BUREAU OF LAND MANAGEMENT
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El Rio Bonito: An Ethnoecological Study of the Bonita Creek Watershed, Southeastern Arizona

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CULTURAL RESOURCE SERIES No. 8

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El Rio Bonito: An Ethnoecological Study of the Bonita Creek Watershed, Southeastern Arizona

Submitted by

SWCA, Inc.
Environmental Consultants

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Cultural Resource Series No. 8

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EDITOR'S FORWARD

"Ecosystem management" is a term used frequently in land managing agencies today. It signals a shift in focus from managing resources separately on the landscape, to managing resources holistically as interconnected parts of environmental systems. The notion that components of an environment function together and affect one another is not new, but the manner in which it is being emphasized by the Bureau of Land Management (BLM) is changing the way our resource management professionals approach their work and interact with each other.

The BLM's cultural resource program is uniquely equipped to provide the kind of information, and the long-term perspective, that can help land managers understand how the ecosystems they manage have changed through time, how human land uses have modified them over the past hundreds or thousands of years, and how present-day land use proposals are likely to affect the health of those ecosystems. We can and should learn from the successes and mistakes of the past to help us more effectively manage our resources in the present and plan responsibly for the future. The document you are reading is a contribution to responsible ecosystem management.

This is the second ethnoecology study funded by the BLM. The first such study was published as No. 7 in the Arizona BLM cultural resource series. Both studies were conceived of and overseen by an inter-disciplinary team in our Safford District. The funding for both studies was contributed by several resource programs in keeping with their cross-program benefits. With the publication of *El Rio Bonito*, Safford District has once again led the way in applying cultural resource information to the management of other resources.

We are pleased to offer this latest addition to our cultural resource series. Our hope is that it will encourage similar studies of environmental change on other public lands consistent with the Bureau's new emphasis on ecosystem management.

Gary Stumpf, Series Editor
Arizona State Office
Bureau of Land Management

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The documentary search took the project historian to the Graham County Historical Society in Safford, the Graham County Recorders Office, the Family History Library of the Church of Jesus Christ of Latter Day Saints in Safford, the Arizona State Archives in Phoenix, the Arizona Historical Society in Tucson, the Arizona Historical Foundation in Phoenix, the Manuscripts and Archives, Division of the Hayden Library at Arizona State University, Special Collections at the University of Arizona Library, Documentary Relations of the Southwest at the Arizona State Museum, the Bureau of Indian Affairs in Phoenix, the Arizona Department of Water Resources in Phoenix, the Bureau of Land Management Records Department in Phoenix, the Huntington Library in San Marino, California, the Los Angeles Public Library, and several document repositories on the San Carlos Reservation at San Carlos, Arizona, including the Real Estate Office of the San Carlos Tribe, the office of the San Carlos Cattle Associations, and the Bureau of Indian Affairs Conservation Division. Personnel at these organizations provided generous assistance. The project historian is particularly grateful for the assistance of the many informants who shared their recollections of Bonita Creek. Informants included Jesse Henry Baker, Lois Claridge, Vic Christensen, Kennedy Curtis, Clyde Daringer, Cowboy Earven, Jim Earven, Ernie Garcia, Suzy George, Ted Lee, Ruskin Lines, Warner and Jane Mattice, Macaria Bianes Melendrez, Ramon Melendrez, Reg Melendrez, and Harold O. Stevens. Safford historian Frank Quinn was as always very helpful. Sara Stevens provided a great deal of useful information in a brief telephone conversation. Larold Aday, Clark Richins, and John Fanta of the Bureau of Indian Affairs (B.I.A.) at San Carlos were very helpful in ascertaining the sequence of change on the San Carlos Reservation, the secondary study area. Pierre M. Cantou of the Phoenix B.I.A., who has an extraordinary memory, provided valuable records and shared important understandings of San Carlos history. Larry Shiflet, former Safford resident and local historian, now with the Bureau of Land Management in Boise, Idaho, shared information and numerous documents with the project historian. He conducted a tour of the Bonita

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TABLE OF CONTENTS

	Page
ACKNOWLEDGEMENTS	i
TABLE OF CONTENTS	iii
LIST OF PHOTOGRAPHS	v
LIST OF TABLES	xi
LIST OF FIGURES	xiii
CHAPTER I. THE BONITA CREEK WATERSHED ETHNOECOLOGY STUDY	1
CHAPTER II. BIOLOGICAL AND ECOLOGICAL SETTING OF BONITA CREEK	21
CHAPTER III. PREHISTORIC USE OF BONITA CREEK	41
CHAPTER IV. APACHE OCCUPATION OF THE STUDY AREA	53
CHAPTER V. LIVESTOCK GRAZING, OPEN-RANGE RANCHING: 1876-1934	69
CHAPTER VI. HISTORIC PERIOD SETTLEMENT ON BONITA CREEK	113
CHAPTER VII. ENVIRONMENTAL CHANGE ON EL BONITO	149
CHAPTER VIII. CONCLUSION	201
BIBLIOGRAPHY	271
SOURCES	285
INTERVIEWS	285

APPENDICES:

APPENDIX I. SETTLERS

APPENDIX II. MISCELLANEOUS CLIMATE AND WEATHER DATA

LIST OF PHOTOGRAPHS

		Page
Photo 1.	Chiricahua Cattle Co., herd crossing the Gila River, 1909, photo by Dane Coolidge (Arizona Historical Society).	223
Photo 2.	Cattle corrals and loading pens, San Carlos Apache Reservation, 1911, photo by Dane Coolidge (Arizona Historical Society).	224
Photo 3.	Chiricahua Cattle Co., pack horses, San Carlos Apache Reservation, 1911 (Arizona Historical Society).	225
Photo 4.	Chiricahua Cattle Co., branding on the San Carlos Apache Reservation, 1911, photo by Dane Coolidge (Arizona Historical Society).	226
Photo 5.	Chiricahua Cattle Co., branding on San Carlos Apache Reservation, 1911, photo by Dane Coolidge (Arizona Historical Society).	227
Photo 6.	Chiricahua Cattle Co., horse herd in corral, San Carlos Apache Reservation, 1911, photo by Dane Coolidge (Arizona Historical Society).	228
Photo 7.	Chiricahua Cattle Co., Dad Hardiman, Hal Young, and ?, San Carlos Apache Reservation, 1911, photo by Dane Coolidge (Arizona Historical Society).	229
Photo 8.	Chiricahua Cattle Co., Freman and ?, San Carlos Apache Reservation, 1911, photo Dane Coolidge (Arizona Historical Society).	230
Photo 9.	Chiricahua Cattle Co., horse herd, Blue River, San Carlos Apache Reservation, 1911, photo by Dane Coolidge (Arizona Historical Society).	231
Photo 10.	Chiricahua Cattle Co., rope corral, San Carlos Apache Reservation, 1911, photo by Dane Coolidge (Arizona Historical Society).	232
Photo 11.	Chiricahua Cattle Co., horse herd in Gila River (note lack of down cutting) 1911, photo by Dane Coolidge (Arizona Historical Society).	233
Photo 12.	Watering the herd in the Gila River, n.d. (Arizona Historical Society).	234

LIST OF PHOTOGRAPHS
(Cont'd)

		Page
Photo 13.	Bonita Creek, looking north, 1960s (courtesy Kennedy Curtis).	235
Photo 14.	"Colored" George's cabin in Johnny Creek, constructed 1933-34, photographed 1960 (courtesy Kennedy Curtis).	236
Photo 15.	North facing slope near West Ranch, 1960s (courtesy Kennedy Curtis).	237
Photo 16.	The West Ranch, ca. 1960 (courtesy Kennedy Curtis)	238
Photo 17.	Wash by West Ranch home, ca. 1960.	239
Photo 18.	Original buildings, West Ranch (courtesy Kennedy Curtis).	240
Photo 19.	Bonita Creek, "The Narrows," ca. 1960 (courtesy Kennedy Curtis).	241
Photo 20.	Aftermath of flood in Bonita Creek, 1967 (courtesy Kennedy Curtis).	242
Photo 21.	Aftermath of flood in Bonita Creek, 1967 (courtesy Kennedy Curtis).	243
Photo 22.	Cattle on Ash Flat, early 1940s (courtesy John Lasley).	244
Photo 23.	Cattle near tank on Ash Flat, early 1940s (courtesy John Lasley).	244
Photo 24.	Wild cattle trap on Slaughter Mountain Unit, early 1940s (courtesy John Lasley).	245
Photo 25.	Apache cowboys, San Carlos Reservation, early 1940s (courtesy John Lasley).	246
Photo 26.	House at Turner West Ranch, John West in door (courtesy Velma West).	246
Photo 27.	Prize winning registered bull, Ash Flat headquarters in background, early 1940s (courtesy John Lasley).	247

LIST OF PHOTOGRAPHS
(Cont'd)

		Page
Photo 28.	Early Safford residents at an outing at "Pueblo Deval" ruins along Bonita Creek. The names of many prominent residents of Graham County can still be seen on the ruin along with much graffiti dating from the nineteenth century.	248
Photo 29.	Chiricahua Cattle Company gathering horse herd on San Carlos Reservation in the Slaughter Mountain Unit. Xs at top left mark site where three cowboys were killed by Apaches, 1890s (courtesy Graham County Historical Society).	249
Photo 30.	Serna stone cabin at mouth of Bonita Creek prior to restoration (courtesy Graham County Historical Society).	250
Photo 31.	Cottonwoods in Bonita Creek (courtesy Graham County Historical Society).	251
Photo 32.	Mouth of Bonita Creek and view of Gila River, 1919 (photo by Frank Olmstead for the Gila River Flood Control Survey).	252
Photo 33.	Stone house at Toppy Johnson ranch. The man standing in light colored hat is Toppy Johnson. Horseman is Henry West, son of Turner West, 1930s (courtesy of Velma West).	253
Photo 34.	Outbuilding at Toppy Johnson ranch, 1930s (courtesy of Velma West).	254
Photo 35.	Allen Turner West, seated, and Henry West, standing, 1930s (courtesy Velma West).	255
Photo 36.	Corral at West ranch with the original barns, 1930s (courtesy Velma West).	256
Photo 37.	Confluence of Bonita Creek and Gila River during the 1940s (courtesy Jesse H. Baker).	257
Photo 38.	Baker home at Bianes-Chacon homesite during the 1930s (courtesy Jesse H. Baker).	257
Photo 39.	Original tufa stone house, probably constructed by Angel Bianes at Bianes-Chacon-Baker homesite during the 1930s; house was destroyed by flooding during 1940s (courtesy Jesse H. Baker).	258

LIST OF PHOTOGRAPHS
(Cont'd)

		Page
Photo 40.	Remains of first retention dams installed by Safford Water Company during first phase of construction in 1938 (photo by Diana Hadley 1992).	258
Photo 41.	Portions of 1938 Safford Water Company retention dam being used as fencing (photo by Diana Hadley 1992).	259
Photo 42.	"Dam Site #25. Looking upstream." October 3, 1935 (ARIZ-1551; photo in possession of BLM).	259
Photo 43.	"Bonita Creek Dam Site #25. Man standing at heel of dam." October 3, 1935 (ARIZ-1554; photo by O'Neil, in possession of BLM).	260
Photo 44.	"Bonita Creek Dam Site #25. Panorama showing dam site. View 1 of 2-view panorama." October 3, 1935 (ARIZ-1555; photo by O'Neil, in possession of BLM).	260
Photo 45.	"Bonita Creek Dam Site #25. Panorama showing dam site. View 2 of 2-view panorama." October 3, 1935 (ARIZ-1556; photo by O'Neil, in possession of BLM).	261
Photo 46.	"Bonita Creek Dam Site #25. Gravel in creek bed above dam site; also showing a view of reservoir." October 3, 1935 (ARIZ-1557; photo by O'Neal, in possession of BLM).	261
Photo 47.	"Bonita Creek Dam Site #25. No. 1 of a 5-view panorama." View into canyon from above, October 3, 1935 (ARIZ-1558; photo by O'Neal, in possession of BLM).	262
Photo 48.	"Bonita Creek Dam Site #25. No. 2 of a 5-view panorama." View into canyon from above, October 3, 1935 (ARIZ-1559; photo by O'Neal, in possession of BLM).	263
Photo 49.	"Bonita Creek Dam Site #25. No. 3 of a 5-view panorama." View into canyon from above, October 3, 1935 (ARIZ-1560; photo by O'Neal, in possession of BLM).	264

LIST OF PHOTOGRAPHS
(Cont'd)

		Page
Photo 50.	"Bonita Creek Dam Site #25. No. 4 of a 5-view panorama." View into canyon from above, October 3, 1935 (ARIZ-1561; photo by O'Neal, in possession of BLM).	265
Photo 51.	"Bonita Creek Dam Site #25. No. 5 of a 5-view panorama." View into canyon from above, October 3, 1935 (ARIZ-1562; photo by O'Neal, in possession of BLM).	266
Photo 52.	"Bonita Creek Dam Site #25. No. 1 of a 3-view panorama." View across canyon from above, October 3, 1935 (ARIZ-1563; photo by O'Neal, in possession of BLM).	267
Photo 53.	"Bonita Creek Dam Site #25. No. 2 of a 3-view panorama." View across canyon from above, October 3, 1935 (ARIZ-1564; photo by O'Neal, in possession of BLM).	267
Photo 54.	"Bonita Creek Dam Site #25. No. 3 of a 3-view panorama." View across canyon from above, October 3, 1935 (ARIZ-1565; photo by O'Neal, in possession of BLM).	268
Photo 55.	"Bonita Creek Picnic Area." October 1976 (Photo in possession of BLM).	268
Photo 56.	"Bonita Creek Picnic Area." October 1976	269

LIST OF TABLES

		Page
Table 1.	Cultural Resource Sites in the lower Bonita Creek Watershed (Primary Study Area)	12
Table 2.	Chronology of the water system	195
Table 3.	Time Table of Human Events Affecting Bonita Creek	219

LIST OF FIGURES

		Page
Figure 1.	Map of the Bonita Creek Watershed (Primary and Secondary Study Areas)	2
Figure 2.	Map of the lower Bonita Creek Watershed (Primary Study Area)	5
Figure 3.	Early Safford residents on an outing at Pueblo Devol	16
Figure 4.	Biotic Communities of the Bonita Creek Watershed	25
Figure 5.	Contour map of tree-ring departure values averaged over the decade 1960-1969	36
Figure 6.	Chronological frameworks applied to the area surrounding Bonita Creek	43
Figure 7.	Original buildings, West Ranch	78
Figure 8.	Cattle corrals and loading pens, San Carlos Apache Reservation, 1911	81
Figure 9.	San Carlos Indian Reservation, Cattle Ranges in Bonita Creek Watershed, 1910	86
Figure 10.	San Carlos Indian Reservation, Cattle Ranges in Bonita Creek Watershed, 1937	87
Figure 11.	San Carlos Indian Reservation, Cattle Ranges in Bonita Creek Watershed, 1953	88
Figure 12.	San Carlos Indian Reservation, grazing-related improvements, Bonita Creek Watershed, 1945	96
Figure 13.	(a) Cattle on Ash Flat, early 1940s; (b) Cattle near tank on Ash Flat, early 1940s	97
Figure 13a.	(c) Wild cattle trap on Slaughter Mountain Unit, early 1940s; (d) Prize winning registered bull, Ash Flat headquarters in background, early 1940s	98
Figure 14.	Serna stone cabin at mouth of Bonita Creek prior to restoration	121
Figure 15.	Tufa stone house, probably constructed by Angel Bianes (ca. 1900), at Bianes-Chacon-Baker homesite	123
Figure 16.	Stone house at Toppy Johnson ranch in 1930s	129
Figure 17.	House at Turner West Ranch	131

LIST OF FIGURES
(Cont'd)

Figure 18. "Colored" George's cabin in Johnny Creek 138

Figure 19. Cadastral boundaries referred to in surveyors' notes 156

Figure 20. Mouth of Bonita Creek and view of Gila River, 1919 193

I

THE BONITA CREEK WATERSHED ETHNOECOLOGY STUDY

Bonita Creek is a north-bank tributary of the Gila River located in eastern Arizona, to the north and northeast of the town of Safford (Figure 1). In its lower reaches, the creek flows through a narrow canyon where it supports a lush riparian habitat. To the careless observer, the canyon might appear to be a wilderness--a wild land. With more thoughtful study, however, the impacts of human use and development come into prominence. Evidence of these impacts includes a graded dirt road that heads up the canyon, crossing and recrossing the stream from one terrace to another. Also present is a large pipe that hangs from the cliff on one side of the canyon, corrals, cattleguards, nonnative trees such as pecans and figs, and ruined cabins. In addition, many small cliff dwellings indicate that the canyon had been occupied by prehistoric farmers. Clearly, people have been living and working in this canyon for a long time. This is not a pristine wilderness, though it is a rich habitat that supports a substantial riparian woodland and varied wildlife. Who were the people that have lived here? How are we to characterize the environment that they left behind?

The Bureau of Land Management is aware of the evidence for long-term human habitation along Bonita Creek. It has been said that, at times during the last century, Bonita Creek was home to perhaps dozens of families. Details of this period of occupation are, however, wanting. In addition, the town of Safford has been drawing substantial quantities of water from Bonita Creek for many years.

How has this history of human use affected the environment of Bonita Creek? To answer this question, the Bureau of Land Management instituted the Bonita Creek Watershed Ethnoecology Study. The goals of this study were set out in the Bureau's solicitation of proposals.

The Bureau of Land Management has clear mandates in watershed, riparian, wildlife, range and

Figure 1. Map of Bonita Creek Watershed (Primary and Secondary Study Areas). Primary Study Area is south of solid line, Secondary Study Area is north of line.

cultural programs to improve the ecological condition of the land under its management. We are seeking better methods to fully understand the relationship between past, present and potential ecological conditions of the Bonita Creek Watershed. Solutions to these resource management challenges depend on an in-depth understanding of the presettlement ecological condition of the watershed and the forces that have modified past conditions to give us the present ecological state. This study proposes the use of ethnoecological techniques to uncover ecologically pertinent information on the Bonita Creek Watershed. This information will be combined and compared with the information gained through standard scientific investigation. The total information base will then be examined and analyzed by an interdisciplinary team. The team will identify ecological potentials and management prescriptions necessary to reach desired ecological conditions [Bureau of Land Management 1990:Introduction].

The solicitation identified three general objectives for the study:

The first is to obtain a good ecological description of the Bonita Creek Watershed in early 19th century pre-Euroamerican times. The second is to identify changes that have occurred in ecological condition since approximately 1800. Third is to identify the specific forces that caused the observed changes in ecological condition [Bureau of Land Management 1990:Introduction].

In addition, a number of specific study objectives were listed:

1. A description of the following:
    a. Pre-Euroamerican soil productivity in upland and riparian areas
    b. Pre-Euroamerican vegetation communities in the upland and riparian areas
    c. Pre-Euroamerican watershed condition
    d. Pre-Euroamerican climatic regimes of the watershed
2. Identification of changes in and the causes of these changes for the following:
    a. Soil productivity in upland and riparian areas since the early 1800s
    b. Vegetation communities in upland and riparian areas since the early 1800s
    c. Watershed condition since the early 1800s

d. Climatic conditions since the early 1800s (changes only)

3. A discussion of the following:

a. Site-specific human impacts on the uplands and riparian areas of the watershed since the early 1800s

b. Human occupation of the watershed since the early 1800s

c. Terrestrial and aquatic fauna found on the watershed

d. Faunal changes since the early 1800s

4. A photographic record of the uplands, riparian areas and human impacts to the area as obtained from a historic photographic inventory [Bureau of Land Management 1990:Introduction].

SWCA, Inc., Environmental Consultants submitted a proposal to undertake the Bonita Creek Watershed Ethnoecology Study in June 1990. That fall, SWCA was awarded a contract to complete the project. The study included three major components: an evaluation of current biological and ecological conditions, a review of local archaeology and prehistory, and an ethnoecological study. Methods employed in carrying out each of these components of the total study are described below.

This report addresses the ecological condition of the Bonita Creek Watershed since around A.D. 1800. It is concerned with two contiguous study areas. The primary study area is the lower portion of the watershed, south of the San Carlos Apache Reservation (Figure 2). The Bureau of Land Management has responsibility for the present and future condition of this area. A secondary study area is the upper watershed, that is, the part on Apache land (Figure 1). In the primary study area, our report deals with specific places (including archaeological sites), peoples, and events. For the secondary study area, the discussion is less site specific; it focuses instead on general patterns of land use.

METHODS

Biology and Ecology

There are two ways to compare past and present environmental conditions. The more rigorous approach is to compare data, preferably quantitative data, from the two points in time. Clearly, this requires

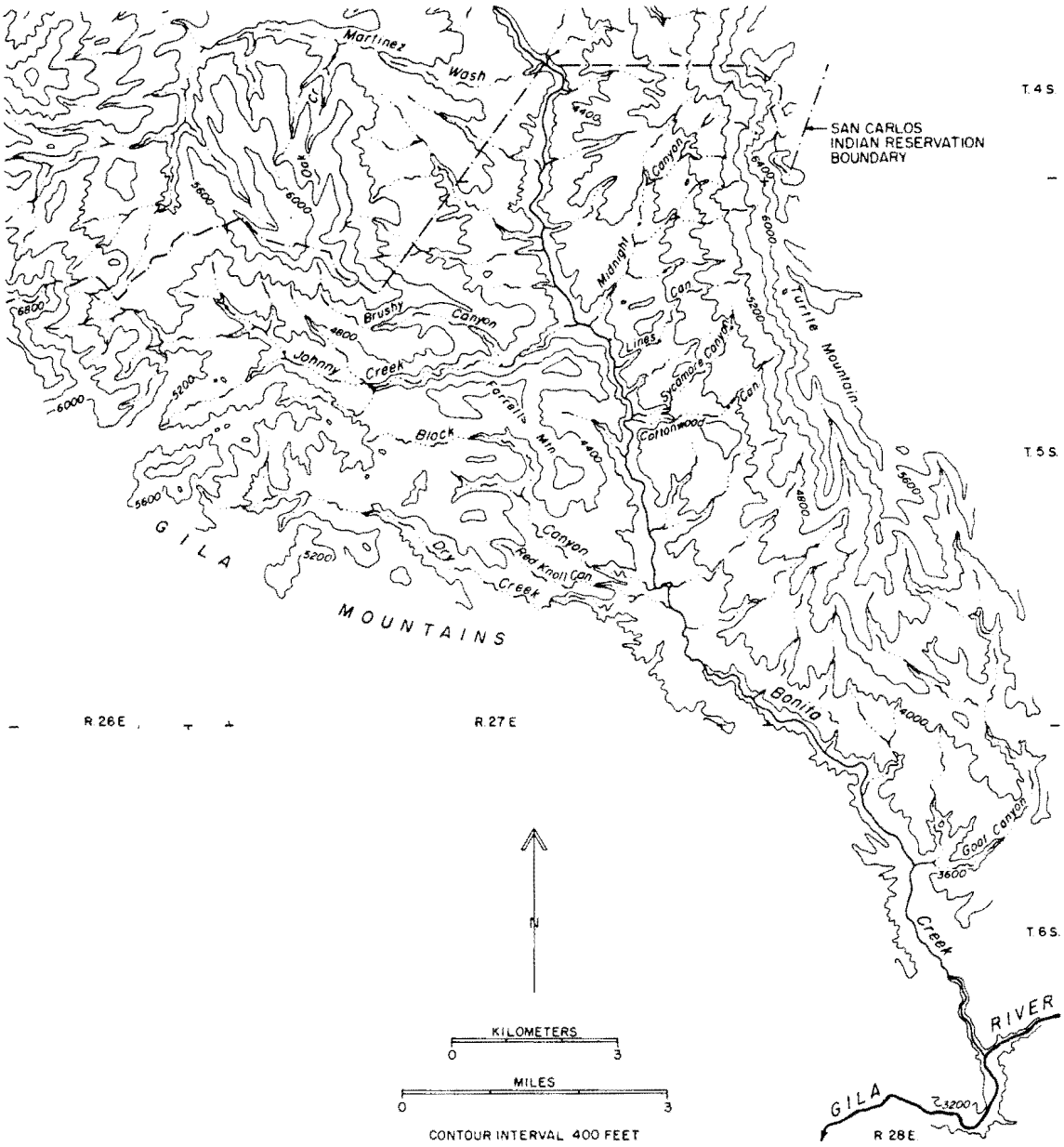


Figure 2. Map of the lower Bonita Creek Watershed (Primary Study Area).

a substantial data base for both periods. Even if data are available from two or more points in time, comparison is difficult if it involves phenomena that are in "dynamic equilibrium." In studying long-term ecological stability or change, the primary interest is on the average condition, which can be determined only with many years of study. Thus, a comparison of good data from the years A.D. 1880 and A.D. 1980 might provide a biased view of ecological history, if one or the other of the two years was atypical of its general period. This problem would be less severe for conditions that change slowly, like soil depth or the location of plant communities, but more damaging for phenomena subject to wide variation on a yearly or decadal scale, like riparian vegetation, average waterflow, and so on.

A second approach to the comparison of past and present begins with observations of present conditions and, on the basis of some body of principles, whether general or localized, attempts to reconstruct past conditions. This approach is more or less speculative, depending on whether it relies on abundant data or scarce data. Speculation can be appropriate, if it is identified as such. The approach does, however, hold the danger of one speculation being built on another, which may result in an interpretation that means little or nothing.

There are, unfortunately, few data and no quantitative data on past conditions in the Bonita Creek Watershed. For example, few photographs of landscapes in the watershed have been uncovered in the course of this study--though such photos have contributed greatly to the study of environmental change elsewhere in the American Southwest (Hastings and Turner 1965; Rogers, Malde, and Turner 1984). Even data on present conditions in the Bonita Creek Watershed are limited. The few studies that do exist are sometimes based on qualitative, not quantitative data. They utilize a variety of approaches, making comparison difficult, and present conclusions that are not necessarily supported by available data. One is left, therefore, with the second approach to environmental reconstruction, the one based on a combination of present data, limited past data, and general and localized principles.

Further difficulties arise because most of the data on present conditions in the Bonita Creek Watershed are qualitative. Qualitative assessments are unavoidably subjective. Thus, many terms are used without definition, such as "good condition," "overgrazed," "well-managed," etc. These terms mean different

things to different people and different things to the same person at different times. It all depends on one's frame of reference. In historical accounts, descriptions of vegetation or range condition by a person from Ohio are likely to differ from those by someone from West Texas. What, for example, is meant by "lush" vegetation? This terminological bias also affects current work. Our assessment of grasslands on Ash Flat was not based on measurements of vegetation, but on comparison to what we expected based on the condition of other grasslands in the state and what we thought it would probably be like with the heavy grazing pressure we expected. Our impression was that the grassland was in great shape, compared to how it might have been. This does not mean the grassland is in the "best" shape it could be or that it is as good as it was before the introduction of domesticated livestock.

Assessing the changes in ecological condition is also difficult because of three factors: the dynamic nature of the environment, especially in aquatic and riparian communities, the lack of well-defined methods for assessing "habitat quality," and the difficulty of selecting a scale for evaluation. (1) Because of floods and other natural processes, riparian vegetation changes according to some periodicity. Floods scour out small and middle-sized trees and rearrange the stream channel, resulting in the deaths of other trees. If the interflood interval is long, then many trees sprout, only to be eliminated in the next flood. The magnitude of the flood determines the magnitude of the changes. The damage caused by frequent small floods may be relatively insignificant in relation to that caused by fewer frequent big floods. In assessing change, it is necessary to consider the position of a particular stretch of the canyon in the cycles of varying levels of destruction and of damage and recovery. (2) Assessments of habitat quality should be based on some quantifiable criterion such as productivity or biomass, or if one is specifically interested in a certain parameter, something like "range condition." General habitat quality is difficult to measure because changes inevitably favor some species or parameters and harm others. Increases in grazing of Plains Grassland in the upper Bonita Creek Watershed have probably resulted in significant enhancement of habitat for horned larks. This has probably resulted in significant negative impacts to grasshopper sparrows. Whether habitat quality has increased or decreased depends on your point of view. (3) Scale is an important factor in assessing environmental stability or change. If one asks whether the environment of today differs from that of 1800,

the answer is an unequivocal yes. It is also true, however, that today's environment is different from yesterday's. What we are really asking is what *significant* changes have occurred, but significant is a relative term. At the finest scale, ecological change occurs second by second, and changes in the populations of the smallest insect could be considered significant. At a larger scale, such as suitability for human occupancy, such a change would likely be termed insignificant (unless the smallest insect significantly impacted a resource considered of value).

