the late 1870s. In the Rio Puerco, settlements that had been abandoned in 1774 were finally reestablished (Widdison 1958:56).

Unless otherwise noted, all the following establishment dates are from Julyan (1996). Among the earlier settlements in the project area were Blanco (1870s), Lumberton (1881), Dulce (1883), Cuba (1887), Cedar Hill (1887), Rosa (1888), San Luis (1890), and Sheep Springs (1892). Others such as Fairpoint (1894-1898), Pendleton (1903-22), Liberty (1907-1920), Haynes (1908-1929), and Gobernador (1916-1942) were established only to be abandoned within a few years or decades (Williams 1986:147).

Many initial economic activities typical of the mid-late nineteenth century focused on farming and ranching. Farming varied from rainfall-based dryland farming in upland areas to irrigated agriculture in river valleys that had relatively permanent flows. The establishments of the settlements listed above were almost invariably accompanied by the immediate construction of irrigation ditches (Ackerly 2002).

Ranching continued to focus largely on sheep, although cattle soon began to appear and eventually equaled sheep in importance. As in the Mexican Period, sheep continued to be an important aspect of Albuquerque's economy throughout the nineteenth century. Sheep ranching during the Euro-Anglo Period expanded north and east to Rio Arriba, Taos, and San Miguel counties, as well as into parts of Valencia County south of Albuquerque (Carlson 1969:33). Sheep continued to play a critical role in the region's economy due to increased demand for fresh meat as a consequence of, first, the 1849 California Gold Rush and, later, the need for meat and wool sparked by the outbreak of the Civil War and an attendant increase in the price of woolen garments (Carlson 1969:31-35). By 1880, sheep numbered 2,000,000, up more than eight-fold from the earlier 1827 estimate of 250,000 (Carlson 1969:33).

Beginning in the 1850s and persisting through the 1860s, there were trail drives of large sheep herds westward along a route that closely paralleled the Old Spanish Trail (Williams 1986:121). Trail drives eventually extended north into Wyoming, east toward Kansas, and west to California (Carlson 1969:34-35). Española, in the heart of the Rio Chama country, became the headquarters of Frank Bond's sheep operation, one of the largest in the territory (Carlson 1969:37). By the early twentieth century, there were 1.8 million head of sheep on the Navajo Reservation, comprising almost 93 percent of all livestock on the reservation (Acrey 1994:157).

The rapid pace of settlement, accompanied by expansion of both farming and ranching, led to the construction of the "Chili Line" of the Denver & Rio Grande Western Railroad in 1879 and, in 1881, the "Farmington Branch" (Whitten and Powers 1980:25). Intended largely to transport commodities—particularly fruit—northward and manufactured goods into the San Juan Basin, a spur line extending from Durango, Colorado, southward to Aztec and Farmington was completed in 1905 (Myrick 1990:130).

During this same period, a series of mineral discoveries, particularly in the San Juan basin, caused the boundaries of some Indian reservations to be redrawn so that mining operations might be established. In 1872, under the terms of the Brunot Agreement, the Utes lost a substantial portion of their original reservation (Swadesh 1974:97). Concomitant with the opening of these new lands for mining was an influx of largely Hispanic settlers into the upper reaches of the Rio Chama and west into the San Juan basin (Swadesh 1974:97-100). Many of the earliest settlers originated from the Abiquiu and lower Rio Chama Valley (Swadesh 1974:105).

In Navajo county, the late nineteenth century and early twentieth century were characterized by the establishment of numerous trading posts. Beginning in 1869, trading posts associated with army garrisons at Ft. Defiance and Ft. Wingate were opened for Navajo trade (Acrey 1994:132). In the mid-1880s, a trading post was opened in Fruitland (Acrey 1994:132), soon followed by trading posts at Crystal (1892) and Two Gray Hills (1897). Trading posts provided both an outlet for goods, notably blankets and jewelry, produced by Navajo craftspeople, as well a source for manufactured Anglo goods.

1.3.2 The Southern Area (Reaches 13 through 17)

To the south, in the area between the Rio Puerco and El Paso, the early history is somewhat different than that observed in the northern reaches of the planning area. Spanish and Mexican Period occupations are virtually absent, while the majority of archaeological remains are associated with the Euro-Anglo Period.

1.3.2.1 The Spanish Period (1540-1821)

At the time of Spanish contact, the southern project area contained numerous pueblos. Along the mainstem of the Rio Grande, named pueblos appearing in Spanish chronicles included Sevilleta, Pueblo de Arena, Almillito, El Barro, Pueblito Point, Pilabo/Socorro, Teypama, Plaza Montoya, Qualacu, Nuestra Señora, San Pascual, Tiffany, Senecú, Magdalena, and Bear Mountain (Bartlett 2002:55). By the mid-1600s, coincident with decreases in the numbers of occupied pueblos in the northern reach of the project area, the number of southern pueblos—those located from Socorro south—decreased from 14 to three (Bartlett 2002:62). This confirms the rather pan-regional abandonment of contact period pueblos across much of New Mexico.

Largely by-passed by the Spanish in their rush to colonize the northern reaches of the Rio Grande, the southern part of the project area remained largely devoid of Euro-Anglo residents until the mid-nineteenth century. Even as late as the nineteenth century, the region between El Paso, Texas, and Socorro, New Mexico, was referred to as *la tierra afuera* (the land outside) (Bloom 1913:12). Archaeological investigations have located pre-Revolt Piro pueblos at Sevilleta (*ca.* 1620-1670), Socorro (1626-1680), Qualacú (*ca.* 1598-1692), San Pascual (*ca.* Pre-1681), and Senecú (*ca.* 1581-1680); most appear to date between 1581 and 1680 (Marshall and Walt 1984:246-257).

Indigenous peoples at the Paso del Norte included the Mansas (*Manso*, lit. peaceable). Described in detail by Benavides (Ayer 1965:13-14), the Mansos lived in brush huts, relying primarily on wild plant and animal resources obtained from the Rio Grande and surrounding uplands; fish and mice specifically mentioned by Benavides (Ayer 1965:14; Bandelier and Hewett 1978:140).

El Paso was to play an important role following the Pueblo Revolt of 1680, inasmuch as Spanish and Native Americans fleeing the devastation in the north eventually took refuge at its presidio (Weber 1992:137). The arrival of displaced Native Americans loyal to Spain led to the founding of the village of Ysleta del Sur, one of the southernmost pueblos in the planning area. With the 1680 flight of the Spanish and their Indian allies from northern New Mexico to the Paso del Norte region, the pressure on local agricultural production systems to sustain such an increase in people appears to have contributed to the expansion of irrigation throughout the valley, a trend that continued in succeeding years. Within a decade, El Paso became the staging area for Vargas' eventual military expedition to recapture northern New Mexico in 1692.