Because of these difficulties in reconstructing the environmental history of Bonita Creek, we have taken a conservative approach in Chapter 2 (Biological and Ecological History of Bonita Creek), understating conclusions that are based on subjective assessments and speculating only where this is warranted by some data. Interpretation is based primarily on observation of the present-day environment within the Bonita Creek Watershed. Data on environmental conditions that were obtained during the ethnohistoric study--both from documents and interviews--appear in later chapters. These data provide the basis for additional interpretations and speculations presented in Chapter 7.

ARCHAEOLOGY AND PREHISTORY

Although the terms "archaeology" and "prehistory" are interchangeable in some contexts, it is often useful to distinguish between them. Archaeology is the study of the physical evidence left by past human activity, whereas prehistory is the study of human endeavor before the introduction of writing. The archaeological aspect of the Bonita Creek Study is concerned with the cultural resource sites that have been identified in the primary study area. This includes sites that have and have not been formally recorded, also sites dating to both the prehistoric and historic periods. Information on these cultural resources was obtained through the review of Bureau of Land Management and Arizona State Museum site files, conversations with Bureau personnel, and visits to the project area. No formal survey was conducted as part of the project, and no new cultural resource sites were recorded--though "BC" field numbers were assigned to some known sites. The sites that have been identified in the primary study area are summarized below. A number of sites located along Bonita Creek that dates to the historic period have recently been recorded by Seymour and

Sinkovec (1992). An important goal of the ethnoecological component of the study was to identify these and other historic sites with the places that were mentioned either by informants or in historic documents. The prehistoric aspect of the Bonita Creek Study consists of a review of local culture history, focusing on the lifeways of the region's prehistoric inhabitants. This summary, which appears as Chapter 3, is included to make the point that the watershed was used and inhabited by human groups over a period of millennia before the arrival of Anglo and Hispanic settlers.

CULTURAL RESOURCES OF BONITA CREEK

Table 1 summarizes data on recorded cultural resource sites, both prehistoric and historic, in the primary study area. The sites are categorized according to their setting (open vs. cliff), period of occupation (prehistoric vs. historic) and type. The category of site type refers to major kinds of cultural remains that are present--for example, masonry structure, lithic scatter, building, trail, and so on. Many sites possess more than one category of remains, and therefore, Table 1 includes three columns of site-type information. An effort has been made to list these multiple entries in a consistent order: (1) categories referring to habitation structures, (2) to features, (3) to artifact scatters or trash deposits, and (4) to rock art.

The site inventory can be evaluated at two levels. One is concerned with the condition of individual sites, the other with the completeness and adequacy of the sample of recorded sites. Documentary data show that some sites, particularly those in rock shelters, have been damaged over the last 120 years by "pot hunting" and other forms of vandalism. In 1901, for example, hunters discovered several "Indian caves" along Eagle Creek above the pump station. They concluded based on the amount of sand and bat guano in the cave that it had been deserted for at least 200 years.

After only an hour's search, they unearthed 60 sandals and several pieces of pottery (GG 2/8/1901). In 1911, it was reported that Toppy Johnson, whose ranch was only 200 yards from Pueblo Devol, had in his possession a pole that had been cut out and fashioned with stone axes. Reporter Charles Dinsmore was of the opinion that the cliff dwellers were "undoubtedly Asiatics" and that their residence in Bonita Creek was followed by that of the Aztecs. He noted that the cliff dwellers wove cloth and that threads had been found

that exactly resembled those used by shoemakers today. A "house of worship" was present in one of the caves. Numerous skeletons had been found in the dwellings, some of which were adorned with shell armlets (CE 7/7/1911).

An apparently special case of vandalism concerns Pueblo Devol, the largest rockshelter site in the primary study area (Figure 3). When First Lieutenant Samuel E. Tillman visited the site in 1873, he saw a cliff dwelling that was in good repair:

> Visited ruins on the East bank of Bonita, a continuous line of houses 200 feet long was found, ruins in places much larger than described yesterday [on upper Bonita Creek]? We could travel along from house to house without getting outside. The houses were built to form a parapet along the roof. The rafters of the roof remained though the covering had fallen in. Instruments [stone axes] used in cutting the roof poles were very dull. It would have been very easy to have enlarged the caves but it seems not to have been done [Smith 1991:316].

Today, the roof timbers are gone, and many of the walls that Tillman must have seen intact are represented only by wall stubs. Dr. Anne Woosley (Amerind Foundation, personal communication 1992) offers a satisfying, though unproven explanation for the damage that the site has suffered since Tillman's visit. She suggests fuelwood collectors, who are known to have been active in the area early in this century (Chapter 6), removed the timbers from the ruin and carried them to Clifton-Morenci, either in the form of wood or of charcoal. Many wall segments were probably knocked down at that time, and others were weakened and subsequently fell down.

Like the prehistoric sites located in rockshelters, the historic sites on Bonita Creek have been vandalized, specifically by "bottle hunters" looking for trash deposits (Seymour and Sinkovec 1992).

The sample of recorded sites in the Bonita Creek Watershed can be evaluated with reference to two criteria. It is useful to discuss these criteria in terms of the three settings in which sites occur: (1) uplands, that is, areas above and away from the entrenched canyon of Bonita Creek, (2) rock shelters eroded in the cliffs that define the canyon, and (3) on the floodplain within the canyon. The first criterion is the completeness and interpretability of a site inventory determined based on surface evidence. Sites may be

invisible to surface survey because they have been buried, or they may have been destroyed by erosion. Also, it is often difficult to date and determine the cultural affiliation of sites based on surface evidence alone. The surface assemblage of a small site may include flaked lithic artifacts but not pieces of broken pottery. A problem in these cases is to determine whether the site is preceramic (i.e., having no pottery and dating before the introduction of that technology), or simply aceramic (having no pottery, regardless of date). Apache sites are particularly difficult to locate and identify. Presumably this is because they yield scant surface evidence and, once located, are difficult to distinguish from sites of earlier periods (Donaldson and Welch 1991). If significant numbers of sites are missed or are incorrectly identified, the record of human settlement provided by archaeological survey will be both incomplete and misleading (cf. Bronitsky and Merritt 1986:334-335).

There appears to be little evidence in upland areas of either erosion that would destroy sites or deposition that would bury them. In sheltered locations in the canyon, erosion has damaged most, if not all, sites and may have removed some small sites entirely. Finally, sites on the floodplains have probably been affected by fluvial processes in ways described by Waters (1989:91):

The extant archaeological record of alluvial-environment utilization has been shaped and molded by the same processes that have shaped and molded the fluvial landscape. At any given time, any position of the fluvial landscape may be characterized by conditions of stability, deposition, or erosion. Different segments of the fluvial environment have different preservation potentials. Fluvial processes determine which sites are likely to be eroded from the riverine environment which sites are likely to become buried and subsequently preserved in the alluvial record.

The age of particular terraces and terrace surfaces within the canyon of Bonita Creek is unknown,though this might be determined through a detailed study of alluvial stratigraphy. Given the frequency and severity of flooding in Bonita Creek, it is likely that alluvial terraces suitable for human habitation and use have been deposited and removed on a regular basis. The importance of this process for the archaeological site record is a function of the amount of time that has elapsed since the sites were created. Thus, we would guess that, if any Paleoindian or early Archaic sites were once present on the

NUMBER	SETTING	PERIOD	TYPE-1	TYPE-2	TYPE-3	COMMENT
W:14:1(ASM)	cliff	prehistoric	masonry structure	cache		Ceremonial Cave
W:14:1(BLM)	open	prehistoric	rock art			
W:14:3(BLM)	cliff	prehistoric	masonry structure			
W:14:4(BLM)	cliff	prehistoric	masonry structure			
W:14:4(ASM)	open	historic	building	masonry structure	rock alignments	Farrell Place
W:14:5(BLM)	cliff	prehistoric	masonry structure			
W:14:5(ASM)	open	historic	homestead			Old Lady Gay Place
W:14:6(ASM)	open	historic	canal segment	poss rock structure		possible site of "Chinaman's Place,: HS-141
W:14:7(ASM)	open	historic	tree	rock alignment(s)	fence post	
W:14:8(ASM)	open	unknown	clearing	canal(s)		
W:14:10(BLM)	open	historic	building	windmill	corral	Colored George's Cabin
W:14:11(BLM)	open	historic	building	corral		Honeymoon Cabin
W:14:11(ASM)	open	historic?	canals	fields?		
W:14:12(BLM)	open	unknown	clearing			
W:14:13(BLM)	open	historic	rock & barbed-wire fence	clearing	tree	possible pithouses
W:14:13(ASM)	open	historic?	rock pile	clearing?		small tree size indicates past clearing
W:14:14(BLM)	cliff	prehistoric	masonry structure			
W:14:14(ASM)	open	historic	orchard	buildings	corrals	Toppy Johnson/Christensen Place
W:14:15(BLM)	open	historic	building	canal	corral	"Chinaman Place"; Moore Place
W:14:16(BLM)	cliff	prehistoric	rock art?			
W:14:17(BLM)	open	prehistoric	lithic scatter			
W:14:18(BLM)	cliff	prehistoric	masonry structure			Pueblo Devol
W:14:19(BLM)	open	prehistoric	cer/lthic/gs scatter	rock alignment		
W:14:20(BLM)	cliff	historic	ladder			
CC:2:1(BLM)	cliff	prehistoric	masonry structure			
CC:2:2(BLM)	open	prehistoric	pit structure			
CC:2:3(BLM)	cliff	prehistoric	rock art			
CC:2:5(BLM)	open	prehistoric	lithic scatter			
CC:2:8(BLM)	open	prehistoric	masonry structure	rock alignment		
CC:2:11(BLM)	cliff	prehistoric	masonry structure			
CC:2:22(BLM)	cliff	prehistoric	cer/lith scatter	rock art		
CC:2:44(BLM	open	historic	trail			Safford-Morenci Trail
CC:2:56(BLM)	cliff	prehistoric	rock art			
CC:2:56(BLM)	open	prehistoric?	rock alignment	artifact scatter		
CC:2:57(BLM)	cliff	prehistoric	masonry structure	rock art		
CC:2:59(BLM)	open	prehistoric	rock feature	rock alignment	lithic scatter	
CC:2:60(BLM)	open	prehistoric	rock feature	rock alignment	lithic scatter	
CC:2:140(ASM)	open	historic	building	hearth		Jones Ranch
CC:2:141(ASM)	open	historic	trees			
CC:2:142(ASM)	open	historic	rock alignments	hist artifact scatter	trees	
CC:2:143(ASM)	open	historic	masonry structure			
CC:3:14(BLM)	open	prehistoric	lithic/gs scatter	rock art		
CC:3:20(BLM)	open	prehistoric	lithic/gs scatter	rock feature		
CC:3:20(BLM)	open	historic	building	trash	canal	Gorgeous Giorgi Site

Table 1, page 1. Cultural Resource Sites in the lower Bonita Creek Watershed (Primary Study Area).

Table 1, page 2. Cultural Resource Sites in the lower Bonita Creek Watershed (Primary Study Area).

NUMBER	SETTING	PERIOD	TYPE-1	TYPE-2	TYPE-3	COMMENT
CC:3:21(BLM)	open	prehistoric	lithic scatter			
CC:3:24(BLM)	open	prehistoric	rock feature	cer/lithic scatter		
CC:3:31(BLM)	open	historic	campsite	building	picnic area	Kearny Campsite/Bonita Cr. Cabin
CC:3:49(BLM)	open	prehistoric	rock art			
CC:3:51(BLM)	cliff	prehistoric	rock art			
CC:3:52(ASM)	open	prehistoric	masonry structure			Mimbres village
CC:3:56(BLM)	open	historic	building			Serna Place
CC:3:64(ASM)	open	historic?	rock wall			
CC:3:65(ASM)	open	historic	corral			
CC:3:66(ASM)	open	historic	trees			
CC:3:67(ASM)	open	historic	building			
AR-52	cliff	prehistoric	ground stone scatter			
AR-044-368	open	prehistoric	ground stone scatter			
AR-818	open	prehistoric	lithic scatter			
HS-140	open	historic	building			"1st Chinamen Place"; misplot of W:14:15?
BC-1	open	historic	corral			
BC-4	open	historic	building	corral	trees	Bianes-Chacon-Baker-Earven-Claridge Ranch
BC-5	cliff	historic	shrine			
BC-7	open	historic	building	corral		Ray Claridge's Place
BC-9	open	historic	rock wall			
BC-10	open	historic	building			Farrell/Toppy Johnson Cabin
BC-11	open	historic	building	goat pen	trees	Christensen Place
BC-12	open	historic	corral	?		

floodplain, it is likely that they have been destroyed in the intervening 5,000 and more years.

A second criterion for evaluating the sample of recorded sites is the amount of archaeological survey and excavation that has been conducted in the area. As noted, little work has been accomplished on prehistoric sites in the Bonita Creek Watershed. The sample is complete regarding sites in sheltered locations in Bonita Creek Canyon. Also, many historic sites on the floodplain in the canyon have been recorded (Seymour and Sinkovec 1992), or at least their presence has been noted. There have been no controlled excavations, and only a few small areas have been surveyed systematically. Unpublished site forms and cards provide almost all that is known about cultural resource sites in the watershed. The one exceptional case is a sheltered site described by Wasley (1962) that produced well-preserved wooden artifacts. These limitations in the data place constraints on the kind of overview that can be developed for the study area. That is, one must rely on indirect evidence, including reports from surrounding areas, descriptions of the Apaches who occupied central Arizona in the protohistoric period, interviews with individuals familiar with the area, and general principles arising from prehistory, ethnology, etc. Data and interpretations from these sources can be applied to the study area based on analogy. This approach has at least two dangers. First, the situations may not be comparable. Second, in applying lessons from elsewhere, one may lose sight of the fact that no new information is being generated. In other words, it may appear that the Bonita Creek case supports an interpretation developed in another setting, when in fact the interpretation has simply been applied to the data from Bonita Creek.

HISTORY, ORAL HISTORY, AND ETHNOECOLOGY

Methods for this report combined standard archival historical research with oral history interviews and field observations to create a chronological record of land use and ecological change in the Bonita Creek area (Table 2). The project historian visited over a dozen document repositories, interviewed over 20 informants, and questioned many other individuals who had been familiar with Bonita Creek in past years.

ARCHIVAL RESEARCH

The project historian made an initial search of the documentary record. This included reading early

Graham and Greenlee County newspapers from the 1880s to World War II, when reporting concerning rural areas began to decline. She consulted anthropological records for descriptions of Apache land use and searched San Carlos Tribal records and documents at the Bureau of Indian Affairs for indications of impacts on the reservation portion of the Bonita Creek Watershed (the secondary study area). She examined early surveyors' notes and searched for homestead deeds, water filings, census records, property transfers, grazing-lease records, and early voting registrations to ascertain the length and sequence of residence in Bonita Creek and the probable early land uses.

Several factors make the research on the land-use history of Bonita Creek unique: the relatively small amount of private property within the public domain, the presence of the division line between Indian reservation land and public domain, and the development of the Safford Water Company's collection system. Although Bonita Creek experienced its most intensive human occupation during the early years of the twentieth century, it remained a largely undeveloped rural area without an access road, public services, or a school. The first direct road into the lower creek area was not constructed until the Safford Water Company installed a water collection system there during the early 1930s. Because of the difficult access and the distance to the nearest school (San José), residence tended to be intermittent, with seasonal or part-time occupation. There was a greater incidence of absentee ranchers than has been found in other rural areas in the Southwest before the 1950s. Few multiple generation families lived full time along the creek, and most homesites were occupied by a baffling series of undocumented residents. Some farmers and ranchers, several of them single men, resided in Bonita Creek and used its resources for many years without patenting their property. Others took out homesteads but probably never resided on the land. Because the majority of land in the Bonita Creek area remained in the public domain, research was complicated by the absence of the usual property records.

Surveyors' notes, on the other hand, provided unusually ample information. The reservation boundary was surveyed and resurveyed, with incidental partial surveys, three times during a 50-year period. Surveyors' descriptions yielded surprising discussions of early residents and their attempted illegal uses of reservation land. They included unusually complete descriptions of land forms and plant communities.

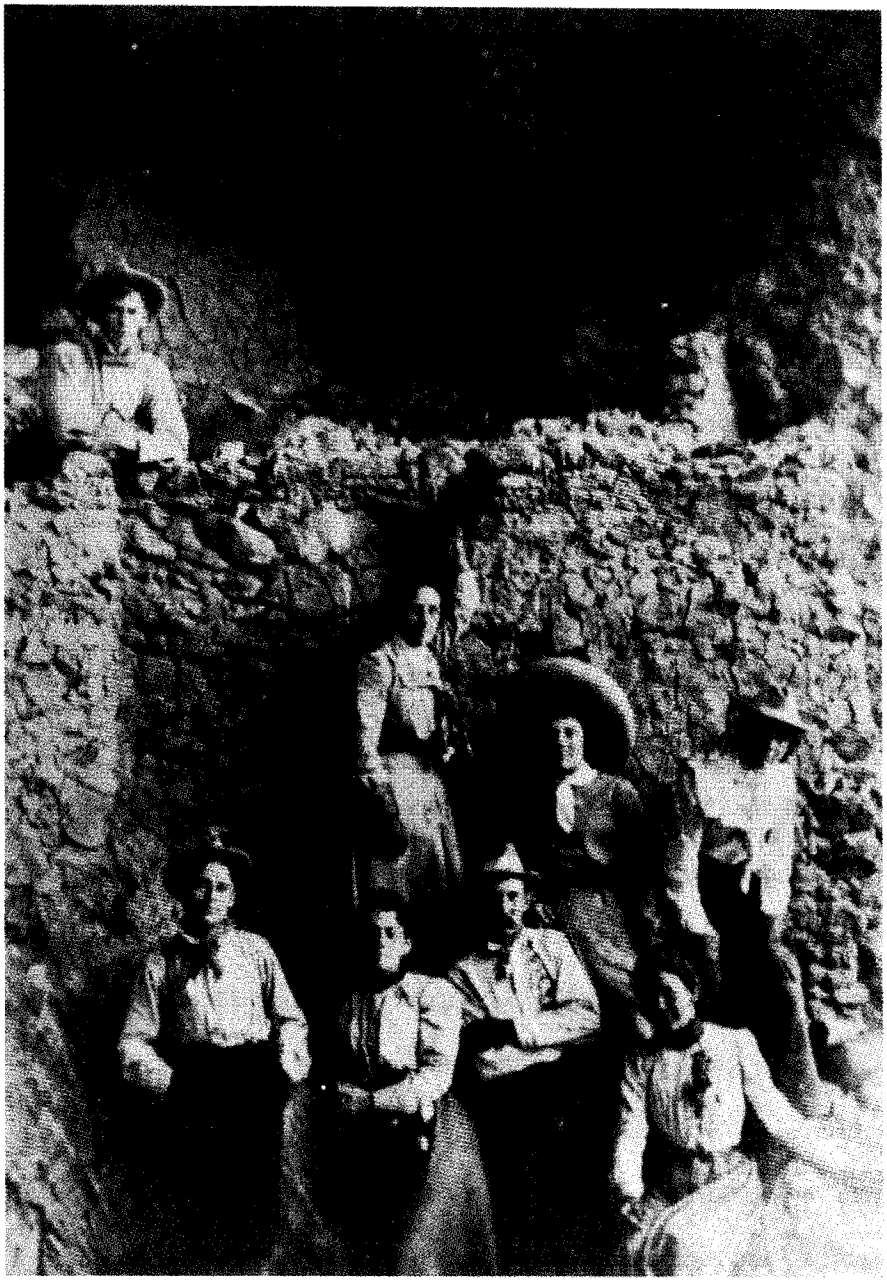


Figure 3. Early Safford residents on an outing at Pueblo Devol (courtesy Graham County Historical Society).

The Bureau of Land Management records in the Safford office also proved to be rich in historical information. Norman Lowe, a Bureau of Land Management employee with an unusual interest in history, recorded details of conversations with early residents and kept a record of his notes. In addition, several law suits for lease rights provided a record of occupation and chronology of improvements. Archival research was facilitated by hydrological reports and engineers' reports produced by the Safford Water Company during both construction phases of the Bonita Creek collection system.

ORAL HISTORY

After becoming familiar with the general outline of Bonita Creek's history, the historians began the oral interview portion of the research. They conducted 20 interviews with former residents and questioned several more individuals who frequented the area through their work with government agencies or the Safford Water Department. The project historian visited most of the informants in their homes. However, in several cases she traveled to Bonita Creek with former residents to hear firsthand descriptions of residence patterns, household organization, farming systems, grazing organization, incidental land uses and subsequent secondary land impacts. Most of the interviews lasted from one to three hours. Although the interviewer attempted to gain answers to specific questions, the interviews were conducted in a conversational and casual format.

The methodology for oral history contains several obvious pitfalls: failure of the informants' recollection, idealization of the past, repetition and alteration of secondhand information, the selective process in memory, the tendency to permit self-interest to shape facts, and the possibility that the interviewer will influence the informant or encourage specific responses. The historian attempted to avoid these pitfalls and achieve a standard of reliability by cross-checking information with one or two other informants and by substantiating it with documentary sources.

A comparison with another oral history project recently undertaken by the Bureau of Land Management may explain the utility of this process for the Bonita Creek land-use study. Aravaipa Canyon is an area for which the Bureau of Land Management has recently published an ethnoecological study (Hadley, Warshall, and Bufkin 1991) in which oral history methodology was used. Members of three ethnic

groups resided in Aravaipa Canyon during the last century, and the area provided a unique opportunity for comparative ethnoecological research. A few Apache informants recalled having visited the canyon in their early childhood. Others could share information and repeat stories that their grandparents and great-grandparents had passed on to them. They could describe previous subsistence activities in the canyon that were consistent with the information contained in the major ethnographic literature on the area. Euroamericans arrived in Aravaipa during the early 1870s, settling in two separate dispersed rural villages in Pinal and Graham counties. Aravaipa subsequently developed a core group of continually resident families. Members of three generations in at least six families resided full-time in Aravaipa Canyon for up to a century. The Salazar family has had five generations of residents in Aravaipa. One descendant of Epimenio Salazar, the earliest permanent settler on Aravaipa's east end (1860s or early 1870s), still resides full-time on a portion of the original homestead. Another descendant still operates the family ranch. Exceptionally interesting to the younger generations of many long-term resident families was the history of Aravaipa. Children in these families paid careful attention to the recollections of their parents and grandparents, and secondhand information was of unusual accuracy and detail. Most of these families were landowners who had a sense of custodianship for the unique ecological character of their land. They were familiar with the history of land use and, having been continually present in the area, were often keen observers of environmental change.

In comparison to Aravaipa Canyon's settlements, Bonita Creek presented a less well-developed continuum of historical memory. Although the 20 oral history interviews undertaken for this report provided valuable information unavailable through any other source, they left several major gaps. Since multi-generational year-long residence was uncommon in Bonita Creek, the area provided less abundant resources for both oral history and ethnoecological research. The historian uncovered only three families that had resided on Bonita Creek for two generations. Even in these cases, the families had maintained an additional residence for purposes of school attendance or economic production. There are, therefore, certain blank spots in the oral history information. Moving backward in time, recollections of former residents along Bonita Creek who are still living today begin in the late 1920s. Second-hand information passed on by the preceding generation of settlers (informant parents and grandparents) extends back to the late nineteenth

century. However, second-hand information for Bonita Creek is not particularly detailed and is sometimes confused or contradictory. Little oral history information exists for the first generation of Bonita Creek's Hispanic and Anglo settlers. More frequent references to Bonita Creek can be found in newspapers during this period. The area's ranchers and farmers were among the most important economic producers in the county.

ETHNOECOLOGY

Ethnoecology is the study of the way in which groups of people conceive of and live in the particular environment they inhabit. The term combines several Greek root words: "ethnos," the Greek term for a nation or group of people living together: "oikos" or "eco," the word for dwelling place or household: and "logos," the term for discourse, discussion, or logical argument, the "ology" or regulatory principle in things. Ethnoecologists attempt to describe the understanding that members of a group have of their environment, their adaptations to it, and their impositions upon it. The discipline is multiple faceted and combines portions of the methodologies employed by ethnographers, historians, botanists, biologists, pedologists and ecologists.

Ethnoecology for any area can be generated when members of the group (or groups) that inhabit (or inhabited) a particular place are willing to discuss their ecological understandings and describe their land-use practices. This situation existed to some degree in Bonita Creek. During the past century and a half, four distinct ethnic groups, Apaches, Mexican-Americans, Chinese-Americans and Anglo-Americans have lived and sustained themselves within the Bonita Creek Watershed. Concerning Apache occupation, ample information exists for the creation of an analog to Bonita Creek, since Apaches have described their land-use practices in many similar watersheds. However, informants whose ancestors were resident farmers on Bonita Creek who described land-use practices specific to the area have not been uncovered. There is considerably more information for the Hispanic settlers. Although members of the first generation of Mexican-American settlers are now deceased, one descendant of the first generation of Hispanic settlers, a son-in-law of the Bianes family, has shared ample information. He has provided the majority of information for the area's Hispanic ethnohistory. Descendants of the Chinese settlers have not been uncovered. It can be assumed,

however, that many of their land-use practices, largely small-scale irrigated fruit and vegetable farming, were not substantially different from those of their Mexican-American and Anglo-American contemporaries. Several second-generation Anglo ranchers and farmers have described the lives of their parents on Bonita Creek. However, residence among these families was not continuous, and there are gaps in the information. In addition to the incomplete ethnological record, the presence of large numbers of corporately owned cattle companies complicated the ethnoecological survey for Bonita Creek. Land-use practices among the early large cattle companies were not openly discussed and were sometimes even deliberately falsified (see Chapter 5) to obscure illegal or inappropriate activities. As a result, Bonita Creek did not provide an ideal situation for ethnoecological research. However, it was possible to obtain considerable information on the ecological perceptions and the land-use practices employed by the area's early settlers. An evaluation of the success of this report as an ethnoecological survey appears in the last chapter.

ORGANIZATION OF REPORT

Chapters 2 through 4 provide background from three perspectives--biology and ecology (Chapter 2), lifeways of prehistoric Native Americans (Chapter 3), and Apache use of the watershed. Chapter 5 discusses the history of cattle ranching in the watershed. Chapter 6 describes the settlement patterns of both Hispanics and Anglos and the impacts of the various land-use practices on the watershed. Chapter 7 evaluates the effects these practices have had on the environment. Finally, Chapter 8 summarizes the history of human impacts on Bonita Creek and evaluates the ethnoecological study of the Bonita Creek Watershed.

II

BIOLOGICAL AND ECOLOGICAL SETTING OF BONITA CREEK

This chapter provides information on the present day environmental setting of Bonita Creek. Recent environmental studies (Rucks 1981; Minckley et al. 1979; Hunter 1987) and field visits by SWCA biologists to the watershed in November 1991 provide data to describe the existing environment. Virtually no scientific data relating to past environmental conditions exist. Historical photographs and records provide some limited information of the kind needed to produce accurate reconstructions of environmental change in the area. Therefore, conclusions relating to such conditions must be based in part on extrapolations from more general works (Hastings and Turner 1965; Turner 1974) and on conjecture relating to possible consequences of known or suspected changes in climate or historical activities. Because such extrapolations and conjectures include considerable speculation, our approach has been to identify the possible factors affecting environmental change for the area, review the existing data relating to each factor, and discuss the possible effects of each factor on the Bonita Creek environment. As noted in Chapter 1, this chapter takes a conservative approach to environmental change; the conclusions reached on this basis are reassessed in later chapters, based on data derived from interviews and historic sources.

EXISTING ENVIRONMENT OF BONITA CREEK

An overview of the geology of the Bonita Creek is provided in Heindl and McCullough (1961). An overview of the physical-chemical features of streams and springs and biological features of Bonita Creek and parts of its watershed are provided in the resource inventory of the Gila River complex in eastern Arizona by Minckley et al. (1979). The latter paper provides a summary of most of the literature pertaining to Bonita Creek, and data on many aspects of the aquatic and upland ecology of the area. Additional data on the

riparian vegetation of Bonita Creek are provided in Rucks (1981) and in Hunter (1987), which also provides additional data on the avifauna.

Geology and Hydrology

Reynolds (1988) provides general data on the geology of the combined Primary and Secondary Study Areas. Soils maps have been published for the Primary Study Area (DeWall 1981). In the upper Bonita Creek Watershed, the Gila Mountains are formed of Tertiary (middle Miocene to Oligocene) volcanic rock. Nantac Rim consists of this same Tertiary material, along with Mississippian to Cambrian sedimentary rock and Middle or Early Proterozoic granitoid rock. Located between the Gila Mountains and Nantac Rim, Ash Flat is underlain by Quaternary (Holocene to middle Pleistocene) surficial deposits and Tertiary (Pliocene to middle Miocene) sedimentary rock. The canyon of the Bonita Creek drainage cuts into this Tertiary, sedimentary rock, the Tertiary volcanic rock already mentioned, and Tertiary (middle Miocene to Oligocene) sedimentary rock. Heindl and McCullough (1961:12) divide the Tertiary rocks into four major units: three predominantly volcanic units overlaid by "an alluvial conglomerate composed of volcanic fragments."