White (1950:7) notes that there is no documentary evidence indicating that irrigation agriculture was practiced to any great extent in the El Paso region between 1581 and 1650. The earliest record of American Indian irrigation agriculture in El Paso appears in Bolton (1930:178). Referring specifically to the Pueblo of Senecú in 1582, Espejo noted that: "They [the Piro] have fields of maize, beans, gourds and piciete, in large quantities, which they cultivate like the Mexicans. Some of the fields are under irrigation, possessing very good diverting ditches, while others are dependent on the weather [rainfall]."

In 1659, following the founding of the mission of Nuestra Señora de Guadalupe de Paso del Rio, Hackett (1942: 193-213) notes that: "Father Garcia was there attending to the establishment of a farm, and obliging even the heathen to construct a ditch for it, with great labor, from the Rio del Norte [Rio Grande]." This account places early irrigation systems on the southern or right bank of the Rio Grande in the vicinity of the modern city of Juarez, Mexico. Whether there were irrigation systems on the northern or left bank of the Rio Grande remains unclear. White's (1950:9-10) review of documentary sources

suggests that irrigation systems were not present in the area of modern-day El Paso, Texas, prior to about 1680.

However, irrigation agriculture did not come to the fore until after the Pueblo Revolt of 1680. With the removal of Spanish-Americans from northern New Mexico to the Paso del Norte region, the pressure on local agricultural production systems to sustain such an increase in people appears to have contributed to the expansion of irrigation throughout the valley. Aid to Otermin's refugees was decreed to include 150 plowshares, 600 large hoes, 24 pickaxes, and 24 iron shovels (White 1950:12).

Sometime between 1681 and 1683, additional irrigation canals appear to have been constructed by Otermin (White 1950: 14). In 1683, Otermin's successor, Cruzate, tried to induce Spanish settlers in the vicinity of San Lorenzo, on the Juarez side, to relocate near Nuestra Senora del Guadalupe. His inducement, in part, would allow the settlers to make use of an existing irrigation canal and an offer to widen the canal (White 1950:15). Two years later, in 1685, a drought period that coincided with the Manso revolt in the El Paso area, was noted to have led to widespread crop failure in the El Paso area (Castañeda 1936:267).

By 1726, de Rivera noted that the region contained a number of irrigation ditches diverting water from the Rio Grande (White 1950: 18). Castañeda (1936: 276) relates that Rivera found:

In this same direction [east of El Paso] there is a spacious valley dotted with farms where they plant wheat, corn, beans, and all kinds of vegetables, as well as a quantity of vineyards which yield fruit of a superior quality to that of Parras. The natural fertility of the land is improved by the number of irrigation ditches which carry water from the said Rio del Norte, making the farms independent of drouth.

Retrospective accounts of conditions in 1744 are presented in Morfí's description of the El Paso region. On the left (northern) bank of the Rio Grande, Morfí recounted that (Thomas 1932: 110):

In the neighborhood of El Paso there are various haciendas and ranches because of the possibilities which the Rio Grande and other different arroyos and springs offered. Don Alonzo Vitares Rubin de Celis, Captain of the Royal Presidio of El Paso, founded the hacienda of cultivated fields, called La Rancheria at a distance of seven leagues from El Paso, which in 1744 had for the tilling of lands and raising of herds twenty families of Spaniards and some Indians.

In 1760, following a visit to the El Paso region, Bishop Tamarón reported that the irrigation canal diverted approximately half of the flow of the Rio Grande and that there were many smaller canals that distributed water to fields in the region (White 1950: 18). According to Tamarón, there were 2479 Spaniards and 249 Indians at the presidio in 1760 (Adams 1953:193).

El Paso continued to be a center for agricultural production throughout the eighteenth and nineteenth centuries. Agriculture in the El Paso region, as in northern New Mexico, depended on the construction and maintenance of irrigation systems. According to White (1950:4-7), the earliest documentary evidence of irrigation agriculture in the valley appears sometime between 1659 and 1661. Two years later, in 1782, Fray Morfí noted that the mission of Nuestra Senora de Guadalupe had expanded dramatically. Morfí attributed the expansion of Spanish settlements in the El Paso region directly to the irrigation systems then present in the valley (Thomas 1932: 109):

Some families of Spaniards have been added to them and because of the facilities of irrigation, the village pushed down to the river so that today the place occupies two leagues of maize, beans, and vegetables, especially grapes, which the owners pick and having made wine, sell profitably in Chiguagua [Chihuahua] and Sonora.

In 1773, a long-time resident described the El Paso region as follows (Hackett 1942: 507-508):

In these places [Nuestra Senora de Guadalupe] Indians and Spaniards live commingled, the former having their farms and a branch of irrigating ditch, while the latter have the main ditch, containing two floodgates from which the Indians' water comes. The upkeep of the dam is obligatory upon all. It is made of wattles, as the terrain of that river does not permit any other kind of fabrication, to say nothing of the trouble caused by its excessive floods and freshets, for it not seldom happened that after a dam had been built of stones, fagots, and stakes, it was necessary to tear it down in order to prevent inundation of the town. This causes constant labor for the inhabitants, as does also the cleaning of the ditch, which caves in frequently, because of the weakness of the fine sandy soil. The lands are extremely fertile, not altogether because of the quality of the soil, which is thin, but because of the benefit furnished by the water in bringing with it a thick mud which serves as manure for the land, leaving on top of the irrigated earth a glutinous scum which resembles lard. The products yielded by this land are: Excellent wheat, free of all darnel, and with a remarkably large grain; good maize, when they know how to work the soil, which supports it only by making the furrows deep, for, on account of its lightness, if the corn is not well rooted the strong winds (to which this country is subject) uproot it and lay it flat on the ground. The land also produces beans of two sorts, black and spotted, of the size of Indias; white and black broad beans; fair-sized chick peas, though not very large; anise, and all kinds of vegetables and garden-stuff of very good quality, especially large sweet onions. There are many vineyards of excellent wild grape stock, but the vine is slender, and for this reason it is necessary for its preservation to cover it. The grape, which has a good taste, is black, and there are some vines of muscatel. There are many fruit trees, which yield largely if they are not attacked by frost at a critical time. The principal ones, of which there is an abundance, with large trees and fruit, are bergamot pears and apricots; of a more moderate size, though not less abundant in fruit, are the apples and peaches. All yield so bountifully in a good year that no one takes care of or guards them; the most industrious dry the fruit in the sun to preserve it, and not seldom it serves as food for the poor. Most of this land lies in the valley of the river, facing a broad inlet formed by its banks, and only the church and the royal buildings are situated on the height at the margin of the said river bed.

Further downstream, in the vicinity of San Lorenzo/Senecú on the Mexican side and opposite the modern town of Socorro, Texas, the same resident provides a general described the valley and its agriculture as follows (Hackett 1942: 507-508):

They [Sumas] have a ditch apart from the bed of the river with which they water their lands and those of some white citizens who live at the mission in order to prevent dissensions (sic). This land has the advantages spoken of above, but is not so productive because there has not been time to clear and plant it, as all of it requires. In the same direction follows the mission of La Isleta [Ysleta], abundant in everything, with its separate irrigation ditch and a large number of laborious, civilized, and industrious Indians. Then follows in the same direction, the mission of Socorro, which has a small number of Indians, on account of being made up of natives from other countries. They are the ones who were brought from the Indians of New Mexico, and by them from the Comanches, who are at war with the Apaches. With them are quite a number of white people who work good land, much of which was accidentally given to them by the river when it changed its course to the opposite bank. They guard against the danger that the river may return to its old course by making deep ditches through which it may flow in such an event. There are a few cattle and sheep in the country, but the river abounds in fish, known as rock fish, although some call it bream. Other delicious kinds are the corazon and the *enguila*, all of more than medium size. The *enguilas* are found more often in the ponds formed by the overflow of the river than in its channel.

What emerges from this very detailed description of the El Paso region in the late 1700s is a picture of a mosaic crop production strategy with a primary emphasis on wheat and corn. At the same time, not all

portions of the El Paso valley were equally subjugated and the overall productivity of the valley varied considerably from one place to another. Irrigation facilities appear to have consisted of three spatially-distinct systems, each with its own diversion point and associated dam. The approximate locations of these systems were at the narrows near the modern-day American dam, at Senecú, and at Ysleta. All of the systems appear to have diverted water from the right (south) bank of the Rio Grande. At the same time, the overall character of the floodplain of the Rio Grande appears to have consisted of heavy bosque interspersed with oxbow lakes reflecting the presence of former river channels.

At the end of the eighteenth century, Spanish explorers found myriad small groups of hunter-gatherers situated along the margins of the Rio Grande River, including Sumas, Jumanos or Quemanderos and, finally, Apaches (Forbes 1957). These groups lacked large agricultural villages that were the foundation of Spanish colonization policies which required access to native land and labor. Therefore, these groups were largely ignored and standard Spanish *encomienda* practices were largely abandoned. Because of Spanish disinterest, there is a corresponding dearth of documentary information about Native Americans in southern New Mexico throughout most of the Spanish Period.

The Suma groups thought to have occupied western Chihuahua as far north as El Paso disappear from narrative accounts between 1680 and 1710, although it is not certain whether their absence from documents signals their disappearance as ethnic groups. They may well have been absorbed into the Chiricahua Apaches of southeastern Arizona (Forbes 1957:321) inasmuch as intermarriage between groups is thought to have been common (Forbes 1957:326). There is also evidence to suggest that Sumas were confounded with adjacent Manso groups (Forbes 1957:328). Sumas in the El Paso area remain prominent in documents as a thorn in the side of Spanish authorities well into the 1700s (Forbes 1957:332), but were so decimated by smallpox that, by 1762, their population was sent to join Lipan groups at San Lorenzo (Opler 1974:341).

Manso Apache groups occupied the Jornada del Muerto between El Paso and Las Cruces no later than 1630. By 1659, Manso groups already residing in the El Paso area had been consolidated at Nuestra Señora de Guadalupe de los Mansos (Opler 1974:343). By 1683, a second rancheria containing Mansos is noted at the church of San Francisco de los Mansos situated within 8 to 9 leagues from El Paso.

Not all Manso elements remained at the mission. Documents suggest that the Spanish drew a distinction between "civilized" and non-reservation Manso elements (Forbes 1957:325-326; Opler 1974:344). This is especially true following the Pueblo Revolt in 1680 and the subsequent withdrawal of Spanish forces to the El Paso area. By 1796, all of the native tribes in the area were referred to as Apaches, although numerous regional subgroups were recognized (Matson and Schroeder 1957:337).

While uncertainty remains, it is thought by some that Mescalero Apachean elements were situated in the project area by the late 1690s and certainly no later than the 1780s (Ray 1974:179; Opler 1974:349). Like the Mansos, the Mescaleros were mobile hunter-gatherers. Consistent with this adaptive pattern, population densities appear to have been quite low. Population estimates from 1847 suggest that no more than 1,500 Mescaleros were in the region north of El Paso (Ray 1974:182, 207). In this region they remained largely undisturbed until the arrival of Anglos in the 1850s. By 1862, systematic military campaigns were launched by the Army against the Mescalero culminating in their reduction to the Bosque Redondo and Ft. Stanton reservations.

Archaeological studies of sites associated with the activities of such Native Americans in the southern project area is lacking. Matson and Schroeder's translation of Don Antonio Cordero's 1796 account of Apaches in the vicinity of El Paso (1957:338-339) shows that these groups were characterized by high mobility, reliance on a variety of wild plant and animal resources, and rather minimal cultivation of domesticated crops. Crops were pot-irrigated (Matson and Schroeder 1957:fn12). Fire drives of game

were also practiced during the summer months (Matson and Schroeder 1957:344), during which areas in excess of nine square leagues were burned.

During this period, the Socorro (1815) and Pedro Armendaris #34 and #35 (1820) grants were established. Later Anglo accounts, however, indicate that these settlements struggled throughout much of their early history.

1.3.2.2 Mexican Period (1821-1846)

The Mexican Period in the southern portions of the project area were typified by establishment of a number of new land grants (Bowden 1971; Williams 1986:105). These included, in chronological order, Santa Teresa (1790), Canutillo (1824), Bracito (alt. Brazito, 1824), Doña Ana Bend Colony Grant (1844), Refugio Colony Grant (1850), Mesilla Civil Colony Grant (1852), José Manuel Sanchez Baca Grant (1853), and the Santo Tomás de Yturbe Grant (1853). The almost immediate acquisition of this region by the United States under the Treaty of Guadalupe-Hidalgo (1848) and subsequent Gadsden Purchase (1854) rendered the Mexican Period in this part of the project area almost moot. Accordingly, discussion of events during this period will be limited.