Bonita Creek drains an area of 370 square miles. Portions of the creek are perennial, except in the driest years (Heindl and McCullough 1961:26, 27). According to Heindl and McCullough, "the known water resources of the lower Bonita Creek area are limited to the surface flow in Bonita Creek, a few intermittent springs, and the ground water within rocks of the upper volcanic unit and the Quaternary younger alluvial deposits that fill the channel of Bonita Creek" (1961:26); "ground water [also] occurs . . . within the alluvial channel fill . . . Elsewhere in the area, the Tertiary(?) volcanic rocks yield water in limited quantities to small ephemeral springs on the high slopes of Turtle Mountain" (1961:30).

Farmers who lived along Bonita Creek would have been dependent on surface flow in the creek, assuming the farmers irrigated their crops, on surface flow from side canyons, assuming they practiced floodwater farming, and on soil moisture in the alluvial terraces flanking the creek which, in the absence of irrigation water, is critical to plant germination in the spring and early summer. Ranchers needing to water their stock would have been dependent on surface flow in the creek, ground water in the alluvial deposits,

which could be tapped by digging wells, and on springs, particularly those on Turtle Mountain where there is no alternate source of water.

Plant Communities

Plant communities present in the lower portions of the Bonita Creek Watershed have been extensively described in Minckley et al. (1979). A general vegetation map covering the watershed is provided by Brown and Lowe (1980) (Figure 4), with descriptions of the mapped biotic communities in Brown (1982). As expected, specific boundaries of plant communities and details of plant community classification differ between the two sources. The general nature of the communities described in the works is quite similar. Our approach to classification of plant communities differs to some extent from either of the above sources. Any vegetation map we produced would differ in habitat types and boundaries from theirs; nevertheless, we see no reason to create a third system when the basic information is essentially the same. Neither can we consider it desirable to repeat the detailed information contained in Minckley et al. (1979), but include it by reference. We limit our description of plant communities in the Bonita Creek Watershed to a brief summary of their composition and distribution. The upper parts of the watershed are not included in Minckley et al. (1979).

Plant communities provide "pigeonholes" in an artificial classification system. Usually, neat lines separating community types on vegetation maps are gross oversimplifications of the complex. Usually gradual changes occur in plant species composition, relative abundance and spatial distribution, which may be measured by such factors as foliage diversity, percent cover, and so on. Differing interpretations of the importance of various species and differing perspectives on the exact point where one community gives way to the next are the primary causes for the differences in plant community maps of an area. Because the Bonita Creek Watershed occurs in an area where a number of recognized plant community types are present and because transitions from one of these communities to the next often occur over relatively large distances, vegetation maps prepared by different people can be expected to differ widely. Recognition of this is important in attempting to evaluate any historical vegetation changes in the Bonita Creek Watershed.

Because of the great elevational changes in the watershed and its geographic location, a variety of plant communities are present in the Bonita Creek Watershed. Upland vegetation ranges from Sonoran Desertscrub at lowest elevations up through Semi-desert Grassland, Plains Grassland, Interior Chaparral, Madrean Evergreen Woodland, and Great Basin Conifer Woodland. Though not observed, it is also likely that elements of Petran Conifer Forest (ponderosa pine) are present in some areas of the uppermost watershed on the San Carlos Apache Reservation. Through much of the middle elevational part of the watershed, elements of Semi-desert Grassland, Interior Chaparral, Madrean Evergreen Woodland, Plains Grassland, and Great Basin Conifer Woodland are intermixed in complex associations. Plant species typical of each community are often present over large areas, with local dominance varying with slope, exposure, and soil conditions. Such conditions make meaningful plant community mapping extremely difficult, especially on a large scale.

Major riparian habitats in the watershed are limited to Bonita Creek and its larger tributaries. Most of lower Bonita Creek supports a variable riparian deciduous forest dominated primarily by cottonwoods, sycamores, mesquites and willows. In some areas, riparian scrubland dominated by burrobrush and desert willows is present. The amount and type of vegetation appear to be affected by width and configuration of the channel and floodplain, soil depth and water table. During a one-day field visit in November 1991, a fairly consistent relationship was observed between the amount of surface flow and the amount and types of riparian vegetation. Areas with greater surface flow generally supported better developed riparian forest with large trees. Areas with little or no surface flow supported mostly plants typical of riparian scrubland with few large trees.

Larger tributaries of Bonita Creek and its upper reaches above the southern boundary of the San Carlos Apache Reservation boundary support well-developed patches of riparian vegetation. Desert willows appear to be increasingly more dominant at higher elevations. Riparian vegetation in many smaller tributaries of Bonita Creek is limited to sparse riparian scrub or higher amounts of plants typical of upland plant communities.

Larger tributaries of Bonita Creek and its upper reaches above the southern boundary of the San

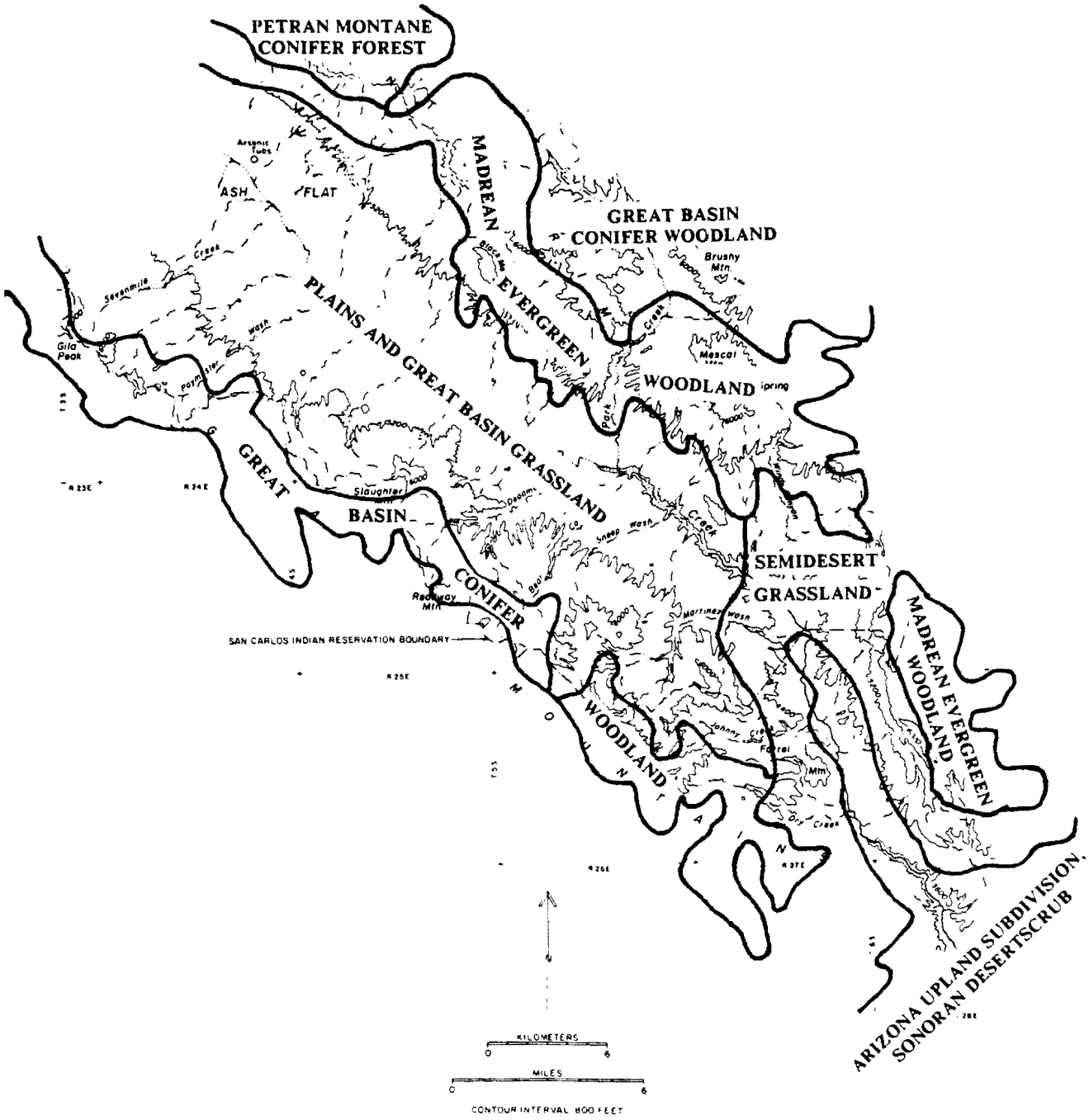


Figure 4. Biotic communities of the Bonita Creek Watershed (after Brown and Lowe 1980). Note that Brown and Lowe's map has been blown up to the scale of the base map (Figure 1) and that registration of the two maps is not exact; therefore, the figure should be used as only a general indicator of the boundaries between plant communities.

Carlos Apache Reservation boundary support well-developed patches of riparian vegetation. Desert willows appear to be increasingly more dominant at higher elevations. Riparian vegetation in many smaller tributaries of Bonita Creek is limited to sparse riparian scrub or higher amounts of plants typical of upland plant communities.

Plant communities in the Bonita Creek Watershed show evidence of disturbance resulting directly or indirectly from natural or man-caused events. Virtually all upland habitats are currently grazed by livestock. Numerous roads and tracks are present in many areas, and several manmade structures including buildings, corrals, fences and a power line (on Park Creek) are present. Numerous earthen stock tanks have been developed in the area, some of which have washed out or silted in. Some areas show evidence of recent fires. Several more or less intact dwellings are present in the lower and upper parts of Bonita Creek, but no one appears to live permanently in the watershed today. Archaeological sites, both prehistoric and historic, indicate that the canyon of lower Bonita Creek was inhabited at times in the past (Chapter 3). Documentary sources and interview data show that the lower canyon was inhabited from the late nineteenth century into the 1960s (Chapters 5 and 6). Disturbances in the floodplain of Bonita Creek include buildings, roads, fences, recreation sites and fairly extensive facilities. These are associated with the infiltration gallery and water delivery system in lower Bonita Creek that provides the water supply for the town of Safford. Though no agricultural activities are currently occurring in the area, evidence of past activities such as cleared lands, remnant irrigation systems, and introduced fruit and nut trees is present.

A brief description of the composition, distribution and current condition of each plant community in the Bonita Creek Watershed is provided below.

Sonoran Desertscrub

This community is heavily dominated by creosote bush but large patches of perennial grasses, mostly three-awns, are present in some areas, especially on steeper slopes. Other common plants in this community include ocotillo, mesquite, blue palo verde and prickly pear. Plant-species diversity appears to be higher on slopes than on ridge tops. This community is present in upland areas at lower elevations in the watershed.

Desertscrub is bordered at higher elevations by Semi-desert Grassland. The transition between the two habitats is gradual and occurs over a large area. In general, the amount of perennial grass increases with elevation, as does the number of plants typically of Semi-desert Grassland. The upper limit of most plants typical of desertscrub appears to be at approximately 4,400 feet. Primary disturbances in Sonoran Desertscrub are grazing, roads and fences.

Semi-Desert Grassland

This extremely variable community is variously dominated by perennial grasses (*Bouteloua*, *Eragrostris*, and *Hilaria*), subshrubs such as snakeweed, and various shrubs and cacti including agaves, prickly pear, mesquites, sotol, beargrass and wait-a-minute bush. In some areas, primarily in the upper part of the watershed on the San Carlos Apache Reservation, few shrubs or trees are present and dense perennial grasses are present. This complex community grades into Sonoran Desertscrub at lower elevations, and Plains Grassland, Interior Chaparral, Madrean Evergreen Woodland and Great Basin Conifer Woodland at higher elevations. As described above, plant communities in many areas contain species characteristic of more than one biome, and classifications are difficult. If defined broadly, Semi-desert Grassland is the most common upland plant community in the watershed. Primary disturbances evident in Semi-desert Grassland included grazing, roads and limited evidence of recent fires.

Plains Grassland

This community is restricted primarily to the Ash Flat area in the upper part of the Bonita Creek Watershed on the San Carlos Apache Reservation. Most of this community is dominated by perennial grasses, primarily *Bouteloua* and *Hilaria*, and annual forbs. Few shrubs and trees are present except where this community intergrades with Semi-desert Grassland, Madrean Evergreen Woodland and Great Basin Conifer Woodland. Though heavily grazed, perennial grass cover in most areas is relatively high. In addition to grazing, disturbances in this community include roads and fences.

Interior Chaparral

As indicated by Minckley et al. (1979), Interior Chaparral is not well developed in the area. However, a number of shrubs characteristic of this habitat such as shrub oak, squawbush, mountain mahogany and silktassel occur in Semi-desert Grassland, Madrean Evergreen Woodland and Great Basin Conifer Woodland. They are dominant in some areas, mostly north-facing slopes.

Madrean Evergreen Woodland

This community is dominated in most areas by juniper and pinyon. Oak, often the dominant tree in this community farther south, is sparsely distributed. This community occurs primarily in the upper parts of the watershed on the San Carlos Apache Reservation; distribution on lands below the reservation is limited mostly to a few north-facing slopes along Bonita Creek. This community intergrades with Plains Grassland at both its upper and lower elevational limits and with Semi-desert Grassland. Disturbances in the community include grazing and roads with some evidence of fairly intensive woodcutting and some recent fires.

Great Basin Conifer Woodland

The community, dominated by juniper and pinyon, occurs only in the northernmost portion of the watershed, if at all.

Riparian Woodlands

The habitat, restricted almost exclusively to Bonita Creek, is dominated by deciduous trees, mostly cottonwood, willow, mesquite and sycamore. Mesquite is generally more abundant at lower elevations, and sycamore more dominant at higher elevations. A few trees associated with Sonoran Desertscrub such as blue palo verde are present at lower elevations. Some higher-elevation species such as oak and juniper are present at higher elevations. Specific data on species abundances are provided in Hunter (1987) and in Rucks (1981). As is typical with riparian woodlands in narrow canyons, vegetation along Bonita Creek is extremely variable

and patchy. This appears to be caused mostly by the effects of periodic floods, which result in a dynamic community. Large trees occur mostly along wider portions of the floodplain or in pockets protected from high water velocities. Regenerations of riparian trees, especially cottonwoods and willows, are rapid following floods. Many young trees are uprooted by subsequent floods, and others die because the subsequent water flow is insufficient for their survival. Channel migration is common in wider areas of the floodplain and often results in heavily vegetated auxiliary channels. Other disturbances in this community include past agricultural development with associated homesteads, grazing, construction and maintenance of roads, and development and use of recreational areas. As mentioned above, an extensive pipe system and numerous structures are associated with the infiltration gallery in the lower part of the creek. Finally, several exotic fruit and nut trees including pecan, fig, apricot, English walnut, apple and pear are present near old homesteads, as are pomegranates and grape vines.

DATA INDICATING HISTORICAL CONDITION

Except qualitative information from range surveys (Chapter 5) and surveyors' descriptions (Chapter 7), no direct data on the flora and fauna or previous conditions of the plant communities in Bonita Creek are available. The few historical accounts pertaining to wildlife and vegetation of the area (Chapter 7; Minckley et al. 1979) are of limited value in attempting to reconstruct changes in the local ecology. Historical accounts almost never contain quantitative data and are usually limited to comments on large forests or dense grasslands. Large riparian forests exist in Bonita Creek today; any changes have likely been in species composition or dominance or some aspect of structure such as height or canopy cover. Such data are rarely contained in historical accounts.

Historic photographs can allow one to semi-quantitatively assess changes in vegetation or to reconstruct previous conditions (Hastings and Turner 1965), but they must be panoramic or very numerous to adequately assess more than local changes. Historic photographs of Bonita Creek partially satisfy these requirements.

Without scientific data on the historical condition of Bonita Creek's flora and fauna and in the

absence of more detailed or numerous historical photographs, the only way to reconstruct historical ecological conditions is to examine known climatic changes and man-caused impacts and evaluate their probable effects on the flora and fauna. Such an effort necessarily results in some degree of uncertainty. In the following section, we list and evaluate those factors that are known to affect Southwestern flora and fauna. Also we identify any scientific data indicating their occurrence in the Bonita Creek Watershed, and discuss their possible role in environmental change.

FACTORS AFFECTING THE ENVIRONMENT

A number of natural and man-caused factors have affected the environment in the Bonita Creek Watershed. Environmental change is certain to have occurred in the area, as it has in most areas of the world. Documenting such changes is difficult, especially when they are other than massive changes in species composition or structure. As few historical accounts contain quantitative data, significant changes in species composition are likely to be unrecorded. Changes in species composition are much easier to document when an entire community type is replaced by another differing significantly in structure. Such changes have been documented along the Gila River, where extensive cottonwood forests have been replaced by mesquite bosques and salt cedar thickets (Minckley et al. 1979). Changes in relative species composition in riparian forests composed of several species of similar structural type, such as sycamore, ash and cottonwood, are much more difficult to document. These changes have significant impacts to the fauna of an area and may significantly affect human occupancy and use. The major factors causing changes in the ecology of Bonita Creek are discussed below.

Floods

Floods are natural events that largely result from variance in rainfall, vegetation cover on watersheds, or both. Flood runoff large enough to be considered flooding normally effects only riparian habitats and their floodplains. Floods are usually the major proximate factor affecting riparian habitats and floodplain vegetation. Natural variations in flood frequency and magnitude are a primary cause of the dynamic nature

of riparian vegetation. Effects of large floods include direct destruction of riparian vegetation, redistribution of sediments and substrates, changes in channel sizes and locations, and the establishment of conditions for seedling growth of many riparian plants (Brown 1982). Smaller floods generally have smaller impacts. Even floods of limited size can be instrumental in keeping certain parts of canyons, especially areas constricted by adjacent cliffs, free of vegetation. In recent years, floods have also been correlated with changes in native and exotic fish faunas, and they appear to be instrumental in preserving native species (SWCA 1985).

Some degree of variation in flooding results naturally from short-term (year-to-year) variation in rainfall patterns and storms. A number of large floods are known to have occurred in historic times (Chapter 7; Appendix C), and similar events have undoubtedly occurred for thousands of years. Major historic floods that affected the Gila and San Francisco rivers are summarized in Minckley et al. (1979). It is likely that some of these floods affected Bonita Creek, especially those caused by widespread fall or winter precipitation. Bonita Creek was affected by recent floods in 1979 and 1983.

Dendrohydrology, the reconstruction of past stream flow from data encoded in annual tree-ring records, has the potential to provide information on the history of stream flow and flooding in southern Arizona. Dendrohydrological reconstructions of stream flow on the Salt and Verde rivers (taken together and individually) during the intervals A.D. 740-1370 and A.D. 1800-1979 have recently been produced (Graybill 1989; Graybill and Nials 1989; Nials, Gregory and Graybill 1989). The Salt-Verde drainage basin covers a large area to the north and northwest of the Bonita Creek Watershed. Along with estimating annual and seasonal flows, the reconstructions provide the data needed to determine the recurrence intervals for flows of various magnitudes--in other words, for defining 10-year floods, 50-year floods and so on.

The applicability of the Salt-Verde reconstruction to the Gila River watershed in general and to the Bonita Creek Watershed in particular is open to question. A comparison of a list of documented floods on the Gila (Minckley et al. 1979) with the reconstruction for the Salt River shows (1) that although many of the years with floods correspond to years with above-average reconstructed discharge, others do not and (2) that a number of years with large reconstructed flows do not correspond to years with documented floods. Fortunately, the Laboratory of Tree-Ring Research at the University of Arizona is currently developing a

dendrohydrological study of the Gila River watershed. It is similar to that conducted with great success on the Salt-Verde drainage (Donald Graybill, personal communication 1992). Such a study might or might not produce data directly relevant to Bonita Creek.

Changes in upland vegetation affect flooding by reducing the ability of soil to hold water, thereby increasing runoff. Reductions in upland vegetation could occur from reduced rainfall associated with climatic change or increased grazing associated with introduced cattle. Livestock have been raised throughout the Bonita Creek Watershed since the 1880s. They were occasionally present near Bonita Creek since at least the early nineteenth century.

Early travelers, including members of General Kearny's 1846 party, reported carcasses. The remains of cattle imported and slaughtered by Apaches at the mouth of Bonita Creek (Emory 1848:67, 74, 97; Hadley, Warshall and Bufkin 1991:135-37). Numbers have varied, however (Chapter 5). It is undoubtedly safe to assume that cattle grazing has affected vegetation in a way that increases runoff, though the extent of such increases and their effects on flood frequency and magnitude are hard to determine.

Insufficient data exist to determine whether flood frequency and magnitude have changed in historic times but such changes appear to be likely. Historic rainfall records and other evidence of climate change suggest a general drying trend for the area. This would likely reduce the frequency but not necessarily the magnitude of floods. Various effects of flood frequency and magnitude coupled with changes in average flows would be expected to significantly effect the distribution, average size, species composition and relative dominance of various kinds of riparian vegetation. Determining an overall trend, however, is very difficult because of the extremely dynamic nature of the riparian community. Comparing the distribution of riparian vegetation in any one year in the 1900s with any one year in the 1800s, for example, is not likely to be meaningful. A more meaningful comparison would be the average condition between two 20 or 30 year (or longer) periods in each century. Such comparisons are not possible since we do not even have comparable data for any two years in the 1900s.

Despite difficulties in documenting changes in flood frequency and magnitude, there is no doubt that such changes have occurred during historic times. The effects of these changes are, however, difficult to

assess. It appears likely that species composition, relative dominance and average vegetation conditions have changed, but in which direction is hard to determine. We suspect any such changes have been limited primarily to those of quantity.

Climate Change

Climatic changes can significantly affect the flora and fauna of an area directly and indirectly. Changes in rainfall and temperature affect water availability for animals, plants and humans. They also affect growing seasons, flood frequency and magnitude, soil productivity and plant species distribution and abundance. Upland habitats are probably more directly affected by climate change than are riparian habitats, though riparian habitats are also influenced by water availability, floods and temperature changes.

Though climate data have not been recorded in the Bonita Creek Watershed, climate data from the region certainly are applicable. Some authors believe that climate data indicate a drying trend over the last 70 years (Turner 1974:H13; Hastings and Turner 1965:279). Such a trend would be expected to result in a change in the distribution of plant communities and a possible retreat of higher elevation communities. In the Bonita Creek Watershed it is unlikely that the number or kinds of communities have changed, but virtually certain that the distribution and relative species compositions of these communities have changed. Reasons for such changes are difficult to determine with existing data. Some changes are clearly human caused, but the extent to which climate change is involved is not clear.

Like dendrohydrology, dendroclimatology reconstructs aspects of environmental history based on data from tree-ring records. In the Southwest, dendroclimatology is generally used to estimate past precipitation and temperature. Bonita Creek is just south of the area covered by a dendroclimatic reconstruction for the interval A.D. 680-1969 (Dean and Robinson 1977). This reconstruction consists of decadal tree-ring growth departures; that is, it measures deviations in tree-ring growth from the long term mean. The departures are a proxy record of past conditions: positive departures indicate relatively wet and cool decades, whereas negative departures apply to relatively dry and hot decades. The tree-ring record is particularly sensitive to short-term fluctuations--year-to-year or decade-to-decade--but is less informative about long-term trends, in

other words, about climatic change. Figure 5 is a contour map of the dendroclimatic data for the decade A.D. 1960-1969; the entire reconstruction consists of 129 of these maps. Although the Bonita Creek Watershed is in the area covered by the maps showing the reconstructed departure values, it is outside the network of tree-ring stations used to produce those values (Figure 5). Therefore, the location of contours in the Bonita Creek area may be more a function of the way the contouring program works than of past climatic conditions. In addition, the nearest dendroclimatic stations to Bonita Creek are above the Mogollon Rim, whereas the Bonita Creek Watershed is below the rim. For these reasons, the departure values in the Bonita Creek area should be used with caution. It would be helpful to determine the degree of correlation between weather records from the climatic stations used in the reconstruction that are closest to Bonita Creek and weather records from towns like Safford or Morenci. This might provide a basis for evaluating the departure values in the area of the watershed.

Grazing

Livestock grazing has direct and indirect effects on both upland and riparian habitats. In upland habitats, grazing affects total plant cover and species composition. Perennial grasses decrease and annual grasses, annual forbs, and shrubs and trees generally increase. In desertscrub habitats, creosotebush is likely to increase, and junipers commonly increase in grassland habitats. Grazing may also affect vegetation through trampling and soil compaction, which can be significant in areas where cattle concentrate such as around water. If grazing pressure is high enough, vegetation reduction may lead to increased soil loss, which could lead to a long term decrease in soil productivity. Grazing indirectly effects vegetation by affecting the number and extent of natural wildfires. Fires play a major role in grassland habitats, and its reduction generally favors trees and shrubs over perennial grasses.

Direct effects of grazing on seedling riparian trees, especially cottonwood and willows, have been well documented. Where grazing pressures are high enough, all seedlings may be eliminated and if such pressure continues long enough, entire riparian forests may be lost. Grazing may also affect riparian habitats through reductions of upland vegetation resulting in increased siltation or flooding. Aspects of water quality and

aquatic floras and faunas are also affected indirectly by grazing in the watershed.

For Bonita Creek, watershed grazing has probably had greater long term impacts on riparian habitat through changes in flood patterns than has direct grazing of the riparian habitat. Severe effects of grazing in the riparian habitat have been documented. Such effects do not appear to have been of a sufficient magnitude or continuous enough to significantly reduce the potential of the habitat to support riparian forest. Though the losses of entire seedling crops of riparian plants have been documented in past years (Minckley et al. 1979), the current vegetation contains numerous trees of many age classes, including those less than five years old.

Upland habitats have undoubtedly been affected by grazing. In Sonoran desertscrub, perennial grasses are much more common on steeper hillsides, where cattle are less numerous, and farther from areas with water. It is highly likely that there has been an increase in creosotebush and cacti and a decrease in perennial grasses. Shrubs and cacti have also probably increased in Semi-desert Grassland as grasses have decreased. Nonetheless, a few large areas heavily dominated by perennial grasses remain in the watershed. Junipers, shrubs and forbs have also probably increased in Plains Grassland on the San Carlos Apache Reservation. The density of trees and shrubs has probably increased in woodland habitats. There have undoubtedly been changes in the characteristics of plant species composition but data are insufficient to determine if the potential of upland habitats has changed.

The grazing history of the upper Bonita Creek Watershed is summarized in Chapter 5 (see also Minckley et al. 1979).