Archaeological investigations reveal that post-Revolt Spanish villages tended to be situated in floodplain settings (Marshall and Walt 1984:259). As a result, settlements were periodically destroyed due to flooding and most underwent a succession of rebuilding events. Among the named settlements were Alamillo, Bosque Bonito, Bosquecito, Bowling Green, Contadero, Cantarecio, Contreras, Mr. Crabb's Rancho, Bigs' Rancho, Elmendorf, El Tajo, El Trasuilla, Escondida, La Joya/Sevilleta, La Joyita, La Mesa de San Marcial, La Parida, Las Huertas, Las Cañas, Latear-Los Balen Buelas, Lemitar, Luis Lopez, Los Torreones, Milligan Ranch, Paraje, Polvadera, Pueblito, Sabinal, Sabino, San Acacia, San Albino, San Antonio, San Francisco, San Marcial, San Pedro, Socorro, Tiffany, Turato, and Valverde (Marshall and Walt 1984:259-287).

Much of this period in the southern project area was typified by Mescalero Apache raiding of outlying Mexican settlements, including the newly-established settlements in the Mesilla Valley. Situated in their traditional homeland in the Sacramento Mountains, the Mescalero raided westward across the Tularosa Basin into the Rio Grande (Dobyns 1973:Map2). By the early eighteenth century, other nearby tribes—notably the Utes and Comanches—had acquired horses and firearms. This ushered in a period of protracted, intense warfare among native peoples during which the Mescalero found themselves caught between the Spaniards along the Rio Grande to the west and Plains Indians to the east (Dobyns 1973:18-21). The collapse of the Spanish Empire in 1823, accompanied by replacement with Mexican authorities, caused yet another outbreak of warfare. Mexican government practices were, at best, ineffective along the northern frontier, allowing Indian groups—including the Mescalero—to resume raiding all across the frontier (Dobyns 1973:33-37). Raiding continued to typify Euro-Indian relations until 1850 and the project area remained largely unoccupied by Euro-American peoples through much of the eighteenth and nineteenth centuries.

To the south, in El Paso, changes in the mainstem of the Rio Grande sometime after 1827 led to a westward shift in the river channel that placed the towns of Ysleta, Socorro, and San Elizario on the left bank of the Rio Grande. Largely as a result of the "capture" of these towns, the spatial extent of settlements and irrigation systems in the El Paso valley expanded greatly. This change in the location of the mainstem of the Rio Grande also destroyed some of the agricultural lands in El Paso and was the catalyst for establishing the land grants in the Mesilla Valley listed above.

1.3.2.3 Euro-Anglo Period (1846 - present)

In 1846, Doniphan's California Column entered New Mexico, ushering in a new era in the region's history. With the subsequent defeat of the Mexican Army, New Mexico officially became a territory of the United States.

Conditions during the period between 1848 and the outbreak of the Civil War remained largely unchanged from those observed during the Mexican Period. Hispanic settlements were very few in number and still concentrated mostly in the Mesilla Valley, while Anglos settled largely centered in existing towns and villages. From 1848 to 1880, virtually all of the Rio Grande floodplain between modern-day Las Cruces, New Mexico, and El Paso, Texas, had been claimed by the U.S.

This period of upstream expansion into the Mesilla Valley of New Mexico was followed by a gradual expansion through the 1880s into downstream portions of the Lower Valley of El Paso that previously were unoccupied (Emory 1857:90). At least part of the lag in this expansion process can be attributed to the depredations of Apache Indians. Only after the Apaches were finally subjugated by U.S. troops in 1881 was settlement in the Lower Valley possible. This supposition is confirmed by detailed histories showing that towns in the southeastern portion of El Paso County were not occupied until the later nineteenth century.

Development in the southern reaches of the planning area began during the later portion of the nineteenth century. Among the most important factors affecting development in the region was (1) resolution of water disputes between the United States and Mexico and (2) the appearance of large-scale irrigation projects under the auspices of the Bureau of Reclamation. These two processes are discussed in more detail below.

The catalyst for explicit consideration of water allocations between the U.S. and Mexico was an inadvertent outgrowth of the first effort to construct a dam on the Rio Grande. A local New Mexican businessman, Nathan Boyd, formed the Rio Grande Dam and Irrigation Company in 1895 with the express intent of appropriating all of the water of the Rio Grande and building a water storage facility in the vicinity of Engle, New Mexico. Shortly thereafter, Boyd arranged for a group of English financial backers to take over control of the company while preserving much of its original intent.

According to the original prospectus, the Rio Grande Irrigation and Land Company, Ltd. was "...formed to acquire, by lease and assignment, the franchise rights, water rights, right of appropriating the waters of the Rio Grande (United States of America), contracts, properties, and undertaking of the Rio Grande Dam and Irrigation Company, and for the purposes of irrigating, colonizing, and improving the lands in the famous Rio Grande Valley, between Engle, New Mexico (sic) and Fort Quitman, Texas (sic)." Dam sites were proposed at Elephant Butte, Rincon, and Fort Selden, New Mexico (Mills 1896 in Follett 1898:12).

The Mexican government responded almost immediately that this project violated the Articles of the 1852 and 1884 agreements between the United States and Mexico inasmuch as the dam proposed by Boyd would adversely affect the navigability of the Rio Grande. Although this scheme foreshadowed the eventual construction of the Elephant Butte Dam, subsequent litigation (*United States of America vs. Rio Grande Irrigation and Land Company, Ltd.*) prevented the company from continuing its plans. Nevertheless, this proposed dam crystallized the problems associated with water allocations between the U.S. and Mexico.

The late nineteenth century and early twentieth centuries in the southern part of the project area were characterized by substantial growth due, in part, to passage of the Homestead Act (1862) and, later, the Reclamation Act (1902). The Homestead Act effectively promoted settlement by allowing up to 160 acres of public lands to be claimed by individuals and, after five years of improvements, to pass into private hands. The Reclamation Act (1902) supported settlement across the West by inaugurating large-scale water projects—notably Elephant Butte Dam—to stabilize water supplies for the newly arrived homesteaders.

The second factor that altered forever the southern reach of the project area was passage in 1902 of the Reclamation Act. Appropriations of \$1 million for the project, initially to consist only of construction of the Elephant Butte Dam, were provided by Congressional authority on March 4, 1907 (34 Stat. L., 1357).