Water Harvesting

The city of Safford has been drawing water from Bonita Creek since 1939 (Heindl and McCullough 1961). Water is collected in an "infiltration gallery" of perforated pipes located 17 feet below the surface of the creek and is carried to Safford by gravity alone. "Discharge from the infiltration gallery during 1939-56 ranged generally from 900 to 2,500 acre-feet per year," though production decreased gradually from 1953 to 1961 (Heindl and McCullough 1961:1). These figures can be compared to the total discharge (including

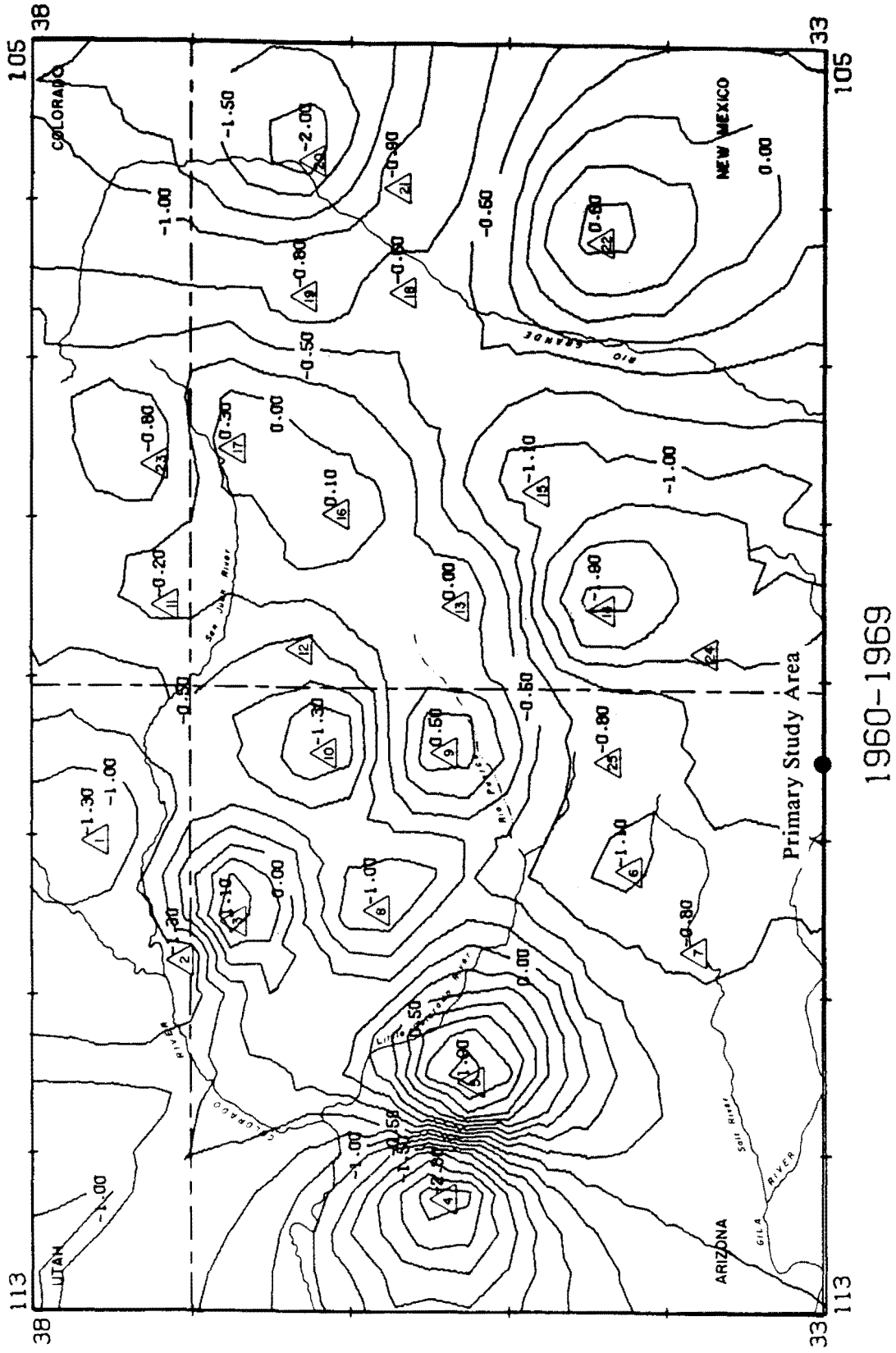


Figure 5. Contour map of tree-ring departure values over the decade 1960-1969 (Dean and Robinson 1977). Departures from mean tree-ring growth are measured in positive and negative standard deviation units. Positive departures indicate cool and wet conditions, negative departures warm and dry conditions. Numbered triangles show the locations of tree-ring data stations (identified by Dean and Robinson 1977).

removal by evapotranspiration and by the infiltration gallery) of 3,500 acre-feet per year estimated for lower Bonita Creek (Heindl and McCullough 1961:40). Withdrawal of water from the creek bed has had some affect on surface flow: thus, according to Heindl and McCullough (1961:27), "below the mouth of Johnny Creek, the flow is continuous except in the immediate vicinity of the infiltration gallery where the creek is generally dry for several weeks before the beginning of the summer floods." (It should be noted that, notwithstanding Heindl and McCullough's statement, Bonita Creek has several ephemeral or intermittent sections downstream of Johnny Creek other than the one in the area of the infiltration galleries [Mike McQueen, BLM, personnel communication]). Though a significant amount of water is harvested from Bonita Creek, neither the loss of water or impacts of the structures associated with the harvesting appear to have a significant impact on the biota of the creek. Riparian forests below the infiltration gallery appear to be as healthy as those above. Also, the dams that have been built in association with the collection galleries appear to be too small to have significantly affected either the upstream or downstream environment. These observations on the effects of the water harvesting system are based on a visit to the canyon in November 1991. The history of the system is summarized in Chapter 7.

Fire

As described above, fires can be important factors affecting plant communities. Natural fires favor perennial grasses over trees, and shrubs and may hold plant communities in a "disclimax" condition. Fires have been natural occurrences in the Southwest for centuries. Man's activities in the Southwest have increased and decreased the frequency, intensity and extent of fires. Man has been responsible for increasing fires through deliberately and accidentally set fires. His activities have also decreased the extent of fires through active control measures and extensive grazing that reduces the amount of fuel available.

Little information on the history of fires or of fire control in the watershed has been found during this study (Chapter 7).

Other Human Impacts

Man has been responsible for a variety of impacts to the Bonita Creek environment including direct clearing of land for agriculture, corrals, houses, trails and roads; harvest of natural resources such as water, wood, plants and animals; and the introduction of exotic plants and animals. In many parts of the Gila watershed, mining has impacted large areas of the landscape but such activities in the Bonita Creek drainage have been very limited.

Clearing of land contributes to increased runoff and erosion. Direct clearing of land in the Bonita Creek Watershed has been for the purposes of road construction, subsistence farm sites in the canyon bottoms, and for fuelwood gathering. In upland habitats, the primary impact has been caused by roads and trails, though a few stock ponds and buildings are present as well. Impacts of clearing have been proportionately greatest in riparian areas along the floodplain of Bonita Creek. Numerous abandoned agricultural fields are still present, some of which have been revegetated by trees to a greater or lesser extent. The history of farming along Bonita Creek is discussed in Chapter 6. A maintained road, usually reestablished yearly, occupies a significant proportion of the floodplain.

Woodcutting does not currently appear to be extensive in the riparian areas of Bonita Creek and does not appear to significantly affect the vegetation. Though past woodcutting (as distinct from land clearing) was certainly more extensive (Chapter 7), few permanent effects appear to remain. Numerous signs of woodcutting are present in the upper parts of the watershed on the San Carlos Reservation but overall cutting does not appear to be extreme. Numerous large junipers and pinons are present. According to historic accounts, juniper trees were cut on Turtle Mountain to provide fuel for the mines in the Morenci area (Chapter 7). The extent of this activity on the side of Turtle Mountain that drains into Bonita Creek is uncertain. Junipers do appear to be largely absent from this face of the mountain.

Hunting of game has undoubtedly occurred for thousands of years. Most populations have probably been affected less by hunting than by changes in vegetation caused by the various factors discussed above. Some species have been extirpated from the area such as wolf, grizzly bear and probably pronghorn. Bones of both pronghorn and bison have been recovered from rockshelters overlooking Ash Flat, implying that these

animals were once present in the upper Bonita Creek Watershed (Chapter 3). Beaver dams were observed on lower Bonita Creek by SWCA biologists, and interview data indicate that beaver have been present for many years (Chapter 7). Whether beavers were extirpated from the watershed in the mid-1800s during the period of intense trapping in the American west, and later returned to the area, is unknown. The effects of hunting and other human activities on the wildlife of the Bonita Creek watershed are discussed in Chapter 7.

A number of species of exotic plants and animals have been introduced purposely or accidentally into the watershed. Introduced plants include saltcedar, pecan, apple, pear, fig, English walnut, apricot, tree tobacco and horehound. None of these is extremely widespread or dominant, and most are limited to a few areas where they were planted. Most of the fruit and nut trees will not reproduce in the area, and unless more are planted, most should disappear. Saltcedar has spread widely along many drainages in the Gila complex but is very limited in the Bonita Creek Watershed probably because of the numerous floods, which tend to favor native species in narrow, rocky canyons.

Numerous smaller plants, such as Russian thistle and various annual grasses, have been introduced into the area. Most appear to have little effect on the ecology of the area though some such as bromes are very widespread and may have significant effects.

Few animals have been introduced into the area other than domestic livestock. Two exotic birds, starlings and house sparrows, have been seen in the drainage, but in numbers so small as to probably be insignificant. Both these species appear to require urban or agricultural areas and the probability of them increasing in the area under existing conditions is remote. A number of exotic fish have been introduced into the Gila River complex, and several occur in the lower reaches of Bonita Creek (Silvey, Sorenson and Rinne n.d.). However, most of the native fauna is still present, and the natural flood cycle appears to favor continued existence of these natives.

BIOLOGICAL EVIDENCE RELATING TO CHANGES IN BONITA CREEK

Though few data exist to reconstruct the historical ecological condition of the Bonita Creek

Watershed, there appears to be nothing to indicate major ecological changes. Many factors have affected the environment, and the current condition unquestionably differs from that in former times. Some of this change has been caused by entirely natural events, such as climate change (or at least fluctuation) unaffected by man. Man's activities, such as livestock grazing and the introduction of exotic species, has clearly contributed to this change and has significantly affected the environment. However, it appears that most of the change has been quantitative in nature rather than qualitative. Though plant community distributions and relative compositions have undoubtedly changed, no community types have been added or lost and few species of plants or animals have been eliminated or added. Many changes that have occurred have been temporary in nature. Clearing land for agriculture or grazing cattle on the floodplain of Bonita Creek does not appear to have caused major irreversible changes. Managed properly, effects of both activities can probably be erased.

As promised, this chapter has attempted to assess environmental change based on good scientific evidence. This is not the only perspective that one can take. Given the lack of quantitative data, it is perhaps not the best perspective. Interviews and historic documents, discussed in the following chapters, attest to the dynamic quality of the Bonita Creek Watershed's environmental history and to the environmental change that has occurred, particularly in the short term.

III

PREHISTORIC USE OF BONITA CREEK

A discussion of aboriginal use of the Bonita Creek Watershed could be organized in terms of either prehistoric lifeways or of cultural chronologies. Three lifeways have been identified by students of Southwestern prehistory that are relevant to Bonita Creek--Paleoindian, Archaic and Formative (Village Agricultural) (Figure 6). (Land-use practices of Protohistoric-to-recent Apaches and Hispanic and Anglo explorers, trappers, soldiers and settlers are discussed in later chapters of this report.) A useful framework for summarizing cultural chronology is much more complex than one dealing with lifeways. Several chronologies, each incorporating a number of periods or phases, have been developed for the areas around Bonita Creek. These chronologies apply (1) to the Paleoindian and Archaic periods in southeastern Arizona, (2) to the Black River branch of the Mogollon and to later puebloan settlement in the area north of the Bonita Creek Watershed, (3) to the Mimbres branch of the Mogollon, east of the watershed, (4) to the San Simon branch of the Mogollon, south of the watershed, and (5) to the Mogollon in general. An additional chronology (6) needs to be developed for the Gila River Valley downstream from the Gila Box, that is, in the Safford area. The first five frameworks, along with elements of the sixth, are summarized in Figure 6 (based on Wheat 1955: Tables 1, 16; Brown 1974; Gifford 1980: Figure 1; Anyon, Gilman, and LeBlanc 1981; Huckell 1984). The periods and phases making up these chronologies fall into groups that correspond to the lifeways already identified. All of the frameworks share the same structure during the Paleoindian and Archaic periods but they diverge during the Formative period, reflecting spatial variation in cultural development.

This discussion is organized in terms of lifeways rather than cultural chronologies for two reasons. First, lifeways are the most appropriate units for studying ethnoecology, that is, the relationship between

human social groups and the nonhuman environment. Second, although both the descriptions of lifeways *and* the cultural chronologies have been developed for areas outside the Bonita Creek Watershed, the concept of a lifeway is meant to be applicable over wide areas, whereas a cultural chronology should be regionally specific. Also, there is little basis for assigning the Bonita Creek sites to one or another subdivision of the existing cultural chronologies.

The following summary of lifeways focuses on how the activities of human social groups might have changed the environment in either the short or the long term. Also, archaeological data from Bonita Creek and environs that are, or may be, relevant to each lifeway are summarized.

PREHISTORIC LIFEWAYS

Paleoindian (9500-7500 B.C.)

The earliest lifeway recognized in the Southwest is that of the Paleoindians. They hunted big game, including mammoth and a species of large bison that, like the mammoth, has been extinct since the Paleoindian period. The climate was probably wetter than it is now, and the grasslands that supported these animals were both more lush and more widespread than today. Assemblages of artifacts from Paleoindian sites often included distinctive "fluted" projectile points, designed to be hafted to hand-held spears (Slaughter 1991:7) which were used to kill the large game animals. Paleoindians also must have exploited wild plants for food, fuel, fiber and tools, though little is known of this aspect of their subsistence. Populations were small, and the lifestyle was apparently nomadic. It is argued that the Paleoindians contributed to the extinction of the mammoths and, possibly, the ancient species of bison. Besides this *possible* impact on what would today be considered "keystone species," it is likely that Paleoindian groups had little lasting effect on their environment. A stretch of the San Pedro Valley located some 80 miles southwest of Bonita Creek has yielded abundant evidence of use by Paleoindians. This evidence relates to the Clovis tradition, which comes at the beginning of the Paleoindian sequence. Included are sites where mammoths were butchered. Evidence from these and other sites relates to the exploitation of grasslands or wooded parklands (Haynes 1981). This is typical of the settings where Paleoindian sites have been identified in the Southwest. Closer to the Bonita

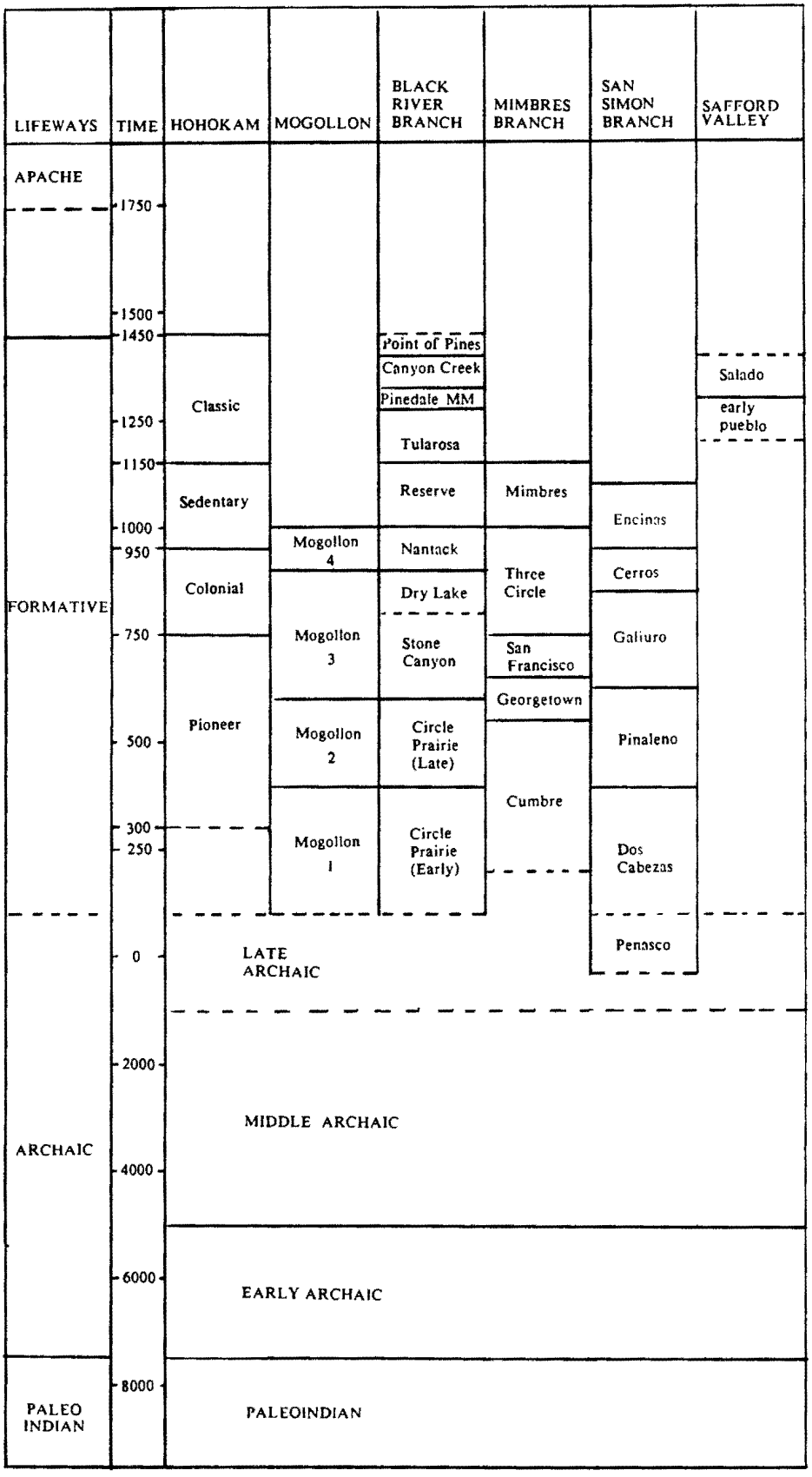


Figure 6. Chronological frameworks applied to the area surrounding Bonita Creek.

Creek Watershed, possible evidence of Paleoindian presence has been found on the north side of the Gila River several miles downstream from the river's confluence with Bonita Creek. This is a single fluted "Clovis-like" projectile point (Euler and Bartlett 1989). As in the case of the San Pedro finds, this point is from a broad valley. Data on these "open" lowland environments tell us little about how, or to what extent the Paleoindians would have exploited a canyon-bajada-upland environment like that of the Bonita Creek Watershed. Perhaps Ash Flat held the kinds of large game animals that the Paleoindians are known to have hunted. It is worth noting in this regard that much later occupations of rock shelters overlooking Ash Flat yielded bones of bison, pronghorn, mule deer and bighorn sheep (Gifford 1980).

Archaic (7500 B.C.-A.D. 400)

The Archaic lifeway included the hunting of animals and the gathering of wild plant foods. The variant of the Archaic recognized over most of the western United States has been termed the Desert Culture. The expression of the Desert Culture in southern Arizona is known as the Cochise culture. Cochise tool kits include projectile points that were mounted on atlatl darts or on spears (Slaughter 1991:9) as well as a variety of grinding implements. According to Fratt (1991:19), the presence of ground-stone tools, combined with their "virtual absence in the preceding Paleoindian period signals a major change in subsistence. This brought the focus away from big-game hunting and plant gathering with little to no processing to more extensive and intensive plant procurement and processing." Although it is clear that climatic conditions varied through the Archaic period, none of the available reconstructions of climate change appear to be entirely reliable (Bronitsky and Merritt 1986:29-31).

In the Southwest, critical wild resources are too scattered to support sedentism. Therefore, Archaic settlement patterns are characterized by mobility. Patterning in the distribution of resources affected the way in which Archaic societies formed task groups and, therefore, the kinds of sites encountered by archaeologists (Wills 1988:42). According to Wills (1988:42), "hunter-gatherer systems can be arranged along a continuum . . . in terms of the degree to which labor is allocated to specialized groups." At one extreme are *collecting adaptations*, in which "a group moves into a resource area and exploits it through the formation of task

groups." This results in the production of campsites and "a variety of functionally specific [limited activity] sites" (Wills 1988:42). Collecting organization is characterized by "repetitive seasonal movement coupled with resource storage and limited geographical movement" (Wills 1988:41). This adaptation is "a typical response to spatially aggregated resources that are available for short periods of time" (Wills 1988:42). At the opposite extreme are *foraging adaptations*, in which "groups . . . 'map onto' resources by moving their residential camps directly to a resource patch . . . Foragers generate fewer activity site types than collectors do and rarely use storage caches or stations for special activities such as hunting" (Wills 1988:42). "Such strategies appear adaptive to environments with spatially dispersed resources that are available over long periods of time" (Wills 1988:42).

The Bonita Creek Watershed is like much of the arid Southwest in that some valued plant resources tend to be locally aggregated and available for a short time. The area is also characterized by environmental diversity, which is primarily a function of abrupt changes in topography and elevation. Therefore, elements of collecting adaptations should be encountered--that is, small, limited-activity sites and storage facilities--along with the base camps that characterize both collecting *and* foraging adaptations.

The Cochise tradition was originally divided into stages--Sulphur Spring, Cazador, Chiricahua and San Pedro (Sayles and Antevs 1941; Sayles 1983). This framework has recently been discarded by Huckell (1984), who recognizes a Southwestern Archaic divided into Early, Middle, and Late periods. One major change in the Archaic lifeway has been documented. Toward the end of the late Archaic, groups in southern Arizona began planting corn and building pit houses. Both innovations reflect a more sedentary way of life than that practiced by earlier Archaic peoples (Eddy and Cooley 1983:46-47; Doyel 1984; Bronitsky and Merritt 1986:164). Archaic occupation has been documented in two areas to the south of Bonita Creek--the San Pedro Valley and the Sulphur Spring Valley (Sayles and Antevs 1941; Sayles 1983; Waters and Woosley 1990).

None of the sites that have been recorded in the study area can be assigned confidently to the Archaic (Table 1). It is, however, probable that some sites categorized as lithic scatters date to this period. Almost certainly, unrecorded sites of the Archaic period are present in the watershed.

Archaic groups would have affected the local environment through both their hunting and their plant collecting. They may have depleted populations of animals and plants--locally and for the short term. Major or lasting effects are doubtful, however. Archaic hunters-and-gatherers probably engaged in what is known as optimal foraging; that is, they concentrated their efforts on resources that provided the maximum return for the minimum effort. As exploitation began to deplete a resource, the attractiveness of that resource would diminish. The group would move to a new area, in most if not all cases before the resource in question had been exhausted. In addition, a group would engage in seasonal movements from one environmental zone to another, both to take advantage of food resources as they became available and in response to changes in the weather.

This mobile strategy would work as long as population levels remained low, as they did throughout most of the Archaic. Wills (1988:143-155) argues that population rose during the Archaic, reaching a level in the Late Archaic that placed some degree of restriction on the mobility of hunter-gatherers. According to Wills, this constraint on movement played a role in the adoption of agriculture by Archaic peoples. It should be noted that Wills's argument applies to regional populations and adaptations, and its relevance to Archaic settlement in a relatively small area like the Bonita Creek Watershed is uncertain.

For purposes of this discussion, the Archaic period is assigned an end date of A.D. 400, whereas the following Formative period is given a beginning date of A.D. 200. The resulting overlaps in the two periods is a reflection of (1) uncertainty in dating the inception of Formative lifeways, (2) some degree of gradualism in the transition from Archaic to Formative lifeways, and (3) spatial variation in the timing of this transition.

Formative (A.D. 200-1450)

Willey and Phillips (1958:146) "define the New World Formative by the presence of agriculture, or any other subsistence economy of comparable effectiveness, and by the successful integration of such an economy into well-established, sedentary village life." Formative settlement patterns incorporate permanent or semi-permanent habitation sites and a variety of limited activity sites. Habitations consist, initially, of pit houses (semi-subterranean earth lodges) and later of surface masonry pueblos. Many limited-activity sites

were used in farming--for example, field houses, check dams and at least some rock alignments and rock clusters. Formative lifeways in the Southwest also included the exploitation of wild animal and plant foods. These activities produced special-function sites that may be indistinguishable from their Archaic counterparts. This is likely to be the case if the activities performed at the site involved the use of flaked-stone tools but not the use, breakage and discard of ceramic vessels and ground-stone tools. In archaeological jargon, the problem in these cases is one of distinguishing sites that are aceramic from those that are preceramic. During the Formative, hunting was done with the bow-and-arrow (Slaughter 1991:13).

The Mogollon archaeological culture, or tradition, was present in east-central and southeastern Arizona throughout the pit house period (Bronitsky and Merritt 1986), that is, to A.D. 1000-1100. This interval is a convenient marker for the appearance of so-called puebloan traits that, in Haury's (1988) view, bring an end to the usefulness of the Mogollon concept. As noted, three Mogollon subtraditions, or "branches," are recognized in the area surrounding the Bonita Creek Watershed. They are the Black River branch (to the north), the Mimbres Branch (to the east), and the San Simon branch (to the south) (Figure 6). Both San Simon and Mimbres branch sites have been identified in the Safford area (Bronitsky and Merritt 1986). Puebloan traits introduced after A.D. 1000 include surface structures of masonry (adobe, stone, or a combination) and black-on-white ceramic decoration. Figure 6 identifies two puebloan periods in the Safford area--"early puebloan" and Salado. The Salado archaeological tradition is characterized by Salado polychrome pottery and "compound" site layouts in which blocks of rooms are joined or surrounded by walls. Although compound architecture is generally linked to the Salado tradition, this architectural style appears before polychrome pottery. Some Salado sites in the Safford Valley are quite large, incorporating more than 100 ground-floor rooms (Brown 1974). Brown (1974) sees close ties between the Safford Valley and the Point of Pines area to the north--that is, the Black River branch of the Mogollon--in both the early puebloan and Salado periods. Bonita Creek is perhaps the most direct corridor between Point of Pines and the Safford area. Brown particularly notes similarities in the ceramics of the two areas. On the other hand, early puebloan sites in the Safford area differ ceramically from roughly contemporaneous sites in the Bylas area located downstream from Safford. Hohokam pottery (Casa Grande Red-on-buff) is common at the

Bylas sites but rare at the Safford sites (Johnson and Wasley 1966; Brown 1974).

The Formative is the one prehistoric interval with clear-cut evidence in the Bonita Creek Watershed. CC:2:2(BLM) is a Mogollon Period 4 site located in the canyon of Bonita Creek. It is thought to have at least one pit house. CC:2:8(ASM) is a Mogollon site (Period 3?) with several masonry rooms that are also situated in the canyon. Site CC:3:52(ASM) is a Mimbres ruin located on a ridge overlooking Bonita Creek near the confluence of that drainage and the Gila River (Arizona State Museum Site Files). The remaining sites appear to date to the early puebloan or Salado periods. Site AZ W:14:1, the Bonita Creek Ceremonial Cave, produced a number of wooden ritual artifacts. It also has a storage structure. Also, there are several puebloan sites with stone-masonry buildings located in rockshelters overlooking Bonita Creek (Table 1). The largest site is Pueblo Devol (W:14:18[BLM]), which is located at the north end of the Primary Study Area. The site includes rooms built into three alcoves and rooms built on the talus at the base of the cliff; buried rooms are probably present in the latter area (Trott and Taylor 1990). The site form (BLM Site Files, Safford) refers to 20-30 rooms that can be identified, and it suggests that 50 rooms may be present. The latter figure is probably the best available pending additional work at the site. Research conducted in pueblos on the Colorado Plateau suggests that the majority of rooms were used for storage, and that fewer than half served for "habitation" (Dean 1969; Adams 1983). The other rock-shelter sites in the canyon are much smaller, incorporating no more than four or five rooms. Together, these small sites account for perhaps 20 rooms, many of which were probably used for storage. Cliff sites occur along a 11-km stretch of the canyon, with the majority in areas where the canyon is relatively wide and alluvial terraces are present. The broader of these terraces appear on one of the soil survey maps (DeWall 1981:Sheet 21).

Prehistoric Southwestern farmers changed their environment in a number of ways. Typical activities included clearing land for farming, collecting and moving water for irrigation, gathering firewood, collecting wild plant foods and hunting wild animals. In discussing how these general activities might apply to the Formative occupation of Bonita Creek, it is helpful to refer to studies in the Mimbres Valley, located 100 miles to the east. The Bonita Creek and Mimbres watersheds are similar in several ways: (1) the drainage flow from uplands in the north to lowlands in the south, (2) they have woodlands at higher elevations and,

most important, (3) they have a strip of Riparian Woodland fringed by drier habitats.

The impact of clearing on the riparian forest in Bonita Creek would have been a function of several variables. The amount of land farmed per person, the number of new hectares cleared each year, the size of the population, and the length of the occupation. In their discussion of farming in the Mimbres Valley, Nelson and LeBlanc (1986:243) refer to Minnis's (1981) estimate that "0.6 ha of farmland per person would be required to produce 50 percent of the caloric needs of the population. This figure assumes aboriginal farming techniques, fallowing, and irrigation." As discussed below, we assume that the population was relatively small, probably only a few families. A population of 30 would require 18 hectares of cleared farmland in any one year. The inclusion of fallowing in the calculation implies that only a few additional hectares would need to be cleared each year. In the areas where cliff sites are located, 18 hectares would be equivalent to only a small percentage of the area in riparian woodland. This amount of land might, on the other hand, account for a considerable percentage of alluvial terraces that were suitable for agriculture, including irrigation agriculture. Additional hectares of woodland would have been impacted by the collecting of fuelwood. In the Mimbres Valley, the period with the highest estimated population yielded a relatively low percentage of charcoal from riparian species: "The most reasonable explanation . . . is that . . . the floodplain was cleared" (Nelson and LeBlanc 1986).

It is reasonable to surmise that farmers in Bonita Creek Canyon diverted water from the stream to irrigate their fields. Prehistoric irrigation canals have been identified, at least tentatively, in the Safford area. The construction of small dams to irrigate fields was a standard practice of the Western Apache who later inhabited the Bonita Creek area (Chapter 4). It is possible that the construction of dams and ditches, in combination with clearing, made the alluvial terraces more susceptible to erosion by floods.