Shortly thereafter, continued funding was provided to reconstruct much of the irrigation system that would eventually be supplied with water from Elephant Butte Dam (Reclamation 1907:221).

The first of these reconstruction efforts to be authorized under the terms of this Act was the Rio Grande Project, which included agricultural lands in both Texas and New Mexico. In general, the overall Bureau of Reclamation (Reclamation) strategy focused on consolidating formerly distinct canal systems into fewer, larger systems. In the Mesilla Valley, the Doña Ana and Mesilla canals—originally constructed in the mid-nineteenth century—formed the backbone of the initial consolidation and reconstruction of irrigation systems. In the El Paso valley, the Franklin Canal also constructed in the nineteenth century became the backbone of this system. In both the Mesilla and El Paso valleys, new canal segments were constructed to connect the alignments of smaller community ditches these backbone canal systems. In effect, that earlier small community ditches became laterals within a much larger system of water distribution canals (Reclamation 1919:226). This simplified the problem of conveying water to farms throughout the region and, moreover, did not require Reclamation to obtain large amounts of new canal right-of-way.

Although this strategy was largely successful, the rapid creation of new agricultural lands throughout the valley was accompanied by an increased demand for lateral canals to supply water for these new lands. As noted above, by 1917 Reclamation abandoned its initial approach of simply trying to (1) provide water to large main canals that could then (2) be managed by community acequias. This strategy simply did not work.

By 1918-1919, Reclamation agreed to provide or construct additional lateral canals subject to two constraints (WPRS 1981:1052). First, laterals would be constructed only if the lands to be served were greater than or equal to 160 acres in size. Second, Reclamation agreed that farmers would not have to construct more than 0.5 miles of the lateral. So, if a farmer cultivated 160 acres in a parcel that was at some distance from the nearest lateral, the farmer would construct the last 0.5 miles of the lateral, while Reclamation would construct the balance to connect a lateral to these fields.

The impact of this policy change is reflected by numerous agricultural statistics. One particularly telling statistic may be found in the Annual Reports of the Bureau of Reclamation (Reclamation 1921:68). Specifically, there was a gradual decrease in the ratio of irrigated acreage to total canal mileage (Reclamation 1916:337; 1920:295; 1925:85). In 1910, immediately before Reclamation inaugurated its reconstruction program, the average number of acres per canal mile in the El Paso region was 3,767. By 1915, when the initial El Paso component of the reconstructed system was largely completed, the average number of acres per canal mile had declined to 769. By 1981, the ratio of irrigated acres to total canal mileage was 244 (WPRS 1981:1054).

1.4 Projected Impacts and EIS Alternative Evaluations on Cultural Resources

Of the 17 reaches comprising the entirety of the planning area, FLO2D discharge modeling indicates that potential impacts will be limited to only seven (7) reaches. The area of potential effect (APE) for cultural resources, as well as other issues, will be limited to Reaches 7–14. The remainder of the upstream (Reaches 1–6) and downstream (Reaches 15–17) portions of the project area would not be affected by any of the planning alternatives.

For cultural resources specifically, potential impacts revolve primarily around overbank flooding that could adversely affect prehistoric and historic archaeological sites. Within the broad definition of overbank flooding are a variety of sub-issues, each of which have the potential for adversely affecting cultural resources. These include:

- How many cultural resources will be affected by overbank flooding?

- How long will cultural resources be inundated during the 40-year modeling period used during this project?
- Will channel erosion associated with overbank flooding exacerbate adverse impacts to cultural resources?
- Are the characteristics of sites that may be adversely affected similar from reach to reach and alternative to alternative?

To begin analyzing alternative-specific impacts to cultural resources, it is first necessary to delineate the character of the reaches making up the planning area and the character of prior archaeological research completed in each of these reaches (**Table O-1.8**). Reaches vary considerably in size, ranging from as little as 37,000 acres (Reach 11) to approximately 440,000 acres (Reach 14). There are equally significant differences in the amount of acreage subject to prior archaeological survey. The absolute amount of survey coverage varies between as little as 2,000 acres (Reach 11) to more than 28,000 acres (Reach 14). The percentage of each reach subject to prior archaeological surveys varies from a low of 4 percent (Reach 13) to as much as 18 percent (Reach 9).

Given the variable amount of prior survey coverage, the number of known archaeological sites varies considerably from reach to reach. Accordingly it was first necessary to standardize archaeological data into site densities; for purposes of these analyses, site density was calculated on a 100 acre basis (i.e., number of sites/100 acres). Site density varies from a low of 2.01 sites/100 acres (Reach 14) to a high of 12 sites/100 acres (Reach 9).

Table O-1.8. Basic Parameters for Cultural Resources in the Planning Area

Reach	Acres per Reach	Acres Surveyed	Number of Known Sites	Percent of Reach Surveyed	Multiplier	Site Density per 100 Acres	Projected Sites per Reach	Number of Known Sites Inundated	Percent of Known Sites Inundated	Projected Sites to be Inundated
2		0	0	0%	—	—	—	—	—	0
3	271,015	3,254	472	1%	83.29	14.50522	39,311	—	0%	0
4	38,664	2,777	47	7%	13.92	1.69	654	—	0%	0
5	76,914	446	131	1%	172.45	29.37	22,591	—	0%	0
6	179,061	15,742	748	9%	11.37	4.75	8,508	—	0%	0
7	105,231	8,877	720	8%	11.85	8.11	8,535	5	0.7%	59
8	52,847	4,590	219	9%	11.51	4.77	2,521	3	1.4%	35
9	97,109	17,855	2142	18%	5.44	12.00	11,650	7	0.3%	38
10	11,7624	19,331	608	16%	6.08	3.15	3,700	2	0.3%	12
11	37,060	1,991	154	5%	18.61	7.73	2,867	0	0%	0
12	133,422	18,316	653	14%	7.28	3.57	4,757	5	0.8%	36
13	161,073	6,417	210	4%	25.10	3.27	5,271	3	1.4%	75
14	439926	28,367	571	6%	15.51	2.01	8,855	15	2.6%	233
15	102,247	8,200	204	8%	12.47	2.49	2,544		0%	0
16	358,484	8,309	721	2%	43.14	8.68	31,107		0%	0

* Highlighted reaches subject to potential inundation under alternatives; all other reaches unaffected and excluded from analyses.

Estimates of the number of archaeological sites likely to be inundated in each reach were estimated using a three-step iterative analysis as follows:

- (1) First, the number of known sites shown to be inundated based on FLO2D output was divided by the total number of known sites to generate reach-specific inundation rates. For example, of the 571 known sites in Reach 14 (Number of Known Sites), a total of 15 sites (Number of Known Sites Inundated) were shown to be inundated by the FLO2D output. This indicates that 2.6 percent of all known sites in Reach 14 would be inundated.
- (2) Second, the projected total number of archaeological sites in each reach was estimated by multiplying the site density by the total number of acres in each reach. This necessarily assumes that site distributions are uniform with reaches.
- (3) Finally, estimates of the total number of sites likely to be inundated were obtained by multiplying reach-specific inundation rates by the estimated total number of sites in each reach.

Using this approach, anywhere from zero sites (Reach 11) to 233 sites (Reach 14) are projected to be potentially inundated under one or more of the EIS alternatives.

At the same time, different alternatives may result in different inundation rates for any given reach. To estimate these differentials, alternative-specific and reach-specific inundation rates were measured using FLO2D output (**Table O-1.9**). Put more simply, the number of known sites that would be inundated were tallied for each reach under each of the EIS alternatives. The estimated total number of sites was multiplied by proportion of known sites subject to inundation in a given reach under a given alternative to provide estimates of the total number of archaeological sites that would be inundated. This was repeated for each reach and each alternative.

An analysis of variance indicates that there are no significant differences between alternatives with respect to the number of prehistoric and historic sites potentially subject to adverse impacts associated with periodic inundation ($F_{6,42} = 1.56$, $p = 0.18$ for known sites and $F_{6,42} = 1.05$, $p = 0.41$ for projected numbers of sites). Alternatives are expected to lead to the inundation of between 383 (Alternative D-3) to upwards of 465 (Alternative E-3) archaeological sites. For all of the alternatives, average inundation days vary from a low of 2.03 (Alternative B-3) to 5.06 (Alternative I - 1) days per annum.

Analyses of channel erosion across the reaches likely to be affected by overbank flooding found few significant differences between the EIS alternatives (Appendix H). For purposes of this analysis, it is assumed that channel erosion affecting archaeological sites is normally distributed across reaches and alternatives. Of all the alternatives, the alternative having the lowest combination of inundated site numbers and annual number of inundation days is Alternative B-3. Alternative D-3 and Alternative I-3 have the next lowest combinations of impacts.

Table O-1.9. Alternative Number and Reach—Specific Inundation of Archaeological Sites

Reach	No Action Alternative - Known Sites	No Action Alternative - Projected Sites	Alternative B-3 - Known Sites	Alternative B-3 - Projected Sites	Alternative D-3 - Known Sites	Alternative D-3 - Projected Sites	Alternative E-3 - Known Sites	Alternative E-3 - Projected Sites	Alternative I-1 - Known Sites	Alternative I-1 - Projected Sites	Alternative I-2 - Projected Sites	Alternative I-2 - Projected Sites	Alternative I-3 - Known Sites	Alternative I-3 - Projected Sites
7	5	59	4	47	5	59	4	47	5	59	5	59	4	47
8	3	35	2	23	2	23	2	23	2	23	2	23	2	23
9	7	38	7	38	7	38	7	38	7	38	7	38	7	38
10	1	6	1	6	1	6	2	12	1	6	1	6	1	6
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	3	22	4	29	2	15	5	36	3	22	3	22	2	15
13	1	25	3	75	1	25	3	75	1	25	1	25	1	25
14	15	233	14	217	14	217	15	233	15	233	15	233	15	233
Total	35	418	35	436	32	383	38	465	34	406	34	406	32	387

The preceding analyses have focused primarily on variations in the numbers of archaeological sites potentially affected under each of the EIS alternatives. Each of the EIS alternatives has impacts on these sites, most related to overbank flooding. The second analysis focuses on potential variability in the frequency and duration of inundation of these sites.

The annual frequency of overbank flooding varies considerably between alternatives. For each of the EIS alternatives, **Figure O-1.7** shows mean numbers of years that sites will be inundated. There are two basic groups inherent in these data. The first group (Group 1) consists of the “Baserun” conditions and conditions expected under Alternative I-1 or Alternative I-2. The second group (Group 2) consists of Alternatives B-3, D-3, E-3, and I-3 which exhibit no statistical differences between pairs, but which differ significantly from alternatives in Group 1.