During the Archaic, optimal foraging would lead hunter-gatherers to move on before a resource was exhausted to the point of jeopardizing its survival. For sedentary farmers, on the other hand, the optimum strategy might be to collect resources as close to their home base as possible. With the passage of time, it becomes necessary to travel farther and farther for resources. It has been suggested, for example, that agave has been "thinned out" in a densely inhabited area of Baja California due to human exploitation (Castetter,

Bell and Grove 1938:59). On the other hand, it has been argued that the distribution of agave north of the Mogollon Rim was expanded as a result of human exploitation. That is, agaves occur with some frequency on archaeological sites located outside their normal range (Minnis and Plog 1976:299-308). In the case of a canyon like that of Bonita Creek, hunting by sedentary farmers might have had a greater impact on species that are dependent on riparian habitat, such as turkey and beaver, than on animals that come to the creek to drink only during the dry season, such as deer and javelina (Al Bammann, personal communication 1991).

In some situations, the activities of farmers change the environment by depleting some resources but encouraging others. For example, agriculture increases the abundance of weedy species (Fish 1989), some of which can be exploited for food. Also, Szuter and Bayham (1989) have stressed that the relative abundance of cottontails and jack rabbits is probably dependent to a great extent on the vegetation cover in the site vicinity. Removal of vegetation, whether from field clearing, fuel collecting, or any other impact of a large human population on the site vicinity, will diminish cottontail habitat and should increase the relative abundance of jack rabbits. Thus, diachronic changes to greater relative abundances of jack rabbits have been convincingly argued by Szuter and Bayham to reflect degradation of the local vegetation cover (Gillespie 1989:186). Hunting by sedentary farmers can also deplete populations of large animals. This is reflected in the Mimbres by a shift in faunal remains from large to small animals (deer to cottontails and jack rabbits) (Nelson and LeBlanc 1986).

The scale of the impact of Formative peoples on the environment of Bonita Creek is a function of the size and duration of prehistoric occupation. Our best evidence on this score comes from the "cliff dwelling" period in the canyon, which is contemporaneous with the early Pueblo/Salado period in the Safford Valley. We hypothesize that the population was small--probably no more than 10 families--and that the occupation was brief--only a few decades. This interpretation is based primarily on the relatively small number of structures present. Each family would have had several storage structures at any one time. The shifting of fields and abandonment and replacement of structures every few years would add structures to the archaeological record. As noted, there appear to be no more than 70-80 rooms in the canyon. These structures, which occur along a 11-km stretch of the canyon, could all have been built by a single community

that was based at Pueblo Devol. Flannery (1976:107) suggests that, for Formative period villages in Mesoamerica, 5 km is "the threshold beyond which agricultural activity is considered to yield 'decreasing returns'." On the other hand, it is likely that the individual farmers who lived along Bonita Creek followed the Hopi practice of planting crops in a number of different settings--some wetter than others and some warmer than others. This was done as a hedge against variation in the weather and other contingencies which could not be predicted (Adams 1979; Hack 1942). In a narrow canyon environment like that of Bonita Creek, it might have been necessary to "stretch" the 5-km threshold to have access to the desired variation in farming locations. The accompanying decrease in efficiency could have been offset by building temporary habitations and storage structures near the fields that were farthest from the main settlement.

This interpretation of a relatively small, brief occupation is influenced by a more general hypothesis that a restricted canyon environment like that of Bonita Creek would be unfavorable to long-term settlement. Although the Riparian Woodland is a rich environment, it is confined to a narrow canyon. The Sonoran Desert scrub and Semi-desert Grassland that surrounds this "linear oasis" is poor in plant resources compared to the mixed communities that occur at somewhat higher elevations. Also, the prehistoric settlers might have been discouraged by the severe floods that are likely to have swept through the canyon at unpredictable intervals. Finally, it is probable that the people who occupied the canyon came either from Point of Pines or from the Safford Valley. They would have been used to the social amenities provided by larger communities, including a complex ceremonial life, substantial numbers of potential marriage partners, economic support from relatives in times of trouble, and possibly defensive support in times of strife. For some or all these reasons, the inhabitants of the cliff sites may have eventually decided that Bonita Creek was both too small and too remote a place to live. To reiterate, this seems to be a reasonable hypothesis to explain the settlement of Bonita Creek during the early Pueblo/Salado period.

IV

APACHE OCCUPATION OF THE STUDY AREA

The Western Apache occupied the study area from at least the early eighteenth century until the early 1870s. During this period they practiced an economy that mixed farming, raiding, and hunting-and-gathering. Members of one subgroup of the Western Apache farmed along the upper Bonita Creek drainage. After the establishment of the San Carlos Reservation in 1872, Apache occupation of the study area was limited to the upper portions of the drainage (the secondary study area). The intensification of hostilities with United States troops between 1870 and 1886 led to a general decrease in farming and an increased reliance on hunting, gathering, and raiding for cattle and horses. During the first phase of Apache occupation, from initial settlement until 1870, the major cultural impacts were from Apache farming, hunting and gathering. During the unsettled period of conflict all impacts probably decreased. Some more peaceful Apaches relied on government rationing for sustenance. After the 1890s, very limited settlement and farming occurred on the Bonita Creek drainage. From the 1890s through the 1920s the major impacts were generated by cattle grazing, the greatest percentage of which came from non-Indian owned cattle. After 1930 with the removal of non-Indian ranchers, cattle numbers declined sharply. Human residence on the upper Bonita Creek drainage was limited to occasional, temporary stockmen.

Information on Apache ethnology is contained in the works of anthropologists Grenville Goodwin (1937, 1942) and Keith Basso (1971, 1983). Abundant military records and many secondary sources relate the events that took place during the period of hostilities. The Bureau of Indian Affairs (Indian Service) and San Carlos tribal records provide documentation for the subsequent history of the San Carlos Reservation.

THE WESTERN APACHE

The Western Apache are descendants of Athapascan-speaking peoples who migrated southward from points in northern Canada. At some period after A. D. 1525, they established themselves on the plains of Texas and New Mexico. It is uncertain when these ancestors of the Western Apache first penetrated southern Arizona, although Spanish documents from the late seventeenth century mention the presence of Apaches in the portion of northern Sonora that is now Arizona. Probably during the early eighteenth century, the Western Apache established themselves in the territory that extended from the Mogollon Rim to the Gila River (Basso 1983:456). Although the Western Apache continued to be semi-migratory people, by the early to mid-nineteenth century they were divided into five politically autonomous subtribal groups. Each group occupied a specific geographic territory. Each of the subtribal groups was further divided into a varying number of bands, and each band functioned as a territorial unit and occupied a specific geographic area.

The largest of the five subtribal groups was the White Mountain or Coyotero group. During the nineteenth century, the term "Coyotero," which once designated all peoples of the Western Apache division, was applied particularly to the people of the White Mountain group who lived south of the Black River. By the 1930s it designated the White Mountain groups residing on the San Carlos Reservation (Goodwin 1942:2). Prior to the "Apache Wars," the White Mountain group had a population of approximately 1,400-1,500 members (of a total Western Apache population of 6,000 to 8,000). White Mountain territory included the area immediately north of the Gila River in southern Arizona.

The White Mountain subtribal group was further subdivided into two bands, the Eastern and Western White Mountain bands. Bands were the most important segments of Western Apache society and were the basic units around which social organization, government, and economic activities of the Western Apache revolved (Goodwin 1942:110). Each local group had exclusive rights to certain farm sites and hunting localities. Each band was politically independent and was headed by a "chief" or "headman" who directed collective activities. In pre-reservation times, the Eastern White Mountain band, known as dzit ya "on top of the mountains people", was the larger and more powerful of the two White Mountain bands (Goodwin 1942:60). Both bands lived a semi-migratory life within a specified territory that included the Bonita Creek

Watershed.

The territory occupied by the Eastern White Mountain band included the western slopes of the White Mountains, the Blue Range and the Morenci Mountains. It extended south to the Graham and Winchester mountain ranges. They were bordered on the north by the Navajo, on the west by the Western White Mountain band, on the east by the Ojo Caliente Apache of New Mexico, and on the south by the Chiricahua Apache. On hunting and gathering trips, members of this band ranged north to the area of Springerville and the border of Navajo territory and south to Mount Turnbull and the south-facing slopes of the Pinaleño Mountains. The San Carlos River delineated the western border of their territory, and they ranged east to approximately the New Mexico State line. They often wintered in sheltered places that had springs and southern exposure along the Nantac Rim. In the spring, they gathered mescal on the south-facing slopes of Mount Graham and Mount Turnbull (Goodwin 1942:12-13).

WESTERN APACHE SUBSISTENCE

Griffin, Leone and Basso (1971) discuss a horticultural adaptation practiced by the Western Apache prior to A.D. 1900. This adaptation involved two settlement foci--a summer camp at higher elevation where agriculture was practiced and a winter area at lower elevation with a series of camps that were occupied in turn. The adaptation includes five procurement systems: (1) wild floral resources, (2) large game, (3) small game, (4) plunder, including cattle and horse theft, and (5) horticulture. Hunting-and-gathering activities would have employed the same optimal-foraging strategy as characterized Archaic exploitation of the environment (Chapter 3). A few individual members of several White Mountain bands raised small herds of domestic cattle prior to reservation times (Goodwin 1937). This practice would constitute a possible sixth subsistence strategy.

Grenville Goodwin, who studied the Western Apache during the 1930s, interviewed many elders who recalled details of the pre-reservation period. Goodwin's informants described details of life in their rancheríos (settlements), including considerable Apache farming within the study area. The principal Eastern White Mountain farm sites were located on the east fork of the White River, the head of Bonita Creek, the

head of Turkey Creek, the head of Black River, the head of Cienega Creek, Point of Pines, and on Eagle Creek at the site of the Double Circle Ranch headquarters, with additional minor farm sites throughout the area (Goodwin 1942:16-17). Goodwin does not indicate how far down the Bonita Creek drainage the farms extended. However, Apache agricultural practices on other drainages suggest that irrigated farm plots probably occurred intermittently along the perennial flow portion of the creek. Goodwin found that, contrary to popular supposition, agriculture was a major component of Western Apache economy and culture. The Apache practiced an annual cycle of subsistence activities that took them to different locations. "Despite seasonal residences in other places, the real ties were with the home locality about the farming site" (Goodwin 1942:160). Farming was adequately developed, to the point that some farms in pre-reservation times were even fenced (Dobyns 1981:59). Apache mythology is full of references to agriculture indicating its long-duration within the culture (Goodwin 1937:97). According to Goodwin (1942), individual bands of the White Mountain derived their separate identities from the farm sites that they considered their homes. From continually returning to their specific farms, distinct bands began to be known to each other by different names. Although these bands continually intermarried and often traveled together, they maintained separate home farms. They also had separate places to which they traveled to gather mescal, juniper berries, acorns, etc. The food-gathering camps were located south of the farming locations, across the Gila River. Each band went to the food-gathering camp site closest to the home farm (Basso 1971:26).

Despite the collection of well over 100 different wild plant species for food and medicine, 60 to 65 percent of the plant products in the traditional Apache diet came from domesticated foods (Goodwin 1937). Although agricultural practices varied among the different subtribal groups, the majority of White Mountain people were farmers (Goodwin 1937:92, 97). They practiced both dry and irrigated farming. The size of an average farm during the pre-reservation period was approximately a half acre per family (Opler 1973:44-45). Agricultural produce was made available to non-farm-owning families through hiring them as farm workers, with labor payments made in produce. Clans controlled the farm site, farms could be lent to relatives, and new individuals might request a farming site. Sites were often shared by several members of a family, although Apaches often referred to farm sites as owned by certain individuals. When Apache bands resumed

farming at old sites after an absence, particular clans claimed specific farm sites because of long continued residence and use. The association of clans with farm sites remained strong through the 1930s (Goodwin 1937:102).

In 1932 John Rope (Tlodilhil), an elderly member of the Eastern White Mountain band (born about 1855 near Black River), described his band's pre-reservation farming practices in considerable detail for Grenville Goodwin. In pre-reservation times his people constructed irrigation ditches with digging sticks and removed the loose dirt in baskets. After completion of the ditch, they dammed the creek for water diversion, constructing the dam with a series of pole tripods on which they packed bear grass and the inner bark of cedar and cottonwood. A wall of flat stones was built in front of this. The space between the stones and bear grass wall was filled with dirt (Basso 1971:93-96). A "ditch boss" directed the work of constructing, clearing, building dams, and turning in the water (Goodwin 1937:102). The headman of the community got the water first; other farmers got it after him. Corn was the most important crop. Farmers watered their fields before the corn was planted, placing seeds at a depth of six inches. They weeded the field until the corn reached a foot and a half in height, when they watered it again. When the corn was three feet high they left the farm site to go on gathering trips and returned for harvest in the early fall (Basso 1971:93-96).

If practiced by the Apache along lower Bonita Creek, agriculture would presumably have involved the clearing of farm plots. As in the case of Formative period farming, diversion of water to irrigate fields might, along with clearing, have made the alluvial terraces more susceptible to erosion during floods. In their hunting-and-gathering activities, the Apache are as unlikely as Archaic peoples to have seriously depleted wild resources. One possible difference between Archaic and Apache resource use involves Apache activity in the vicinity of summer farming camps. This facet of Apache settlement may have involved a greater degree of "seasonal sedentism" than was typical in the Archaic. This could, therefore, have led to a greater depletion of resources in the vicinity of the farming settlements. Even considering this possibility, Apache groups would have probably had significantly less impact on the environment of Bonita Creek than would the earlier Formative period farmers.

APACHE ANGLO-AMERICAN CONTACTS

During the period when Western Apache territory was part of the northern frontier of the Spanish empire (1540-1821), contact between Spaniards and Apaches was largely limited to military actions and Apache raiding. Under Mexican sovereignty (1821-54), Apache raiding and warfare intensified, particularly during the period after 1831. Although a limited number of Spanish and Mexican trappers, traders and military personnel ventured into the area north of the Gila River, the heart of Western Apache territory, no documents describing their expeditions have been uncovered. The first contact with Anglo-Americans occurred during the Mexican period. The Apache were still settled on primary farming areas, including Bonita Creek, practicing an economy that mixed farming, hunting-and-gathering, and varying amounts of raiding. Anglo-American travelers in this section of Sonora reported contact with Apache, and the Apache similarly reported sightings of these new strangers to Mexican officials.

In 1826, James Ohio Pattie descended the Gila with a party of New Mexico trappers. They ascended a small stream that they called the "San Carlos". Finding no beaver, they returned to the Gila and continued downstream until the trail became "blocked by high mountains." At this point they turned north and followed a small stream to its source, from which point they could see the Gila emerging onto flat country. They passed several recently deserted Indian villages in the immediate vicinity but did not encounter Indians until they reached the mouth of the "San Carlos" River. They surprised a small group of frightened Apaches who promptly fled, depriving the white intruders of their desired opportunity to obtain food. The creek that Pattie ascended and referred to as the San Carlos could have been either Eagle Creek or Bonita Creek. During the next few years, parties of American trappers (George Yount, Ewing Young, Michael Robidoux, Bill Williams) visited the Gila regularly. In the spring of 1836, Aravaipa Apaches living at the Mexican peace settlement on Aravaipa Creek reported to the commander of the Tucson garrison that a large number of Americans (40) had constructed a fort and planted a field of corn on the Gila above the confluence with the San Pedro. The Americans abandoned the fort but returned to harvest their corn in November (Officer 1987:139). Eastern White Mountain Apaches must also have been aware of the presence of these Americans.

The earliest detailed descriptions of contacts with Apache people in the region near Bonita Creek

are contained in the reports of General Kearny's journey to California during the Mexican War. Kearny's Army of the West left Santa Fe in 1846 and followed a route down the Rio Grande, west to the Santa Rita del Cobre mines, and southwest to the Gila River. Both Lieutenant William H. Emory and Lieutenant A. R. Johnston described contacts with Apache, including a formal parlay near the Santa Rita copper mines between General Kearny and Apache chief Mangas Coloradas. Several days after this meeting, the party camped on the Gila at the mouth of Bonita Creek, which Emory called the "San Carlos" (Figure 7 and Table 1:Site AZ CC:3:31[BLM]). Emory noted the remains of a large Apache camp, with the carcasses of many cattle, near the camp site (Emory 1848:60-66). Farther west, they found the grass near the foot of Mount Graham "burned to a cinder," and assumed the fire had been set by Indians. Downstream from Mount Turnbull, Kearny's party traded with Apaches for mules. Nearing the San Pedro River, they again noted the remains of cattle carcasses. An Indian trail near the San Pedro was so large that Emory referred to it as a "highway." It was distinctly marked by the hooves of horses, cattle and mules (Emory 1848:67,76). Johnston noted tracks left by herds of Indian horses along the sandy banks of the Gila (Emory 1848:579). Their observations indicate Apache bands living along the Gila customarily imported livestock into the area for consumption rather than for breeding purposes. Since no mention is made of herds of cattle, it can be assumed that most of the cattle were promptly slaughtered.

In 1848, the United States acquired the territory north of the Gila River through the Treaty of Guadalupe Hidalgo which terminated the Mexican War. During the 1849 California gold rush, thousands of California-bound emigrants traveled along the trails that had been taken by General Kearny and Colonel Cooke. These were now known as the Southern Overland Route. In western New Mexico, the trail separated into several branches, one of which passed directly down the Gila River. Although the Gila branch was the most direct, wagons could not travel down it and it received less use. Emigrants on horses or mules followed both banks of the river, many of them using Lieutenant Emory's report as a guide. They often referred to the trail as the "great stealing road of the Apaches" or the "devil's turnpike" (Green 1955:60). Many emigrants encountered Apache along the Gila, having anticipated the event with both fear and excitement. Although initially well received by the Indians, the presence of Anglo-Americans in Apache

territory soon exacerbated existing hostilities. Some emigrants were eager to obtain bounties offered by the states of Chihuahua and Sonora for Apache scalps, which brought a reported $100 to $200 US (Harris 1984:109; Bieber 1938:36). As a result, most encounters were guarded and wary, although some contacts resulted in friendly bartering and the exchange of livestock, food and goods. In July 1848, a typical encounter took place in Robert Green's Gila River camp. After some limited trading, Green remarked that the Apaches "steal everything they can, but being entirely naked except a breech cloth they have but a poor chance to hide what they pilfer" (Green 1955:65). Of the hundreds of emigrant companies that passed down the river, few contacts were more than fleeting encounters of the type described by Green. The first friendly contact between the Eastern White Mountain group and the United States government may have occurred during 1852 when the Santa Fe Indian agent James Calhoun negotiated a treaty with the "Gila Apache." Later during the 1850s, a Mexican from Santa Fe visited the Eastern White Mountain people occasionally, traveling from Fort Defiance into their territory (Goodwin 1842:12-14). At sometime before the establishment of Fort Bowie (1862), he invited them to Apache Pass for the distribution of food, cloth and brass kettles. In 1864, Fort Goodwin was established, the closest military post to Eastern White Mountain territory. Soon after its establishment, a large council was held in which army representatives informed the Apache that the area around the post was to be their reservation. The army negotiated to build a road to Fort Apache in 1867. After its establishment in 1869, some members of the Eastern White Mountain band drew rations there (Goodwin 1942:14).

Elderly members of the Eastern White Mountain band recalled an infamous incident, known as the Goodwin Springs poisoning, which occurred during the 1860s. Prior to the establishment of the Fort Apache (or White Mountain) Reservation, Americans camped at Goodwin Springs and sent out word among the adjacent Western Apaches that they would give out food to all who came in. Having recently received rations from U.S. cavalry officers, the Apache did not suspect treachery. Many assembled at the springs, where dried meat was distributed among them. The meat was apparently poisoned and scores died on the trail home. Many victims were subchiefs. However, Diablo, who was one of the Eastern White Mountain band's most powerful chiefs during the 1860s and 1870s, had evidently been warned and did not go to Goodwin Springs

(Goodwin 1942:14).

When General George Stoneman took command of the newly created Department of Arizona in July 1870, he immediately began a tour of the military posts and Indian reservations in his district. In August he made an extended trip though southern Arizona and stopped at Camp Goodwin on the Gila River. John H. Marion, publisher of the Prescott Miner, accompanied him and kept a diary of the trip. Marion, already familiar with the area, had traveled down the Gila from Camp West to Camp Goodwin in 1866. He did not pass by Bonita Creek on his 1870 trip. Marion knew of it and remarked that Bonita Creek was the largest stream emptying into the Upper Gila. This was the place that "Cheis [Cochise] and his tribe wish to settle and live in peace" (Marion 1965:31-32). It is not clear, however, whether Marion was speaking of Eagle or Bonita Creek.

CONFLICT BETWEEN THE US ARMY AND THE APACHE

The United States took over the traditional Western Apache homeland at mid-century; the territory north of the Gila River was acquired in 1848, and that south of the Gila River in 1854. For several years after the Civil War, US military presence was so limited that little disruption of traditional Apache settlement patterns occurred. However, after 1870, when the War Department created a separate Department of Arizona, the army adopted a more aggressive policy toward the Apache. They began a program of settling various Indian groups on reservations. The pacification program and resulting hostilities with the US Army prevented any sedentary life and largely precluded farming on the home sites. Eastern White Mountain and other bands had farmed here throughout the periods of Spanish and Mexican control.

The San Carlos Reservation was established by Executive Orders of November 9, 1871 and December 17, 1872. The new reservation included the former Fort Apache Agency until 1897, at which time the subagency became a separate entity. Under pressure from non-Indians interested in obtaining mineral rights or agricultural lands, large portions of the eastern, southern and western sides of the reservation were removed (in 1873, 1874, 1877, 1893, 1896 and 1902). This reduced the total acreage by 2,814,136 acres to the present reservation acreage of 1,643,939. During the early 1870s, the US Army, in conjunction with a series

of Indian agents at San Carlos, enacted a policy of concentrating the five subtribes of Western Apache on the reservation. It is possible that some Eastern White Mountain bands remained on Bonita Creek until approximately 1875. San Carlos agent John Clum brought the various bands together to live at selected locations along the Gila River. Eastern White Mountain Apaches who had been moved away from their former farming sites settled on the north bank of the Gila opposite Dewey Flats and at Bylas. They remained on the river until 1880 or 1881. During this five-year period, they were allowed to return to their old farms only long enough to plant and harvest corn. After 1881, agency policy changed and most of the bands returned to their former farming sites (Opler 1973:26). Some of the Eastern White Mountain band who chose to return to their previous homes were placed on the Fort Apache Agency. It is unknown whether any of the groups resumed farming on Bonita Creek at that time.

From the time that the reservation was established, in 1873 until the termination of hostilities between the Apache and the US Army in 1886, severe discontent existed among the various groups of Apache at San Carlos. Restriction of traditional freedoms, mismanagement, and the introduction of mutually hostile Apache groups who were foreign to the arid lowlands of San Carlos contributed significantly to the general discontent on the reservation. When Clum became Indian Agent on August 8, 1874, the reservation contained mainly Indians who had been moved from Camp Grant in 1873. In 1875 Yavapais (or Mohave-Apache) were relocated from the Camp Verde Reservation to San Carlos. The following year, the Chiricahuas arrived at San Carlos, after their reservation was terminated on October 30, 1876. In April 1877, Agent Clum brought a large number of Mimbres (Warm Springs or Ojo Caliente) Apache from western New Mexico to the reservation. The area around San Carlos appeared uninhabitable to these mountain Apache people and placed them in close proximity with traditionally hostile Apache groups.

During the next ten years San Carlos was fraught with discontent, and the Chiricahuas and other mountain dwelling Apache made repeated outbreaks. Mention of Bonita Creek during this period of hostilities focuses on its use as an escape route for various groups of fleeing Apaches. Usually, Indians who left the reservation without permission were automatically considered renegades whether actively hostile or not. Fugitives frequently headed east on their way to New Mexico or to the international boundary with

Mexico. The trail that best lent itself to an escape route passed through the remote Ash Flat area and through the rough, broken country in the upper portions of the Bonita Creek and Eagle Creek watersheds. Eagle Creek was ideally situated to provide either fast access to the Gila River or a mountainous shortcut into New Mexico. To travel from most parts of the reservation to Eagle Creek, which appears in military documents as the major "escape route," fugitive Apache groups had to cross Bonita Creek watershed. Major outbreaks which warranted pursuit began in 1877 and continued until the settlement of hostilities with Geronimo's band in 1886 (Thrapp 1974).

During April 1877, Agent Clum went to the Ojo Caliente Reservation in western New Mexico to bring Geronimo's group of fugitive Chiricahuas back to San Carlos. The government terminated that reservation and expanded Clum's mission to include Mimbres Apache as well (Thrapp 1974:186-87). Victorio's band settled near old Camp Goodwin on the Gila River but disliked the desolate, malaria-infested site. In early September 1877, after a Western Apache chief was reportedly killed by some of the Mimbres, over 300 members of Victorio's group fled San Carlos for Ojo Caliente (Basso 1971:116). The cavalry pursued, following the Mimbres' trail toward the San Francisco River. The cavalry stopped at the head of "Rio Bonito" to graze their stock. They continued to the east side of Eagle Creek, and then crossed into New Mexico. They reported that the country through which they passed was "very rough" and that they were forced to walk most of the time (Thrapp 1974:197).

In April 1881, some Apache scouts took part in the Cibecue Creek uprising. Several mutinous scouts went into hiding on the northern portions of the Bonita and Eagle creek drainages. In March 1882, Juh's band of renegade Chiricahuas who had escaped to the Sierra Madres in Mexico reentered the United States. They went directly to visit Na-ti-o-tish, one of the "outlaw" Apaches camped on Eagle Creek. Juh's band went with a band of forty renegades, a group that included some mutinous scouts. From Eagle Creek they continued to San Carlos and other parts of the reservation, where, according to agency officials and army personnel, they generally stirred up hostility (Thrapp 1972:77).

Within a month, a massive desertion of the reservation took place with estimates of up to 700 Indians absent without leave. Former San Carlos agent and fort settler George H. Stevens, married to an Apache

woman and fluent in the language, observed the departure of the group. He estimated 90 warriors in the party. General Willcox estimated 150 to 200 hostiles (warriors). The fugitives included old people, children and livestock. The majority fled eastward, following the Gila River, while the warriors traveled north of the river, passing though Bonita Creek and Eagle Creek (Thrapp 1972:77).

On April 18, 1882, some Chiricahuas including Naiche, Chatto, Chihuahua and Geronimo stopped at George Stevens' sheep ranch near Eagle Creek south of Ash Flat. The widely-reported killing of nine herders and three women took place (Thrapp 1972:80). Stevens' foreman, Victoriano Mestas was a former Apache captive, supposedly captured as a boy by Geronimo and later traded to Mexican ranchers. Mestas was in charge of nine or ten Mexican herders and several White Mountain sheep herders, including subchief Bylas. The herders, who tended Stevens' 10,000 sheep, were living at the Ash Flat sheep camp, some of them with their families (Debo 1976:139-42; Thrapp 1967:237). Although not an eyewitness to the event, John Rope, one of Goodwin's Apache informants, had been told of the event by participants. He told Goodwin that the Chiricahuas arrived at the camp and began to butcher and cook some of the lambs. Geronimo became angry when Bylas, who had been drinking whiskey immediately before Geronimo's arrival, refused to share it with him. The fugitive Apaches separated the Mexican herders and their families from the White Mountain herders, killed nine of the men and three women (Basso 1971:143), but spared the Apache herders. Of the Mexicans only Mestas' third child, a boy about nine, escaped from the Apaches protected by Bylas' wife and hidden under her long skirts. The child's version of the event was widely circulated in the press.

As late as May 1882, a small band of White Mountain Apaches and at least 17 of the former scouts from the Cibecue Creek battle were still at large. They hid in the remote areas of the White Mountains, including the headwaters of Eagle and Bonito creeks. The army wished to bring in these renegades to prevent them from forming a nucleus for additional hostiles. Agency personnel did not want army operations on the reservation. In July 1882 after the chief of scouts was killed, the army secured permission and put a force in operation on the reservation. On July 17, Colonel George Crook's troops engaged the hostiles at Big Dry Wash (outside the study area), the last major battle between the army and non-Chiricahua Apache. Na-ti-o-tish and several others of the scouts were killed; the rest were dispersed and joined peaceful

settlements on the reservation (Thrapp 1972:98-100).

A band of Chiricahuas led by Juh and Geronimo that had escaped from the reservation in April 1882 remained at large in Mexico until June 1883. They hid in the more remote portions of the Sierra Madres. The group of hostiles in Mexico maintained periodic contact with other Apache bands at San Carlos. In December 1882, ranchers on Eagle Creek reported smoke signals, cattle-killings, tracks and other signs of Indian presence (Thrapp 1972:111-12). In May and June 1883 General George Crook, accompanied by an expeditionary force that included 193 Apache scouts, crossed the border into Mexico and succeeded in bringing most of the renegade Chiricahuas back to the reservation. Throughout the fall and winter of 1883-84, small groups of the Chiricahuas still at large in Mexico returned unaccompanied to the reservation until by April 1884 all of the renegade bands had been resettled (Thrapp 1972:176-77).

On March 21, 1884, Geronimo made a formal statement to Captain Crawford for forwarding to General Crook. The main concern expressed in his statement was that of finding a suitable homesite with enough land for his entire band to live together. Geronimo's people rejected Fort Apache and complained of inadequate game and mescal in that location. The heart of Geronimo's message was an appeal to live on Eagle Creek. As quoted by Crawford, Geronimo requested removal of the white settlers and a return of the land to Indian people. "There is plenty of land, plenty of grass and his people can also live there. Those Americans who live on Eagle Creek, can't their land be bought from them and given to the Indians? They take great interest in good land, as they want to farm and live like white men, and think that Eagle Creek would be good for them" (Debo 1976:206). James Parker was stationed at Fort Apache with Troops H and K of the 4th Cavalry from June 1884 through the summer of 1885. He stated that Geronimo's group was settled in a "camp on the Bonito" during the fall and winter 1884-1885. This indicated that there may have been some confusion between Eagle and Bonita creeks. Parker noted that the Apaches had considerable money. It was acquired through the sale of wild grass that the women cut and brought into Ft. Apache, and also from the sale of barley that they "cultivated in the creek bottoms" (Parker 1929:149-50).

Parker noted that the winter had been exceptionally cold with deep snows. In addition, the Apaches did not receive land on Eagle Creek. On May 17, 1885, a group of Chiricahua and Warm Springs Apache,

led by Geronimo and Mangus, made another escape from the reservation. Both Parker and Davis wrote descriptions of the army's pursuit of the escaping Apaches. The cavalry arrived at "Bonito Cañon" at night and in the dark lost the trail in the rough country. They continued toward Black River, crossing the 14-mile-long "Prieto Plateau" and then dropping into the valley of Eagle Creek (Parker 1929:153). Britton Davis noted that his troop followed the Apaches as far as the Stevens Ranch on Eagle Creek where some fugitives had decided to return to the reservation and turned back toward San Carlos. However, the arrival of Lieutenant Davis with the Apache scouts forced the group to turn around and rejoin the fugitives. Apache scout John Rope, who pursued the renegades all the way to the Sierra Madres, noted their escape route through Eagle Creek (Basso 1971:148). Parker noted finding at least five victims of the Apaches at various ranches between Bonita Creek and the San Francisco River before the Apaches escaped into Mexico in June (Parker 1929:149-167).

Again in November 1885, another group of Apaches, this time members of the White Mountain bands, deserted the reservation. They killed the herders in charge of the reservation beef herd, stole several horses, and attacked some reservation Apaches who refused to leave with them. They also escaped by the Eagle Creek trail and headed for New Mexico, pursued again by cavalry and scouts (Thrapp 1967:335). These were the last major hostile outbreaks from the reservation. In December 1885, the army made another expedition into Mexico. In March 1886, General Crook and Geronimo held negotiation in the Cañon de los Embudos. It was not until September that Geronimo surrendered, and organized resistance by the Apaches ended (Thrapp 1967:315-16).

POST-CONFLICT RESERVATION LIFE

The peace at San Carlos was one of despair and exhaustion. Deletions of reservation land began promptly and continued until after the turn of the century. The reservation remained under military administration until 1899 (Soil Conservation Service 1938:34). The government initially made a strong effort to encourage farming but gradually shifted the emphasis to stock raising (Goodwin 1937:110). According to one government official, even during the years of conflict, Apaches living on the reservation had made what

he considered "excellent progress" at farming and stock raising. L.Q.C. Lamar, Jr., son of Secretary of the Interior Lamar, made an official visit to the reservation during the summer of 1886. He reported that farming had increased and that the reservation herd had reached 4,000 (Worcester 1979:304). It is unlikely that many Apache rancherías, dispersed rural settlements, or farmsites were reoccupied. One informant indicated that in general officials discouraged settlement in the more remote areas of the reservation because it was not possible "to keep an eye" on the Apaches (S. Stevens 1992). Settlements clustered around irrigation ditches in designated farming areas and in the reservation's few towns (San Carlos, Peridot, Bylas). On the various cattle ranges, there were one or two widely separated houses occupied by the frequently changing line rider or stockman and their families (Goodwin 1937:110).

In 1881 some Apache families who had been forced to settle along the Gila River were permitted to return permanently to their former farmsites. Although it is undocumented, members of the Eastern White Mountain band may have returned at this time to Bonita Creek. The majority remained at Dewey Flats, where the reservation agent had placed them, until 1900 when the water supply failed. In that year, the people at Dewey Flats were again offered a choice of returning to their former homes or moving upstream to the modern site of Bylas, where wells had been installed. Those members of the Eastern White Mountain band who returned to their former locations in 1900 settled closer to Fort Apache to receive services at that agency. A few members of the band remained at Bylas (Goodwin 1937:112).

Apache people on the reservation continued to receive rations for several years. They relied on the sale of firewood, barley and wild hay to the military stationed both on the reservation and at Fort Grant. Jimmie Stevens, the youngest son of George Stevens who operated a cattle ranch at San Carlos, reported to Solomonville press in 1894 that the pending removal of soldiers from San Carlos was going to cause a significant hardship on the Indians, ending the market for Indian products. Apaches at San Carlos had depended on furnishing wood, barley and hay to the military post and on sale of handicraft articles to the soldiers. Stevens stated that with the soldiers gone, the market would disappear, and the Apaches on the reservation would be on the verge of starvation (GCB 10/19/1894).

Gaining a livelihood continued to be a problem for the Apache living on the reservation. After 1900

many men were forced to leave the reservation to find part-time work in agriculture, cattle ranching or mining. Farming did not prove to be as successful as anticipated. During the 1920s less than 1,000 acres of irrigated farm land had been developed on the Gila and San Carlos Rivers. Increasingly, the major tribal enterprise became stock raising. The completion of Coolidge Dam in 1929 and the flooding of the best farmland on the reservation may have contributed to the change in emphasis from farming to cattle. By the 1930s, Apaches were unable to find outside markets for their crops and even complained that their sale of produce to the traders was unsatisfactory. In addition, erosion of many of their previous farming sites had caused a new settlement pattern with increased concentration of population in a few areas. Grenville Goodwin (1937) found the population concentration excessive and inconsistent with traditional dispersed settlements in farm areas. He recommended the reestablishment of communities in many former farming sites. However, if farming were resumed along Bonita Creek at that time, its duration was brief and the impacts slight. The major impacts on the Bonita Creek drainage came from cattle grazing. These impacts will be discussed in Chapter 5.

V

LIVESTOCK GRAZING

OPEN-RANGE RANCHING: 1876-1934

The open range period of cattle ranching began in southern Arizona during the late 1870s with the importation of the first herds of breeding stock and lasted until grazing of public land was fully regulated by the 1934 passage of the Taylor Grazing Act. During this period of unrestricted access to public grazing land, occupation of the range and priority claims established the right to use the land. This public land policy, or lack of it, encouraged competitive overstocking. In the early years of the open range period, several large cattle companies dominated the cattle industry in the Bonita Creek area. Although each ranch had designated ranges, cattle could not be restricted to specific areas since ranchers constructed few fences before the early 1900s. Cattle belonging to the large companies grazed with the cattle of small ranches and "squatters" unobstructed on the open ranges. Cattle belonging to ranchers on Bonita Creek frequently strayed as far away as Duncan. Annual round ups in the spring and fall helped to sort the cattle for sale or branding. Ranchers all around Bonita Creek cooperated in the communal gathering of cattle. Each ranch sent a "rep" or representative from their ranch to assure that calves belonging to their cows received the proper brand. Larger ranches published "Round Up Notices" in the local newspapers announcing when and where the gathering would begin. A typical notice appeared in the Graham County Bulletin (3/30/1894): "All interested cattlemen to take notice . . . the Rail N Roundup will commence north of Bonita Creek on April 5, 1894 . . . cowboys to work down river to Solomonville and thence up the San Simon valley to Whitlock Cienega, etc." This roundup, which was typical of those held by the large ranches, covered an unfenced area of well over 100 square miles.

Cattle importation increased dramatically with the 1881 completion of the Southern Pacific Railroad across southern Arizona. Despite a severe drought which lasted intermittently from 1885 until 1904, Arizona

cattle numbers continued to increase. They reached their peak in 1891 when there was an estimated 1,500,000 head of cattle on Arizona ranges (GCG 10/18/1935). Cattle numbers in the Bonita Creek area also peaked at this time.

The first large herds of permanent breeding stock arrived in the area near Bonita Creek during the 1870s. This was after the establishment of military posts, Fort Goodwin (1864) and Fort Thomas (1876), along the Gila River. Near Bonita Creek, George Stevens imported the first herds of breeding cattle to his ranch headquarters on Eagle Creek during the late 1870s. Within a decade, six large companies controlled most of the public land ranges in the area. These same cattle companies also established themselves informally on the adjacent portions of the San Carlos Reservation. This situation was later legitimized through the issuing of formal cattle leases. The dominant cattle companies are described next.

DOUBLE CIRCLE RANCH

George H. Stevens, a former commissary sergeant in the US Army and reportedly a participant in the Civil War Battle of Picacho Peak, was the first cattle rancher in the Bonita Creek-Eagle Creek area. While on duty at the nearby forts, Stevens married Francisca Stevens, an Apache woman and daughter of a White Mountain chief. Stevens, who was popular with both settlers and Apaches and spoke fluent Apache, had been the acting agent at the Camp Grant Reservation on the San Pedro River immediately before the reservation's termination and had been a trader and interpreter on the San Carlos Reservation. By 1878, Stevens had established a ranch on Eagle Creek in the location that later became the headquarters of the Double Circle. Britton Davis, who spent several days at the Stevens ranch while he was the quartermaster at San Carlos, stated that Stevens was the first settler and the only non-Indian rancher in that area at the time of the visit (Davis 1929). Mormon pioneer Hiram Weech stopped at the Stevens Ranch while inspecting the Gila Valley with a mind to future migration. He noted the presence of many Indians at the ranch, who did not seem pleased with his visit (Weech n.d.:15). During the 1870s Stevens acquired a substantial herd of cattle, and by the early 1880s he had a reported 10,000 sheep. In 1880 Stevens sold his cattle to Tom Newlin. Newlin experienced difficulties during Apache hostilities and soon sold the cattle to Colonel Joseph H.

Hampson, builder of the Arizona and New Mexico Railway from Clifton to Lordsburg. In 1883, after Geronimo's attack on the Stevens sheepherders, Stevens sold his sheep as well, ending his activities on Eagle Creek. Stevens also owned the Eureka Springs Ranch, a former army supply station and stage stop in the Sulphur Spring Valley. In January 1882, Stevens became Graham County's first sheriff.

When Colonel Hampson purchased the Steven's cattle and headquarters, he initiated the Double Circle brand, the name by which the ranch was known from that time on. Hampson's brother, a Kansas City livestock dealer, was a partner in the venture until 1901. Although cattle ranged throughout the area north of the Gila River, the headquarters were on Eagle Creek. The company had several irrigated fields in which they raised corn, barley and alfalfa hay. The company ran high-grade Hereford cattle (AB 1903:45). Prominent among Double Circle managers were J. A. Terrel and Abner Wilson.

By the early 1890s when lease permits were required on the reservation, the Double Circle ran cattle on both the San Carlos and the Fort Apache sections of the Apache reservation as well as on adjacent public land. The company employed a large number of cowboys, most of whom lived in isolated camps scattered throughout the ranch and the reservation. Cattle were usually shipped from Clifton although other stations were used for cattle on the western portion of the Double Circle range.

Double Circle changed owners several times. In 1928 three Texas cattle companies located in Alpine and El Paso purchased the Double Circle for a reported price of $850,000 (GG 3/23/28). Companies belonged to several members of the Jones family, the name Jones appearing in each company's title. During the late 1920s and early 1930s, one of the owners, George Jones, was the ranch superintendent. The Jones brothers owned the Double Circle when the reservation leases were terminated and sold the ranch at that time (Mattice 1991). When the Double Circle removed its cattle from the reservation, cowboys trail herded them to Calva, an isolated station on the Eastern Arizona line 40 miles west of Safford. Hollywood film companies were present to record the loading of 2,800 head into cattle cars (GCG 7/24/1936).

THE CHIRICAHUA CATTLE COMPANY

The Chiricahua Cattle Company [CCC or Three C's] was formed during the late 1870s.

Headquarters were at Turkey Creek on the western slopes of the Chiricahua Mountains. James C. Pursley, who came to Arizona from Tennessee in 1878, was an original founder of the "Three C's". A. L. Vickers, president of the company, maintained offices in Tombstone, the closest town to the Turkey Creek headquarters. During the late 1880s, the company acquired what they called their steer range on the public domain north of the Gila River near Safford. On November 15, 1887, the Chiricahua Cattle Company purchased land from George Olney and M. E. Cunningham. It was to become the core of their operation north of the Gila River. For $3,250.00 the CCC purchased "all that certain ranch and range situated on and along the Rio Bonito Gila, adjoining the White Mountain or San Carlos Indian Reservation and in Graham County, Arizona, sometimes known as the Cunningham and Hill Ranch" (Deed of Sale, Graham Co. Recorders Office). No detailed description of the unsurveyed land could be included in the deed. The company maintained a house and office in Safford. Z. C. "Tuck" Prina was foreman of the CCC's steer range, the portion of the ranch that had cattle on Eagle and Bonita creeks, until 1890. Then Pursley took his place (SVB 8-15-90), and Theodore White was company manager in the Safford area (GCB 1/26/1894).

In 1900 the company was sold, and the name went briefly out of use. In 1908 the Boice, Gates and Johnson Cattle company acquired the stock, land and leases. It operated under that name until December 1919, when the company changed its name back to Chiricahua Cattle Company with Henry Boice as trustee. Two other members of the Boice family, Charlie and Frank, were active in the operation.

The CCC leased cattle range on the San Carlos Reservation from 1889 to 1934. A big portion of the Chiricahua's "steer" operation was on the Reservation. In 1889, the Chiricahua Cattle Company had obtained the beef contract for the army post at San Carlos. They furnished meat to army personnel and for the reservation rationing program. This allowed the Three C's to import live cattle into the area for slaughter. Initially they brought in approximately 2,000 steers, having obtained permission to run steers (only) on the range near Ash Flat. Increasingly, the company allowed cattle from their adjacent public land ranges to graze the unfenced reservation far in excess of the permitted steers for slaughter. In 1892, company managers obtained their first formal grazing lease for cattle that were not to be slaughtered, largely in recognition of the existing situation. In 1899 several Indian stockmen, who also had cattle in the Ash Flat

area, complained to the San Carlos Superintendent that the Three C's ran cattle in excess of the 2,000 permitted head. A range count revealed that the company had approximately 12,000 head, many of which were cows or heifers. After 1900, under its various owners, the company continued to lease several separate ranges on the reservation, eventually obtaining a permit for 20,000 head. Ash Flat became the center of the Three C's San Carlos operation. In 1922 the Indian Service began to withdraw parts of the leased range, and in 1925 the Ash Flat lease was reduced by 1,000 head. The last permit extended from 1927 to 1930 and was issued to John Osborne, the company's manager for the reservation operation. In 1932, Osborne was notified to vacate the range for Indian cattle before 1934 (Getty 1963:20-23). The Three C's realized that they would be forced to fully vacate the reservation ranges. The company purchased three large ranches near Nogales--the Empire, Vail, and Ashland ranches--to accommodate their reservation cattle (GCG 9/7/28).

THE TURTLE CATTLE COMPANY

The Turtle Cattle Company, or Tortuga, as it was called in Spanish, was formed during the early 1880s by Albert Bellmeyer and William Church. He was the superintendent of the Detroit Copper Company at Morenci. Cattle bearing the turtle brand on the left flank ranged from the Clifton-Morenci area to Bonita Creek and were concentrated on what later became known as Turtle Mountain. Turtle Mountain had not acquired that name during the 1883 survey, indicating that the owners of the turtle brand probably arrived after that year. During the 1890s the owners imported several thousand head of cattle, dropping them off in the Guthrie and Trujillo Canyon area where they had their horse camps and headquarters. The company stayed in operation only a few years after 1892, the year in which Apaches ambushed and killed Bellmeyer and his foreman Albert Gordonier. Bellmeyer Saddle, through which the Bonita to Clifton-Morenci Trail passes, is named for the cattleman who died there (Ridgeway 1969). The suspected killers included the Apache Kid, Natchez and Chatto. The posse, headed by George Olney, never apprehended the culprits (CC 10/25/1892). Like many other large companies, the Turtle Cattle Company ran cattle unofficially on the reservation. At sometime during the 1890s, the owners sold their cattle to members of the Parks family and returned to Texas (Lines 1991). After that time, much of the Turtle Mountain range was occupied by herds

of Angora goats. They were owned by dozens of goat ranchers who had headquarters along the Gila and in Eagle Creek (Lines 1991).

THE HAT RANCH

Records describing the originators of the Hat Cattle Company (named for the HAT brand) have not been uncovered. Members of the Parks family had an interest in the ranch before the turn of the century. By 1897 Ben Parks, brother of the Graham County sheriff, was owner or partner in the ranch. During the 1890s the company had several thousand head of cattle on ranges on the San Carlos Reservation and in lower Bonita Creek. In 1912 J. P. Robertson, a member of the L. E. Booker firm of El Paso, purchased the cattle company complete with buildings, horses and "thousands of cattle." The new company hired George Feldshaw as manager (GG 1912). In 1915 when the reservation boundary line was resurveyed, surveyors determined that the Hat Ranch headquarters, a log and adobe house that stood just north of the present reservation boundary, actually fell within the reservation (GG 11/19/15). The company also had a large line camp where they housed their cowboys in an ample cave. It was on the east side of Bonita Creek a few miles north of the present reservation fence. The cave was equipped with a concrete floor and was recalled by the Lee brothers as both spacious and comfortable. They used the cave during the 1930s as their main sheep camp. The Hat Company was later sold to the Fletcher family of El Paso who operated the ranch from headquarters in the lower Bonita Creek area. When the Fletchers sold out, Ed, Amos and Marion McEwen purchased part of the cattle along with the Hat brand. However, Tuck Prina purchased the majority of the cattle and moved the headquarters to Eagle Creek. Prina branded the P Bar P brand, and from that time on the ranch was known as the P Bar. George Feldshaw, foreman for Robertson, continued as Prina's foreman. The Hat Ranch lease on the San Carlos Reservation was terminated during the 1930s. During its later years, before the lease termination, Bill, Sam and Shorty Eaton operated the ranch (Lines 1991).

PRINA AND OLNEY

Z. C. "Tuck" Prina immigrated to the Safford area from Italy during the 1880s and became one of

the community's most important early businessmen. During the 1870s, George Olney came from Texas to Clifton where he served as a deputy sheriff. During the mid-1880s, he was in the cattle business with headquarters in Solomonville. Shortly before 1900, he opened a hardware business in Safford. He was elected Graham County Sheriff in 1890 and 1892 and representative to the Territorial Legislature in 1898 (AB 1903:45). Olney first operated a ranch on Turtle Mountain in partnership with Mark Cunningham, one of the defendants in the 1889 Wham robbery trial. Before his partnership with Olney, Cunningham had cattle on Bonita Creek in partnership with a man named Hill (CC 3/21/1887). In November 1887 Cunningham and Olney sold their cattle interests in the Bonita area to the Chiricahua Cattle Company. Olney also had cattle in a partnership with "Tuck" Prina. The Chiricahua Cattle Company purchased the Olney, Prina and Cunningham cattle in November 1887. Olney kept another herd near Solomonville, which he moved to the sheep tanks on the Gila range and later to Eagle Creek (GCB 9/28/1894).

During the 1880s, Tuck Prina ran cattle with the Triangle H brand in Bonita Creek near the reservation boundary. The Turtle Cattle Company purchased the Triangle H cattle from Prina at sometime before 1892, and the Turtle Company allowed the brand to lapse. Prina also had business interests in Solomonville (GCB 8/4/1893). Prina and Olney also were the major stockholders in the Eagle Creek Cattle Company. It was incorporated in 1910 (GG 10/14/10) with Baylor Shannon as manager (CCE 8/23/12). The Eagle Creek company ran cattle on part of the Bonita Creek watershed within the San Carlos Reservation. Prina was manager of the Safford Creamery for several years. He was responsible for the importation of the first high-quality milk stock into Graham County (GG 8/23/1907). Prina and Olney also operated the flour mill and ice plant in Safford.

THE TURNER WEST RANCH

Several descendants of the "Arkansas Travelers," Mormon converts who migrated from Arkansas to Arizona during the 1870s, ran cattle near Bonita Creek. By the 1880s, members of the West, Talley, Wilson, Stewart and Golding families operated ranches in the area. Turner West initially homesteaded with his father at Hubbard on the Gila River but later moved to Bonita Creek along with two of his brothers and several

other "Arkansas Travelers." The West brothers, John, Raleigh and Turner, ran cattle in conjunction with the Lee, Talley and Evans families. Within the group, a series of trades and purchases occurred, and the West brothers bought out several other families including the Talleys and Goldings. Among this group, Turner West ran the largest number of cattle and remained in the area for the longest time.

Turner West established his headquarters at Bear Springs (Figures 8 and 9), with additional corrals and wells at Cottonwood Springs near Slaughter Mountain where his family had mining claims. The West's dug a well at Bear Springs and put a windmill on the well several years later. They had a small orchard but did not do much farming. West moved the original two-room lumber house across the creek to a location closer to the well. In later years the Wests constructed a four-room house, which was subsequently torn down, on the same site. Raleigh West had his headquarters at Walnut Springs where he constructed a small three-room house, living there for several years. In 1920 Turner West sold part of the ranch to H. Hayes and Victor Hayes of El Paso, who purchased both land and cattle and built a bungalow at Cottonwood Springs (SW 1/4 S26 T5S R26E), north of San Juan Mine (GG 3/5/1920). The original corral and barn are still standing at the headquarters at Bear Springs.

The West family branded the TV brand (evidently intended to be a TW). Before 1900, the Wests ran "thousands of head" of cattle on the south slopes of the Gila Mountains, spreading through Eagle Creek and Bonita Creek (Mount Graham Profiles 1989:89-91). An estimated 5,000 to 7,000 head of West cattle watered at Walnut Spring, Bear Spring, Cottonwood Spring, Johnny Creek Spring and Farrell Spring. They utilized all the smaller springs on the west side of Bonita Creek between Grapevine Mountain and the reservation line. The reservation fence, constructed after the 1915 survey, formed the northern border of West's range. After the Apache tribe replaced lessee cattle with cattle owned by members of the Apache tribe, West reportedly received requests to allow stolen cattle to cross his property. West declined. West developed cattle trails from his headquarters through Johnny Creek to the Farrell ranch on Bonita Creek. Round-ups lasted for several weeks and were held in conjunction with all of the area's smaller ranchers (West 1992). West did not obtain formal leases on much of the extensive range he utilized until the late 1920s, which resulted in contention with some area's other settlers. Informants remember Turner West as an "old

school" rancher who disliked "squatters" and some area's small homesteaders (Lines 1991). In 1935, his dispute with John and Suzy George over access rights to Johnny Creek Spring resulted in George's arrest and a law suit that was eventually thrown out of court (George 1991). West reportedly resented the Taylor Grazing Act (Earven 1991). Lease records indicate a considerable reduction in cattle numbers for later years. There were between 500 and 700 head of cattle stocked on his ranges during years of normal rainfall (1929-30, 500-700 head; 1931, 500 head; 1932, 325 head; 1933, 300-400 head; 1934, 200-300 head). In later years, West operated a flour mill and lived in one of the largest houses in Safford but lost both of them in a 1930s bankruptcy. During World War II, Kennedy Curtis purchased the West's ranch.

SMALLER BONITA CREEK RANCHES

Other early ranchers in the Bonita Creek area included Elias L. Tidwell, William Kimball and Jack Farrell. Elias L. Tidwell owned the O-D Cattle Ranch in the upper Bonita Creek area, on the east side of the creek (S34, T4S, R27E). He ran his cattle on the east side of Bonita Creek and on the San Carlos Reservation. He did not file a homestead claim for any of the range he used or for the site of the residence he occupied. Tidwell ran cattle on Bonita Creek and may have lived there (at least part of the year) until 1894. He decided to move "closer to civilization" and purchased an 80-acre farm two miles below Solomonville, formerly owned by W. E. Dowdle (GCB 1/5/1894). The Tidwells continued in the cattle business near Solomonville and for many years returned to Bonita Creek for visits (Earven 1991). After Tidwell left Bonita Creek, his former ranch was occupied by Jack Farrell for one year (1896); Toppy Johnson moved there in 1897 and continued to reside at the ranch until his death in 1930. J. P. Christensen occupied the ranch until the 1960s (Figure 8 and Table 1:Site AZ W:14:14[ASM]).

William Kimball settled along Bonita Creek in 1888 and established a 20-acre farm with a fruit orchard with peaches, pears and apricots that he sold in Clifton and Morenci. The location of Kimball's farm is not mentioned. In 1894, Kimball was killed by lightening on Kimball Mountain and was buried there (GCB 1/5/1894).

Jack (J. A.) Farrell was a millwright in the Morenci area from 1884 to 1896, when he moved to the

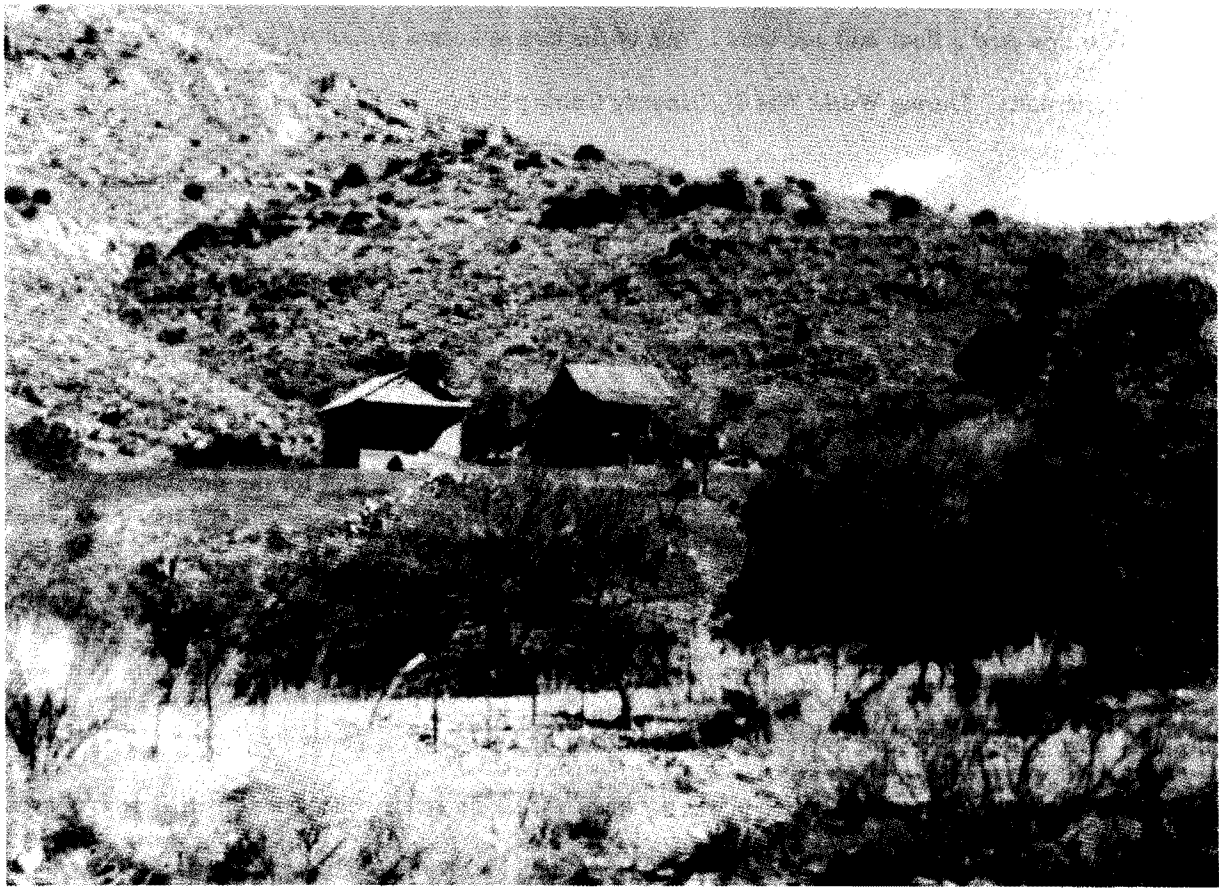


Figure 7. Original buildings, West Ranch (courtesy Kennedy Curtis).

former Tidwell ranch. Records indicate that during the first year of Farrell's residence on Bonita Creek (1896), he was the first person to file a formal claim for what had been the Tidwell ranch. In 1897, after only one year at the Tidwell ranch, Farrell and his wife Louella moved downstream to the confluence of Johnny Creek and Bonita Creek (T5S, R27E, S10). Here he established the G-L Ranch (Figure 8 and Table 1:Site AZ W:14:4[ASM]). Farrell had purchased rights from the William Kimball estate, indicating that Kimball's 20 acre farm may have been at the mouth of Johnny Creek. In 1925, Farrell homesteaded land in Sections 10 and 11. The Farrells remained in the Bonita Creek area until the early 1930s, when they reportedly went to Los Angeles where Farrell was active in the film industry. At one time Farrell reportedly ran up to 1,000 head of cattle on the range in the Johnny Creek Basin area.