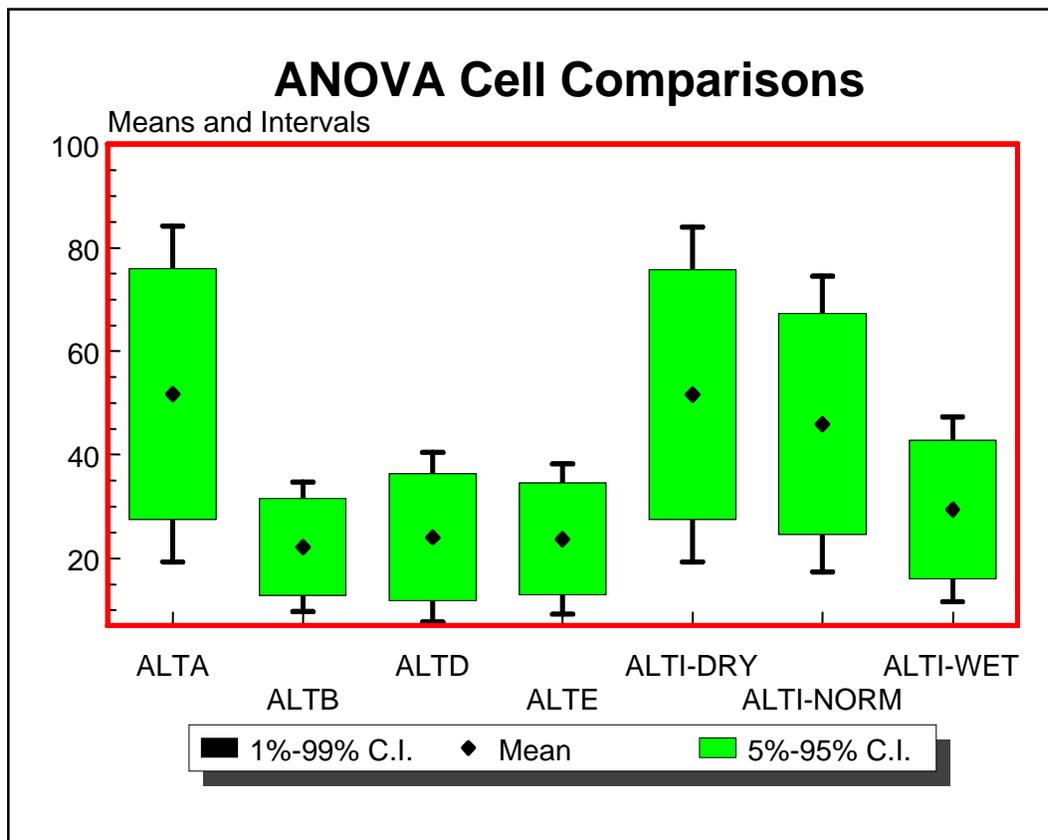


Figure O-1.7. Comparison of Inundation-Years by Alternative

Similarly, the expected duration (inundation days) of overbank flooding varies considerably between alternatives (**Figure O-1.8**). It should be emphasized that inundation days include only those days when overbank flooding greater than or equal to 0.5 ft would occur. Accordingly, estimated inundation days should be viewed as quite conservative. As with inundation years, there are three groups inherent in inundation-day data. There are no statistically significant differences in inundation days between Baserun conditions and Alternatives B-3 and D-3. The second group (Group 2) consists of Alternatives E-3, I-1 and I-3. Alternative I-2 differs significantly from all other alternatives.

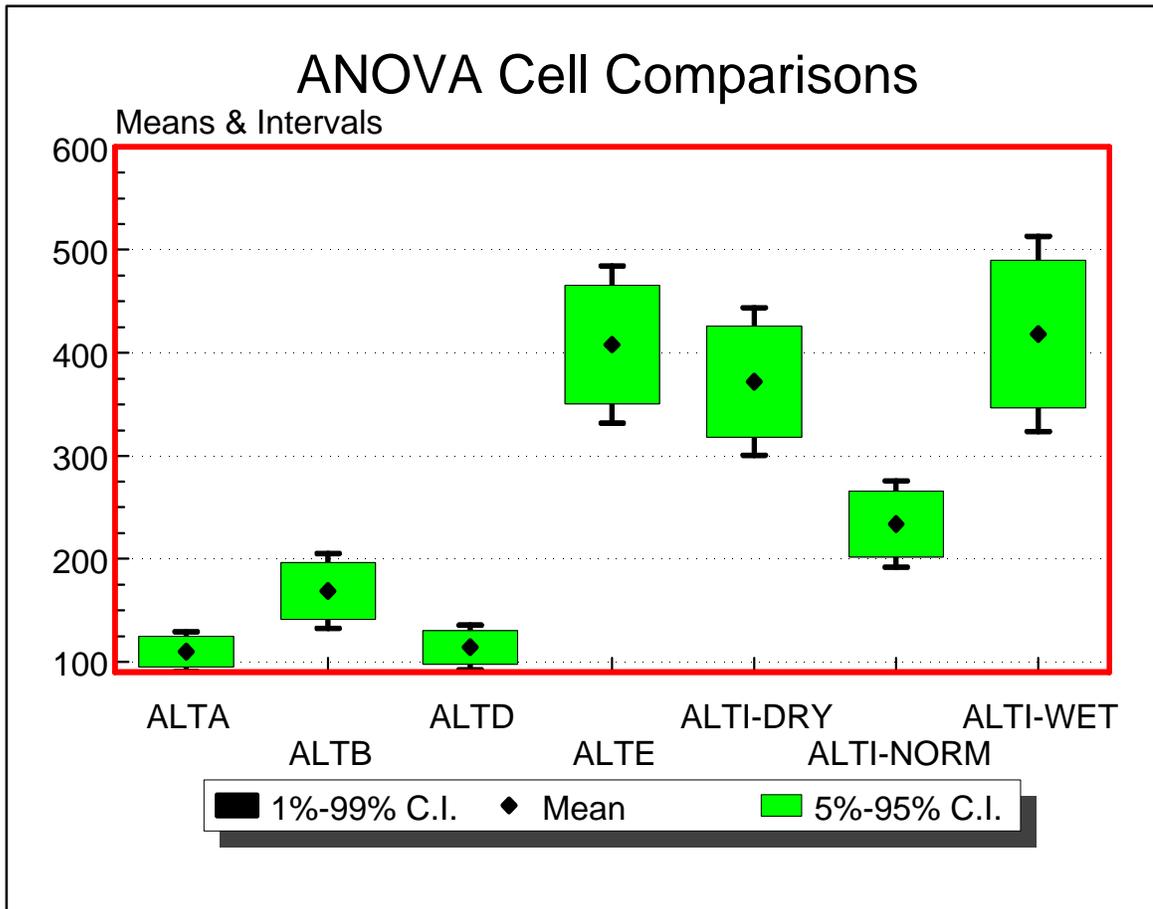


Figure O-1.8. Comparison of Inundation-Days by Alternative

A cross-tabulation of inundation years and inundation days provides a reasonable basis for selecting the alternative which minimizes both the frequency and duration of inundation of cultural resources (**Table O-1.10**). As is evident, Alternative D-3 minimizes the potential impact of inundation frequency and duration.

Table O-1.10. Cross-Tabulation of Alternatives by Inundation Years and Inundation Days

Inundation Days	Inundation Years				
	22	24	29	46	52
109					No Action
114		ALT D-3			
169	ALT B-3				
234				ALT I-2	
372					ALT I-1
408		ALT E-3			
418				ALT I-3	

The final analysis focuses on qualitative site characteristics such as (1) eligibility for inclusion on the National or State Register of Historic Places, (2) whether the sites contain structural remnants, or (3) the ages of the sites likely to be affected. Of the 37 known sites that would be affected, nine (24 percent) are currently on either the State or NRHP. The purpose of this analysis is to determine whether the subset of archaeological sites affected by EIS alternatives differs significantly from the population of sites across the wider region in which the planning area is situated.

Of the 37 known sites affected by EIS alternatives, nine (24 percent) are on either the State or NRHP. Another 27 sites (73 percent) have no eligibility determination (i.e., they may or may not be eligible). One site is not eligible for inclusion on either of these registers. There are no differences between EIS alternatives with respect to the numbers of sites on or potentially eligible for inclusion on the NRHP.

Of the 37 known sites affected by EIS alternatives, 31 (84 percent) contain structural remnants. Projecting to a maximum of 465 impacted sites under Alternative E-3, a total of 391 structural sites may be adversely impacted. For the 6,839 sites that are known in the broader region, only 64 percent contain structural remnants. Thus, EIS alternatives would intersect at structural sites in proportions roughly similar to proportions of such sites in the broader region.

Of the 6,839 known sites in the broader region, almost half (49 percent) are prehistoric in age, with an additional 13 percent related to historic occupations (**Figure O-1.9**). Projections from the known sites that would be affected indicate that only 27 percent are prehistoric in age, while 12 percent are related to historic occupations. Perhaps the largest difference between the known sites that would be affected and the regional population of sites revolves around sites having both prehistoric and historic occupations. Among the known sites that would be impacted, 21 percent have both prehistoric and historic components. In the region as a whole, these comprise less than 5 percent of known sites. Accordingly, it is likely that prehistoric and sites of unknown age will be over-represented in the project reaches compared to the region as a whole.

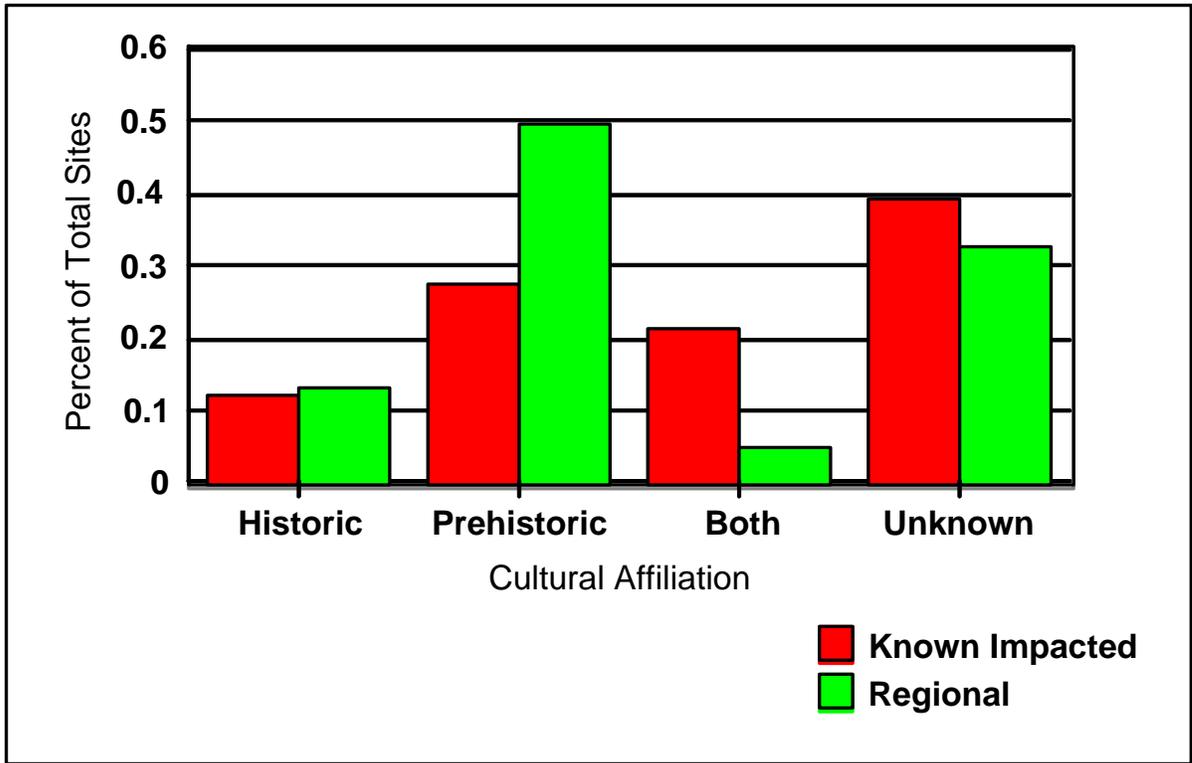


Figure O-1.9. Known Sites in the Broader Region

In summary, this discussion has shown that (1) there are no significant differences between EIS alternatives with respect to the number of archaeological sites that would potentially be affected (**Table O-1.11**); (2) there are significant differences between EIS alternatives with respect to the number of years (frequency) and number of days per year (duration) that archaeological sites will be inundated; (3) the impact of channel erosion on archaeological sites does not vary between EIS alternatives; and (4) there are no significant differences between EIS alternatives with respect to the attributes (e.g., NRHP status) of archaeological sites that might be affected. Based on these findings, implementation of proposed Alternative D-3 or Alternative B-3 would pose the least deleterious effects on cultural resources in the APE of this Review and EIS.

Table O-1.11. Final Weighting of Alternatives Based on Impacts to Numbers of Cultural Resources

	No Action Alternative	Alternative B-3	Alternative D-3	Alternative E-3	Alternative I-1	Alternative I-2	Alternative I-3
Total Sites Inundated	418	436	383	465	406	406	387
Relative Rank: Sites (xi / minimum)	1.09	1.14	1	1.21	1.06	1.06	1.01
Average Days/Annum Inundation	4.25	2.03	3.32	2.98	5.06	4.42	3.37
Relative Rank: Days (xi / minimum)	2.09	1.0	1.64	1.47	2.49	2.18	1.66
Overall Rank (Sites X Days)	2.28	1.14	1.64	1.78	2.64	2.31	1.68
Final Rank	6.0	1.0 Least	3.0	4.0	7.0 Most	5.0	2.0

1.5 Mitigation Measures

For all the alternatives, site inundation rates would be greatest in Reach 14. Indeed, inundated sites in Reach 14 comprise between 55 percent of estimated sites (Alternative E-3) to upwards of 90 percent (Alternative I-3) of estimated sites. Reaches 13, 7, and 9 would also show elevated inundation rates depending on specific alternatives, albeit at rates considerably lower than for Reach 14.

This logically suggests that mitigation measures, regardless of the preferred alternative that is finally selected, should focus on preventing overbank flooding in Reach 14. The precise nature of such measures can be determined in consultation with various lead agencies. Depending on the preferred alternative, measures designed to prevent overbank flooding should also be implemented in Reach 13 and Reach 7.

Alternatively, in the event that overbank flooding should emerge as a desired goal of changes in water operations (e.g., for restoration of riparian habitat), mitigation measures might include construction of barriers to prevent flooding of cultural resources. These may take the form of cofferdams or other similar structures that would prevent or limit overbank flooding of cultural resources.

Finally, if overbank flooding is desirable and barriers cannot be constructed, it is recommended that archaeological excavations be conducted at those sites where flooding is likely. This mitigation program could be phased so that sites in the greatest danger of flooding would be excavated first, followed by excavations at sites that are progressively less subject to overbank flooding

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