Informants have mentioned several other early ranchers in the Bonita Creek area. Two brothers, Bob and Dick Warren, had cattle east of Bonita Creek. Honeymoon Cabin, located between Bonita Creek and the Double Circle ranch, is reportedly named for events in Bob Warren's courtship. Members of the Fulcher family briefly settled in Bonita Canyon, living in Toppy Johnson's stone cabin. They were implicated in cattle theft, charges which were quite common during the open range period (Ridgeway 1990). Later ranchers who arrived after the 1920s are discussed below.

CATTLE SHIPMENTS

After the 1881 completion of the Southern Pacific line, cattle were both imported and exported from the region by railroad. By 1884, local railroad lines connected the ranges north of the Gila Valley to the Southern Pacific. The Arizona and New Mexico Railway, connecting the Clifton-Morenci mines to the Southern Pacific at Lordsburg (passing through Guthrie and Duncan), were constructed by Joseph Hampson during 1883-1884 (Myrick 1980:835). The Gila Valley, Globe and Northern Railway, known as the Arizona Eastern Railroad after 1910, connected Bowie with Globe-Miami and Phoenix. Construction began in 1894 but completion was delayed by four years of negotiation for permission to cross the San Carlos Reservation. The track was not completed through to Globe until 1899. After August 1894, cattle could be shipped from Solomon (Solomonville) and other stations east of the reservation boundary. Fort Thomas, initially the

largest shipping point, shipped 5,470 head during one week in May 1895 (Myrick 1980:843). After 1896, Geronimo, the new railhead on the eastern border of the San Carlos Reservation, became the major shipping point, "with two train loads of cattle being shipped almost every day." (Myrick 1980:845). After the railroad crossed the San Carlos Reservation, Bylas became an important shipping station for reservation lessees. Cattle companies constructed extensive pens at many of the stations (Figure 9). Cattle belonging to the large companies were trail driven to the closest shipping point. Many companies, like the Chiricahua Cattle Company, controlled so much land that cattle on the eastern portion of the range were shipped from Solomonville and cattle on the west from Geronimo or Bylas.

Without the railroad, the cattle boom of the 1880s and 1890s would not have been possible. The railroad was responsible for a sharp increase in cattle numbers and greatly facilitated marketing. Despite the convenience of the railroad, ranchers battled against high shipping rates. During the early years, ranchers in the Bonita Creek area cooperated on communal roundups, driving cattle to the nearest railhead for shipment. In 1910, the railroad delayed the shipment of 1,300 cattle belonging to Prina and Olney, Bryce and Mattice, Jack Farrell, the West brothers, Jim Talley, Billy Heywood, the McEuen brothers, the Bryce brothers and J. D. Lee. The ranchers complained that the Eastern Arizona Railroad did not understand that delays caused greatly increased expenses (GG 11/25/10). By 1912, Clifton had become a major shipping point for the eastern Gila Valley. An estimated 40,000 head were shipped from Clifton alone in the spring of 1912 (CCE 5/31/12). In 1915, the Livestock Sanitary Board's quarantine against the spread of hoof and mouth disease briefly interrupted the cattle movement. Shipments were curtailed, no importation of Texas cattle was allowed, and exportation of hay from the Gila Valley to Texas was not permitted (GG 3/5/1915). In 1917, the Wests, Talleys and Farrells shipped 700 head of yearlings to California, driving them directly through the town of Solomonville to the railroad. This was the first of several spring shipments of cattle (CGC 3/4/1917). Large shipments continued to leave the Gila Valley through the 1930s, when "cattle shipments filling 30 cars were still common" (GG 5/13/1939).

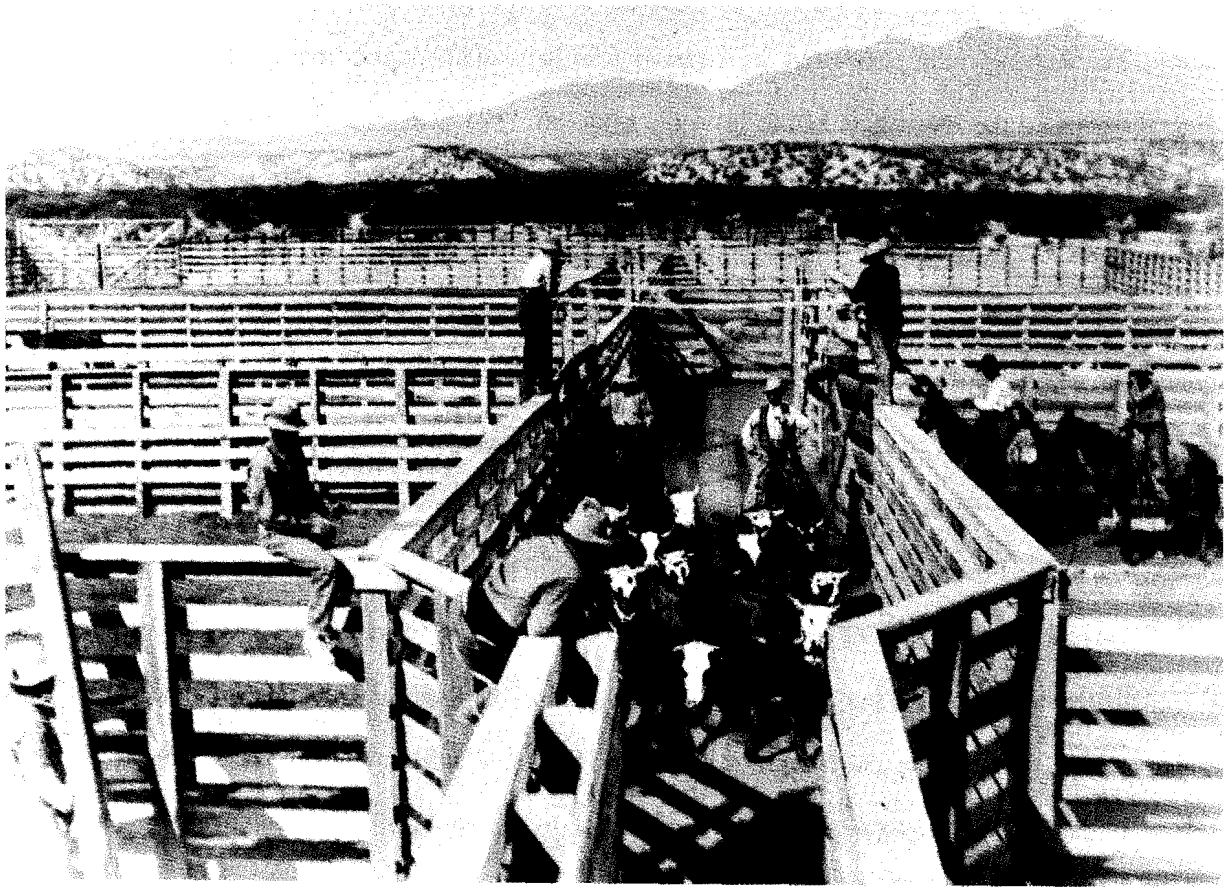


Figure 8. Cattle corrals and loading pens, San Carlos Apache Reservation, 1911, photo by Dane Coolidge (Arizona Historical Society).

LEASES ON THE SAN CARLOS RESERVATION

During the open range period of cattle ranching, no fences were present to prevent the penetration of cattle into any area that had good pasture. By 1892 an intermittent drought had plagued southern Arizona for seven years, and many non-Indian owned cattle had strayed into better pastures on the San Carlos Reservation. The agency report for August 1892 stated that several thousand head of cattle belonging to one of the adjacent non-Indian ranches were starving to death and had been allowed to graze on reservation lands. The starving cattle penetrated the reservation in such numbers and from so many directions that federal troops on the reservation had to drive the cattle off. The unnamed official who wrote the report believed that a number of these non-Indian ranches "were located with the view of such grazing on the Indians lands" (Getty 1958:2).

By 1895 the government sanctioned non-Indian grazing leases, issuing leases to other non-Indian ranchers in addition to the Chiricahua Cattle Company. This was done partly as a recognition that Apaches and agency officials were unable to keep non-Indian cattle off the reservation. Grazing fees, or taxes as they were called, did not cover all the non-Indian cattle on the reservation. According to the 1895 report, the reservation unquestionably contained "many cattle whose owners do not pay for them" (Getty 1958:2). Lease fees for counted cattle were initially as low as $.50 and $1.00 per head of grown cattle per year, and eventually increased to $2.00 per head. Everyone involved in the San Carlos leasing program agreed that undercounting, overstocking and overgrazing continued unabated until non-Indian leases were terminated (Getty 1958:2-3). Agency reports frequently noted that Indian cowboys found it difficult to control the "chronic and willful trespassers" who turned unauthorized cattle on to the reservation and ran them off at "opportune times" without paying fees (Getty 1963:14).

The earliest grazing lease, quietly obtained by the Chiricahua Cattle Company in 1892, permitted 2,000 head on Ash Flat. These were ostensibly steers intended to supply the Apaches with their beef ration. Other cattle companies soon obtained leases, and by 1900 the Double Circle, Bar-F-Bar and Bryce-Mattice companies all had cattle on the reservation (Getty 1963:13-15). Many of these companies practiced intentional overstocking, particularly since the territorial government and the San Carlos Reservation did not

have personnel to adequately monitor range numbers. Between 1911 and 1917, one company (unnamed in the agency report) which had a permit for an average of 20,000 head of cattle and horses per year frequently ran between 5,000 and 8,000 head in excess. During the first years of their leasing agreements, the Chiricahua Cattle Company had consistently run 12,000 head instead of the permitted 2,000 (Soil Conservation Service [SCS] 1938). Dr. John F. Lasley, manager of the Apache tribe's registered herd during the 1940s, stated that "in June 1916, actual counts of cattle on the reservation at roundup time showed 50,000 head in addition to about 10,000 wild horses. Agency records suggest that possibly 100,000 head of livestock of all ages were present on the reservation at that time" (Lasley 1988:1.7).

As a result of the continual trespass, complaints by Indian stockmen, and affidavits filed by reservation officials, bad relations developed between the lessees and the Indian Service. In 1917 one San Carlos superintendent noted that lessees had driven cattle at night to avoid scheduled counts on the following day. When range counts were performed, excess livestock were found in even greater numbers than appeared in the formal complaints filed against lessees (Getty 1963:13-15). By 1920, 1,080,000 acres of the reservation were under lease to non-Indian ranchers with total grazing fees of $80,000. "The Whites who were paying grazing fees on 40,000 cattle were probably grazing half as many again. The range was being destroyed" (SCS 1938:36).

Initially, the leased ranges were unfenced, and only imaginary lines separated them, making it difficult to perform surprise checks. To add to the confusion, many leasing cattle companies had overlapping boards of directors, with one individual appearing as an officer of several companies. When one company received a trespass complaint, an officer of that company could state that the excess cattle were actually making up a deficit for another company with adjacent range of which he also happened to be a director. Extremely rough country and frequent cattle theft further complicated the leasing situation in the Bonita Creek area (Getty 1963:15-16).

Each lessee was required to renew his lease in Washington every five years. Stocking rates were given at the time of renewal and were decreased or increased from time to time (Mattice 1991). Grazing fees varied but by the 1930s the San Carlos Tribe charged from $1.00 to $2.00 per head per year. Lessees

were expected to pay for and construct the fencing needed on their ranges. However, when lessees built fences, the reservation gave them credit for the construction and reduced their lease payments by that amount. The fences were often inadequate.

Non-Indian reservation lessees in the immediate area of Bonita Creek between the 1880s and the early 1930s included the Hat Cattle Company, the Turtle Cattle Company, the Chiricahua Cattle Company, the Double Circle, and the Bryce Mattice Cattle Company. These large ranches established themselves before the turn of the century and ran cattle in the area for 40 to 50 years. Several additional small ranchers may have been using San Carlos ranges unofficially.

In 1910, a system of numbered range designations clarified the leasing process (Figures 11-13). The number designations were changed to letters within a few years. The study area coincides with portions of four separate ranges including Range M, Range G, Range E and Range F. Starting at the northern portion of the study area and proceeding southward down the drainage, Range M (formerly Range 9) contained the headwaters of Bonita Creek and Ash Flat; Range G (formerly 10) contained a small part of the Turtle Mountain portion of the study area and consisted largely of the headwaters of Eagle Creek; Range E (formerly 11) was the more northerly section of two ranges along Bonita Creek; and Range F (formerly 12) extended south along the creek to the reservation fence (Getty 1963:17-18). Until the early 1930s, few of the range boundaries were fenced, and few contained internal fences.

The Chiricahua Cattle Company continued to lease its original area, now designated as Range M. The range included the headwaters of Bonita Creek, extending north to the Black River. By 1913 the permit had been increased from 12,000 to 20,200 head (with fees of $28,280.00). In 1921, 20,000 cattle and 500 horses were permitted. In 1928 the company received notification that it would eventually have to vacate, and permits were reduced at that time. However, until 1930, the Chiricahua Cattle Company had permits for approximately 20,000 head.

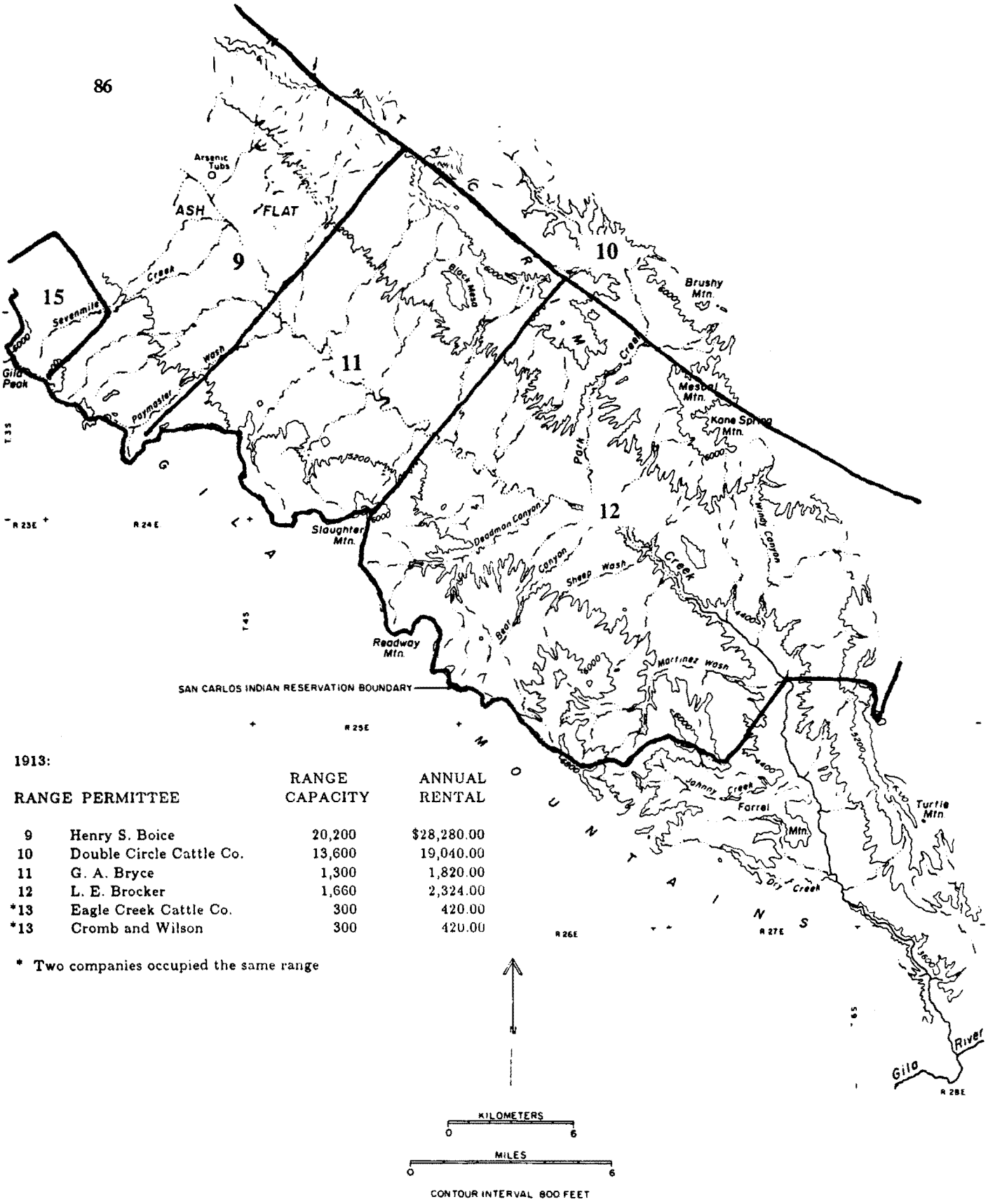
The Double Circle leased Range G in the Turtle Mountain area east of Bonita Creek, extending toward the headwaters of Eagle Creek. In 1913 the Double Circle ran 13,600 head (for payments of $19,040.00). In 1913, a small range called Range 13 at the extreme northern part of this area was also leased

to the Eagle Creek Cattle Company and Cromb and Wilson, with double permits for 300 head each. This small range was soon incorporated into Range G. In 1916 Range G was expanded to include the former Eagle Creek Cattle Company area, and by 1921, the Double Circle permit was expanded to 14,100 cattle and 300 horses. In some years the name of John Landergin, the foreman of the company, appeared on the lease.

The Bryce Mattice Company leased Range E. Prior to 1910, the company had a lease for 6,000 head. Later it was cut down to 5,400, and during the early 1920s the lease was reduced to 2,000 head of cattle and 80 horses. The Bryces and Mattices were Mormon immigrants from Utah who arrived in the area during the early 1880s, descendants of Ebenezer Bryce. Their headquarters were on Bonita Creek within the reservation boundary. Another large camp on the Bryce lease was at "Deadman."

It was named for sheep-rancher William Slaughter, who during the 1870s had been killed by Indians on the mountain subsequently named for him. The Bryce Mattice Company also had a shed at Slaughter Camp and had developments at Coyote, Big Spring, Bob's Flat and Markham Creek. One portion of the Bryce Mattice lease was known as Hells Half Acre. It was so steep and brushy that cattle could not get through large portions of it. In 1916 or 1917, the company fenced the area along the top of the mountain from Bear Canyon to Big Spring to Hells Half Acre and Bonita Creek (Getty 1963:16-21). From 1927 to 1933, G. A. Bryce leased Range E alone. In 1933, the Apache agency constructed a fence through the center of the range to induce him to vacate.

Range F was leased to the Hat Cattle Company. The range was bordered on the north by Bryce Mattice. The Hat Company originally built its headquarters on land that they considered immediately south of the reservation boundary on non-Indian public land. However, the 1915 resurvey determined that the headquarters were actually on reservation land. The company continued to lease the range and use the original headquarters until the lease was terminated in the 1930s. The Hat Company, or their agent, had permits for approximately 2,000 head until the early 1920s. This was in contrast to the more northerly ranges on Bonita Creek. Where one company leased the range for almost the entire period, in which leasing was permitted. Range F had a series of non-Indian lessees, including L. E. Brocker between 1913 and 1923 (1913 for 1,660 head); the Bonita (or Three Circle) Cattle Company (1916 for 2,050 head); L. W. Samuels (1921

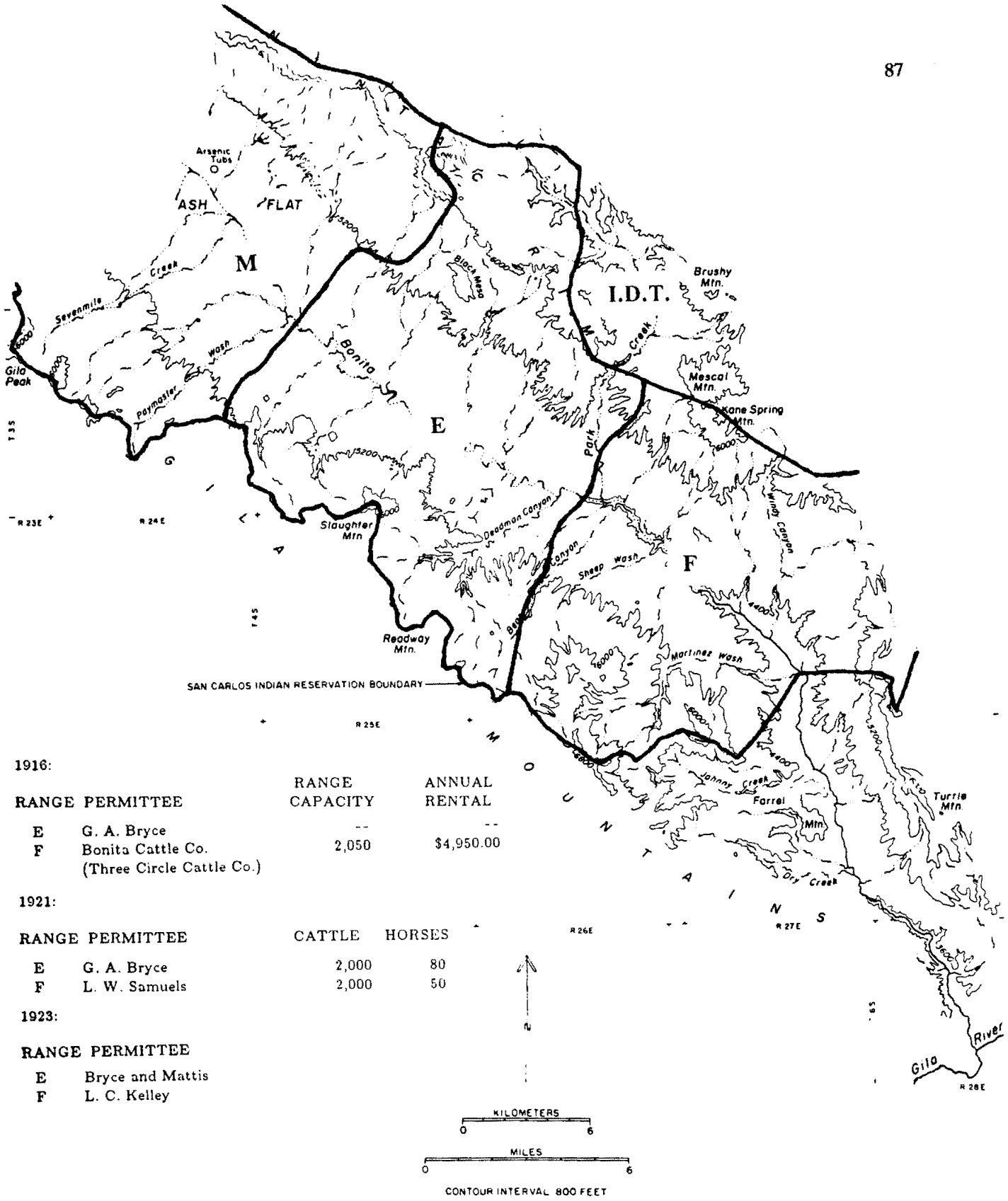


1913:

RANGE	PERMITTEE	RANGE CAPACITY	ANNUAL RENTAL
9	Henry S. Boice	20,200	$28,280.00
10	Double Circle Cattle Co.	13,600	19,040.00
11	G. A. Bryce	1,300	1,820.00
12	L. E. Brocker	1,660	2,324.00
*13	Eagle Creek Cattle Co.	300	420.00
*13	Cromb and Wilson	300	420.00

* Two companies occupied the same range

Figure 9. San Carlos Indian Reservation, Cattle Ranges in Bonita Creek Watershed, 1910 (data from Getty 1963).



1916:

RANGE	PERMITTEE	RANGE CAPACITY	ANNUAL RENTAL
E	G. A. Bryce	--	--
F	Bonita Cattle Co. (Three Circle Cattle Co.)	2,050	$4,950.00

1921:

RANGE	PERMITTEE	CATTLE	HORSES
E	G. A. Bryce	2,000	80
F	L. W. Samuels	2,000	50

1923:

RANGE	PERMITTEE
E	Bryce and Mattis
F	L. C. Kelley

Figure 10. San Carlos Indian Reservation, Cattle Ranges in Bonita Creek Watershed, 1937 (data from Getty 1963).

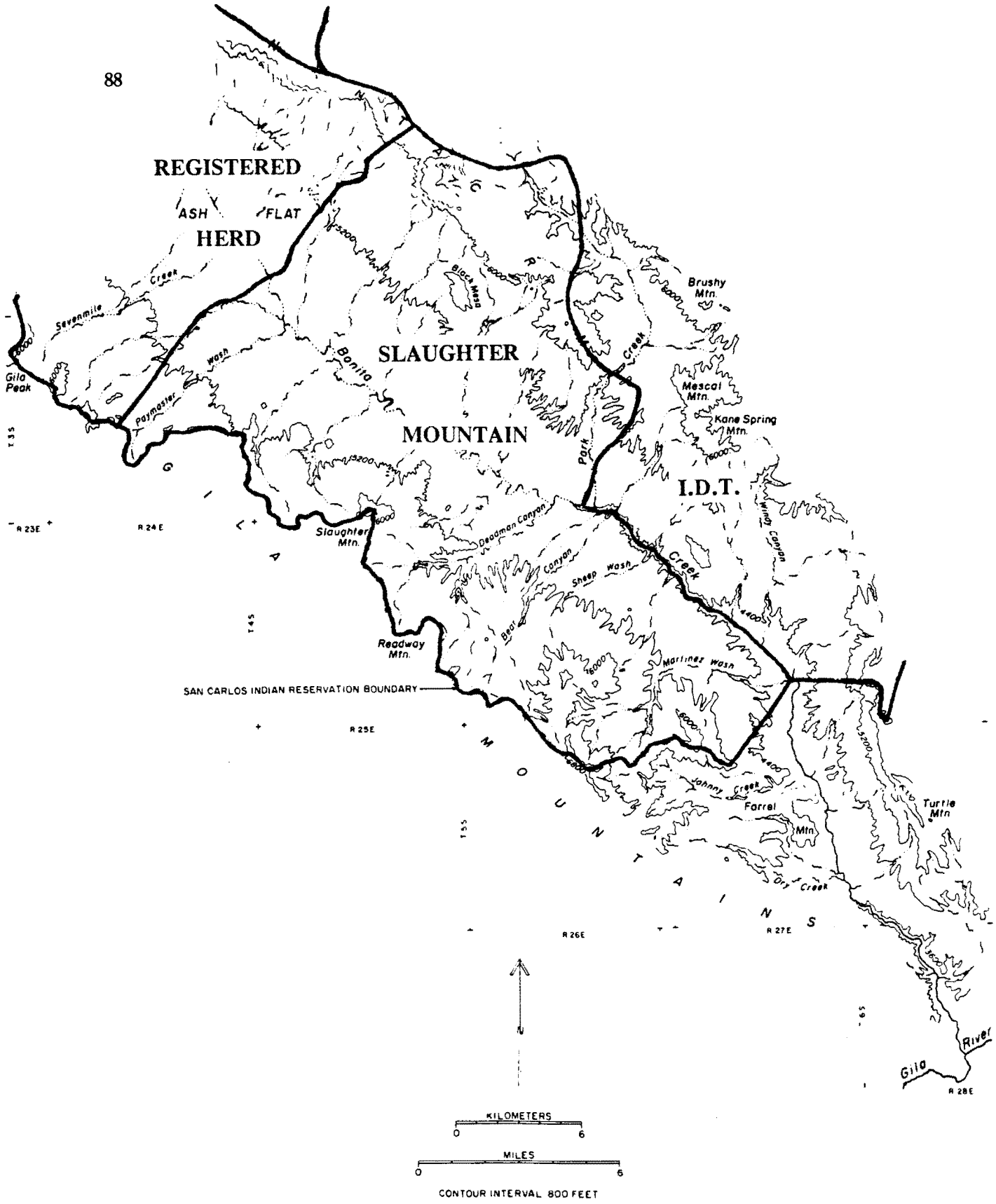


Figure 11. San Carlos Indian Reservation, Cattle Ranges in Bonita Creek Watershed, 1953 (data from Getty 1963).

for 2,000 cattle and 50 horses); L. C. Kelly (1923, no numbers given [Kelly sold the majority of his cattle to the Point of Pines Association of San Carlos, and the remnant to J. M. Smith]); Boyd Fury (1928 to 1930 for 2,000 head); the Double Circle (1929 for 2,000 head); and the Lee Brothers, who took over the southern portion of the Double Circle lease in Range F (1929-38), for 5,000 sheep. In addition to the Lees' sheep, the Double Circle continued to run 1,000 head of cattle on the northern portion of Range F. The Double Circle vacated the range in 1937, and the Lee brothers removed their sheep on May 1, 1938 (Getty 1963:16-24).

The Lee brothers had the only sheep lease on the San Carlos Reservation in the Bonita Creek area. Between 1927 and 1938, the Lees had between five and 10 bands on the reservation. When they arrived in 1927, some of the Hat cowboys, Boyd Fury and Slim Mackey, were still working the remnant of the Hat cattle. The Lees' sheep lease was for 5,000 head. The unfenced range was shared with the Double Circle, whose lease was reduced from 2,000 to 1,000 head of cattle when the sheep permit was issued. The Lees used the former Hat Ranch headquarters as a sheep camp. When they arrived, the original house was still standing, a cabin of adobe and hand-hewn logs with port holes through which rifles could be shot. Behind the house was a tunnel and cave for meat storage. The Lees also had a second sheep camp in a large cave that had a cemented floor, located below the Bonita Creek headwaters. Nearby, they created a ram pasture. This was done by rolling a rock from the bluff above the cave into a side canyon to back up water and block the exit (Lee 1991).

Sheep were watered in several locations throughout the pasture. Including the perennial portion of Park Creek near its headwaters and the "Windmill" (on a hand-dug open well) half way between the headwaters of Bonita and Park creeks. The Lees sunk the well at the windmill camp 70 to 80 feet deep and shored it with cedar posts. It had a live stream at its bottom at bed rock. They constructed a tent-cabin with board sides and a canvas roof nearby. Additional waters were located at Windy Spring, which had a 300-foot-long metal trough; at Midnight Dam, constructed with the assistance of the BIA several miles east of Bonita Creek; and at the Bonita Creek headwaters, above the cave but downstream from the windmill. Bonita Creek extended through the middle of the entire sheep range but ran water only during the wet seasons of the year. Sheep do not have to be watered on a daily basis and can go for extended periods without water during the

winter. The Lees were able to utilize more of the waterless sections of the Bonita Creek pasture.

The Lees ran Rambolais sheep with occasional Suffolks for meat. There were no internal or external fences on the entire sheep range. Only the buck pasture was separated out and was fenced with sheep wire and natural barriers. Each band was turned out with a herder and a camp tender. Each sheepherder had four or five burros that carried 10-gallon wooden water kegs for the herder's use. The Lees employed up to 20 herders and a full-time trapper, who trapped and poisoned predators, lacing carcasses with strychnine pills (Lee 1991). The only shearing pen was located on a ridge near Pima Gap, as close to town as possible. Each band came in for shearing separately to avoid mixing of animals. Fifteen to 20 shearers, who supplied their own equipment, sheared the sheep. Wool was stuffed into 300 pound bags and shipped in a box car from Safford to wool markets in Uvalde or Galveston, Texas. Sale of wool paid the expenses, and sale of lambs made the profit (Lee 1991). According to informants, reservation officials issued the sheep lease anticipating that sheep might have a beneficial effect on the pasture for future cattle grazing. Since sheep prefer to graze annuals, they reduce the density of annuals before grazing the perennial bunch grasses, which are preferred feed for cattle. The lessees were of the opinion that after 10 years with sheep on the range, annuals had diminished while perennial grasses were unaffected (Lee 1991).

The effort to terminate leases began in 1923. The arrival of Reservation Superintendent James Kitch was largely responsible for the expansion of the Indian-owned-and-operated cattle industry and the replacement of non-Indian owned cattle with Apache-owned cattle. Many observers viewed the effort to terminate non-Indian leases as a "battle against the cattle barons" (SCS 1938). When Kitch arrived, his San Carlos Range Management Plan had been tentatively approved by Commissioner of Indian Affairs Charles H. Burke. It took years to implement removal of non-Indian lessees and to expand the San Carlos cattle industry (SCS 1938:37). The year targeted for the termination of all leases was 1934. This was a year that also marked the end of the open-range system of public land stock raising and a complete reorganization of the cattle industry in the Southwest.

SAN CARLOS APACHE CATTLE INDUSTRY

The Open Range Period

The Western Apache had horses and cattle for at least 100 years prior to the establishment of the San Carlos Reservation. Stock-raising was not a widespread activity in pre-reservation times, nor did it form a major component of pre-reservation economy. The Western Apache acquired horses, mules, burros, cattle, cloth, clothing, blankets, metal and other lightweight, mobile articles through raids. The Apache raided the Pima, the Tohono O'Odham (Papago) and Hispanic residents throughout an enormous territory in Sonora. Most of the livestock collected in the raids were slaughtered immediately. The raiders brought some animals back to the home ranchería for food or for trade to other groups of Indians or to residents of New Mexico. According to Grenville Goodwin, the "animals obtained were commonly killed and eaten, as the Western Apache made little effort at raising stock in pre-reservation times" (Goodwin 1942:93-94). A few chiefs, however, particularly among the White Mountain Apache, raised small herds of cattle and bred horses (Goodwin 1937:112). During the 1870s, prior to the reservation-instigated cattle industry, a few enterprising individuals had initiated herds of their own.

The reservation rationing system was largely responsible for initiating the cattle industry as it is known today. After the establishment of the reservation in 1873, all resident Apache were guaranteed a regular weekly ration of food and other supplies. The practice of a general ration offered an opportunity to count the number of Indians present on the reservation. This was continued until 1904, at which time rations were limited to indigent Indians. Cattle for the rationing program were initially driven to the reservation, slaughtered, and meat was issued to heads of families. However, many individuals at the agency were anxious to obtain live cattle. They chose to save their weekly issue of beef until they had sufficient credit in rations to draw one or more cows. In 1877, Agent John Clum noted that "many principal men have fine herds of sheep, cattle, and many horses" (Getty 1958:2). Clum may have been exaggerating because in 1878, the total number of stock owned by the approximately 5,000 Indians on the reservation included only 521 cattle and 760 sheep. The largest individual herd accumulated consisted of 43 head. By 1886, individual savings received from deferred beef rations for the year had been sufficient to purchase 1,633 yearling heifers through

the government rationing program. In addition, some Apache families purchased cattle from off-reservation ranchers.

During the late 1880s, the government began issuing stock cattle directly to heads of families for the purpose of starting individual herds. According to an elderly Apache informant, in 1884 the government made the first direct issue of stock cattle outside the rationing system. Each family received five head of black beef cattle, and although many families chose to slaughter them immediately, others began their herds. A subsequent issue of live cattle were Durhams, most of which were promptly slaughtered because they were unpopular with the Apache (Getty 1963:12). Despite these efforts, the total number of Indian owned cattle remained small, and they grazed only the ranges near the Gila River.

During the open range cattle boom of the 1880s, non-Indian cattlemen quietly began to graze their cattle on reservation ranges. From 1880 on, non-Indian cattle comprised by far the majority of all cattle on the reservation. The long drought of the late 1880s and early 1890s encouraged trespass on Indian lands. Since no fences had been constructed to prevent starving cattle from migrating to any range that had forage or water. In 1895, reservation officials began issuing leases and charging small lease fees to non-Indian cattlemen, legitimizing a situation that had existed for 15 years. However, the lease fees were small and requirements for range improvements were almost nonexistent. In 1895 the sum of $4,000, received in annual grazing taxes, was used to buy stallions and operate the grist mill (Getty 1958:2).

During the first three decades of the twentieth century, the Indian owned cattle industry grew slowly. In 1908, 500 head of cattle were issued, with the intention that they were kept as stock. However, because of food shortages many of them were surreptitiously slaughtered. In 1913 the reservation contained 3,000 horses and only 790 head of Indian-owned cattle. In 1914 the San Carlos Apache Tribe established a tribal-owned herd. By 1919 tribal-owned bulls were registered with the American Hereford Association. The object of the tribal herd was to form a supply pool for individual Apache ranchers, and high quality bulls and heifers were sold to individual Apaches. By 1923 approximately 285 Indian heads of families, about half of those on the reservation, collectively owned only 2,500 head of cattle (Getty 1963:27-28).

After the leased ranges had been vacated and restocked with Indian-owned cattle, the estimated

stocking rate was reduced by at least half to approximately 25,000 to 33,000 head. Although no stocking numbers are available on a year-to-year basis between the early 1880s and the early 1930s, up to 70,000 head of non-Indian owned cattle grazed the San Carlos ranges, with many head intentionally in trespass and uncounted, making accurate estimates impossible. Some observers familiar with the non-Indian leasing system estimated that stocking rates may have been as high as 100,000 head (Lasley 1988:1.11). After Indian cattlemen took over the reservation ranges, superintendents repeatedly complained that the shortage of livestock-management personnel made it impossible to manage the cattle properly. In general, the collective impacts from cattle, Indian and non-Indian owned, were intense during the entire period from 1885 to 1934. After termination of non-Indian leases, overall cattle impacts diminished. However, certain areas of heavy use continued to be abused.

San Carlos Cattle Management After 1923

During the 1920s and 1930s under the direction of Superintendent James Kitch, non-Indian leases were gradually terminated and ranges were restocked with Indian-owned cattle. Kitch and other reservation officials targeted 1934 for elimination of all non-Indian lessees. Opposition from lessees was expected. However, many Apaches, some of whom had worked as cowboys for the lessees, unexpectedly opposed removal of the cattle companies as well. With the assistance of his stockman, Hiram E. Brown, Kitch gradually canceled the leases and placed Indian-owned cattle on all the ranges. Gradual lease termination began in 1924 when a portion of the Chiricahua Cattle Company's range was vacated. It ended in 1938 when the Double Circle removed their cattle (Getty 1963:26-27).

Under Kitch's direction, both the quantity and the quality of Indian cattle improved steadily. Prior to 1923, Indian-owned cattle had only been on the range adjacent to the Gila River. When Kitch arrived in 1923, there were 2,033 poor-quality Mexican cows in the Tribal Herd and 1,995 individually owned Indian cows. Only 797 calves were branded that year (SCS 1938:30). During the mid-1920s the tribe began to employ a stockman to manage the increasing numbers of Indian-owned cattle. As the leases were terminated, the numbers of Indian cattle increased. By 1932 the ranges had 16,000 head of Indian-owned cattle under

approximately 600 different brands. By 1938 members of the tribe ran a total of 25,309 head, and ranges were stocked almost at the estimated carrying capacity of 27,957 head (SCS 1938:24).

Reservation officials promptly initiated extensive range improvements. The big push to repossess the leased ranges coincided with the devastating drought of 1933-1934, the Taylor Grazing Act of 1934, and the subsequent initiation of many New Deal range and soil conservation programs. These programs benefitted the San Carlos Tribe. Between 1933 and 1935, in conjunction with the reduction in stocking rates, the government spent nearly 1,000,000 dollars on range improvements including water development and fencing. The Indian Division of the Civilian Conservation Corps (CCC) constructed many dams, drilled wells and built windmills. The Soil Conservation Service (SCS) provided funding and designed management programs. The reservation obtained E.C.W. financing for the construction of 90 earthen dams (average depth 18 feet, average storage 30 acre feet), and for the development of 120 springs with concrete spring boxes and water pipes to 4 x 12 foot concrete stock troughs (SCS 1938:2). The SCS recommended the future rebuilding of several hundred deteriorated wild-cattle traps to protect salt sites and water sources from excessive use (SCS 1938:26). Figure 13 shows grazing-related improvements that were present on Apache lands in the upper Bonita Creek Watershed in 1945. Figure 14 presents several views of ranching in this area in the 1940s.

As on the surrounding public lands, a large number of wild horses and burros grazed the San Carlos Reservation during the open range period. Between 8,000 and 10,000 wild "ponies" were still on the reservation during the late 1920s. Superintendent Kitch called for a removal program at that time (SCS 1938:30). In 1931 the stock reduction program began an effort to kill all of the wild horses on the reservation. A considerable number of the horses killed were gentled saddle horses and had been broken to ride. Apache ranchers expressed strong resentment over the horse slaughter, particularly since it left many individuals without enough riding horses to tend their cattle. As a result, the government purchased 500 saddle horses and distributed them, one to each man who had five horses bearing his brand killed during the reduction program. This indicates that in addition to an unknown number of actual wild or unclaimed horses, at least 2,500 branded horses had been killed on the reservation. The replacement horses were purchased

locally and were reportedly of inferior quality and old (SCS 1938). Wild, and possibly owned, burros also created a nuisance. Apache farmers sometimes cut their tails or ears when they damaged field crops (Goodwin 1937:124, 65). Many burros were disposed of at this time. Some poor quality wild cattle were evidently still present on the reservation as late as 1938. The Soil Conservation Service report mentions that the reservation contained several hundred deteriorated wild cattle traps. This indicates that wild cattle had been a problem for non-Indian lessees prior to the 1930s (SCS 1938:26).

During the early 1930s, when the Indian Service and individual Apache stockraisers took over the ranges, they found them in severely deteriorated condition. Range managers estimated that for up to 50 years the 70,000 head of non-Indian owned cattle had grazed the reservation without any rotation. Large sections of the reservation were without water sources. Areas around the existing water tanks were severely overgrazed. Practically all of the fences constructed by the former permittees were made of low-quality materials and were in a deteriorated condition. Soil Conservation Service range specialists did not consider that erosion was particularly serious. However, they thought that the presence of excessive numbers of predators (including coyotes, bobcat, mountain lion and occasional timber wolves) was a threat to cattle raising (SCS 1938:25,5).

During the early 1940s, the tribe began an artificial insemination program. This was to improve the quality of the registered bulls that were distributed to the associations (Figure 13:Insemination Laboratory and Figure 14d). At the same time, range conservationists began to urge reduction in total cattle numbers with the increase in cattle quality. By the late 1940s, the San Carlos cattle business experienced a "boom" in comparison to previous years. The ranges carried fewer cattle which produced higher calf crops. This brought much higher sale prices because of the higher quality (1.5 million dollars of cattle sold in both 1948 and 1949) (Lasley 1988:9.4). During the late 1940s, reservation officials began a program of tree and brush removal, concentrating on extirpation of junipers which killed out native grasses. Range conservationists used both bulldozers and chains dragged between large caterpillar tractors to remove unwanted vegetation (Lasley 1988:9.6).

When Apache cattlemen began running their own cattle, they chose to organize a reservation-wide

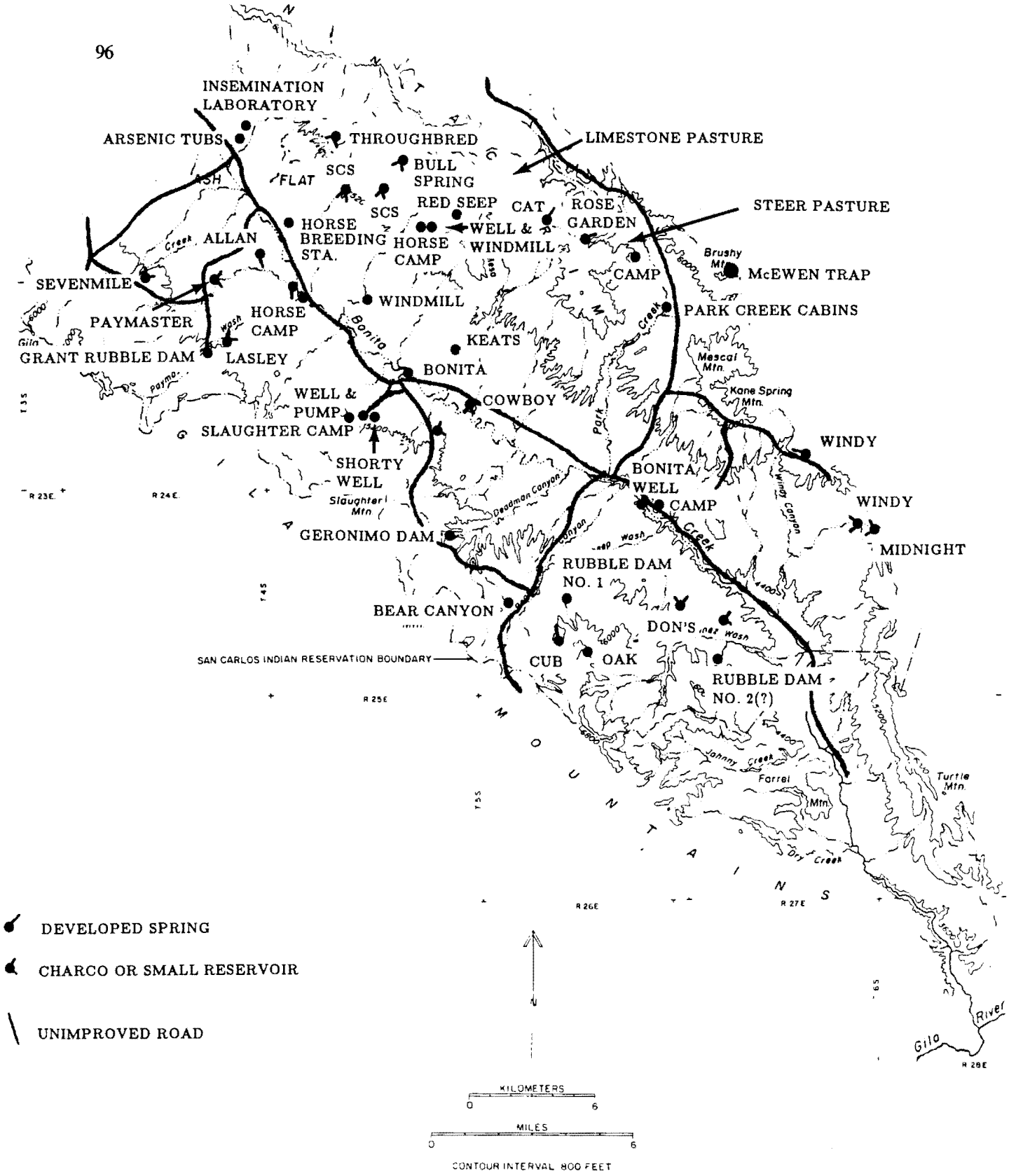
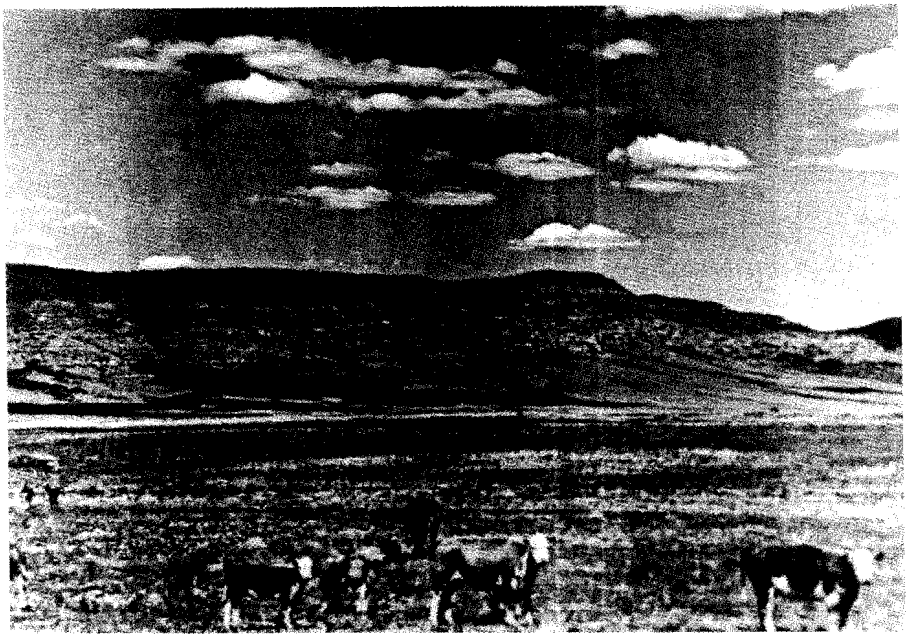


Figure 12. San Carlos Indian Reservation, grazing-related improvements, Bonita Creek Watershed, 1945 (data from Department of the Interior 1945).



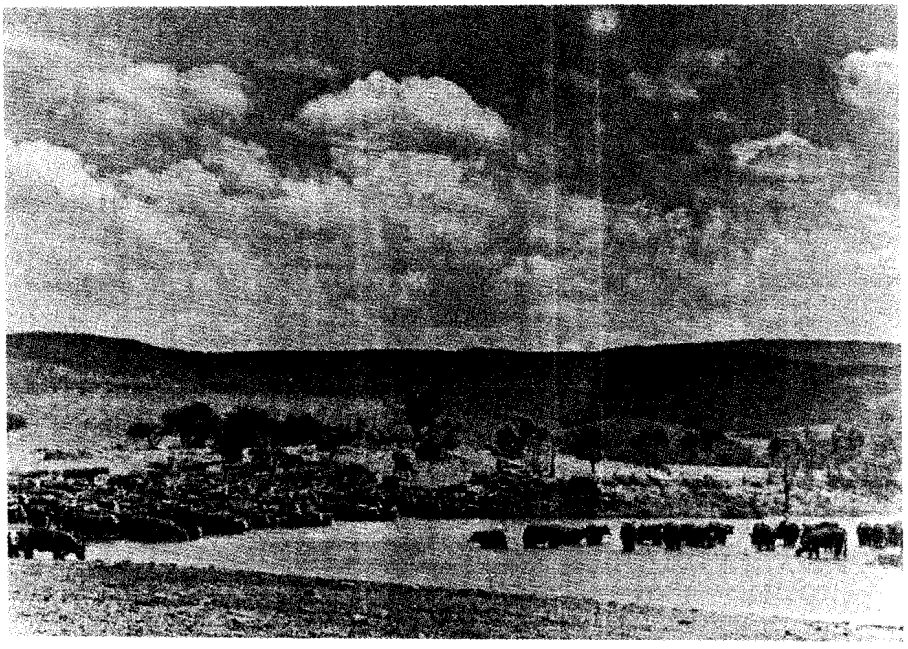
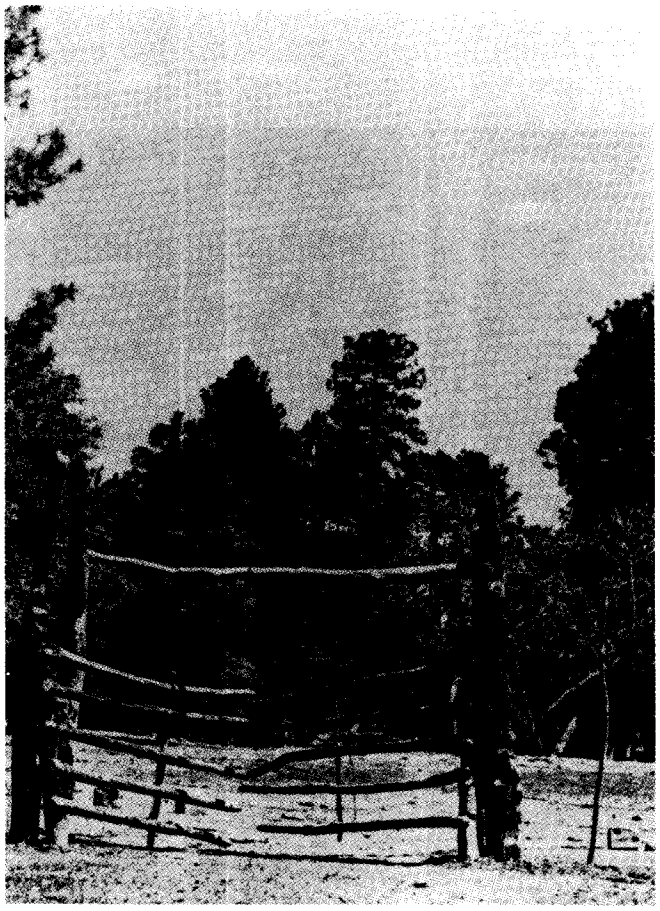


Figure 13. (a) Cattle on Ash Flat, early 1940s; (b) Cattle near tank on Ash Flat, early 1940s (courtesy John Lasley).



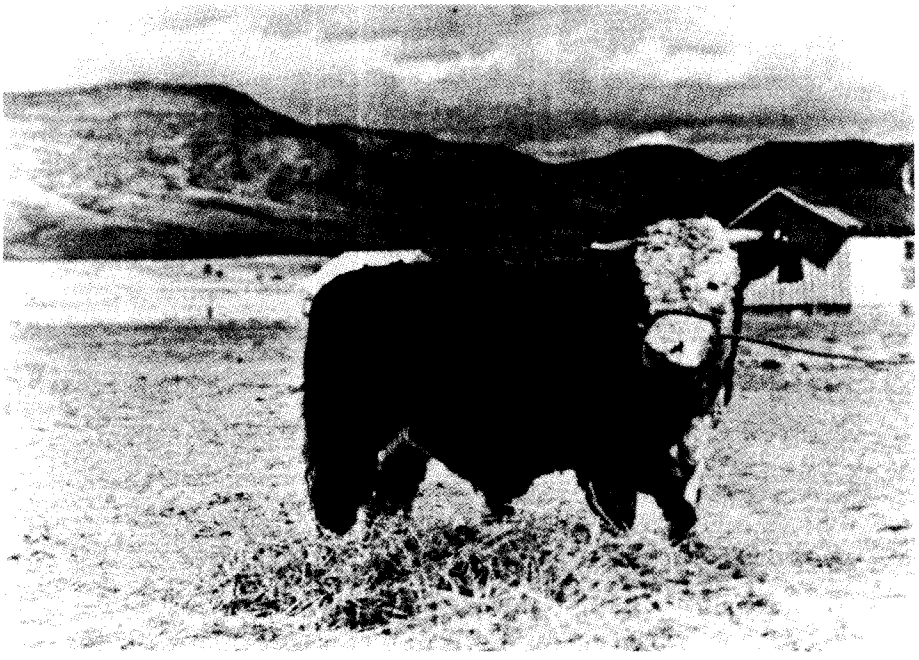


Figure 13a. (c) Wild cattle trap on Slaughter Mountain Unit, early 1940s; (d) Prize winning registered bull, Ash Flat headquarters in background, early 1940s (courtesy John Lasley).

livestock association. The San Carlos Stock Association (or Livestock Association), formed in May 1926, was intended to improve the organization of the cattle business on the reservation. During the 1930s, Superintendent Kitch assisted with the development of a number of smaller, more manageable stock associations, with each association operating on a specific range (Getty 1963:32-35). Initially each association consisted of a nucleus of related families but membership additions made the kinship relation negligible. By 1938 the remaining 1,627, 804 acres of grazing land within the reservation were assigned to nine separate grazing associations. By 1942 there were 11 associations, and during the late 1940s there were 13. They are still operated today (1992) in much the same manner. Each association owns a herd, and members of the association own individual herds, not exceeding 70 head per family. Cattle are restricted to the specific range belonging to the association. The area assigned to each association determines the number of members and thus the number of cattle an association may have. Any resident tribal member may apply for membership in an association and on acceptance is issued 20 yearling heifers. Their price must be repaid (plus two heifers) within seven to eight years. Each association employs a stockman or full-time cowboy to care for the cattle on their range. Association members are expected to assist the stockmen when gathering cattle for branding or sale. All cattle receive both individual and association brands, and excess cattle are sold at auctions through the association (Getty 1963).

The tribe continues to maintain two separate tribal herds, a registered and a grade herd, each on separate ranges. Cattle in these herds are all Herefords. Sale of cattle from these herds benefits the entire tribe. Bulls from the registered herd are issued to all of the association herds (Getty 1958:3). The registered herd has an 89,000 acre range with a carrying capacity of approximately 1,000 head, and the grade herd grazes the 14,700 acre IDT Range (Figure 12), which has a carrying capacity of 2,000 head. Sale of cattle from this herd benefits the "old folks" welfare program. Prior to the 1930s, the Indian Service maintained stallions on the reservation for breeding purposes. The tribal horse herd grazed in the IDT pasture until the cattle associations determined that loss of colts from lion predation made the herd unprofitable. Each association currently owns a horse herd for use in cattle work. Although cattle numbers have been limited from the time the associations began, horse numbers were without limitations until the early 1960s (Getty 1963).

San Carlos Grazing Units

In 1938, Soil Conservation Service range specialists surveyed all of the ranges on the reservation. The range management team stated that the reservation contained some of the best grazing land in the Southwest. They produced carrying capacity estimates for each individual range and estimated the total capacity to be 28,000 head. They thought that with the necessary range improvements and proper care the total grazing range within the San Carlos Reservation could support up to 55,000 head within a few years (SCS 1938:25). However, this stocking rate was not quickly achieved, and as late as 1957, the Land Operation's annual report counted a reservation total of only 27,000 head, for the most part owned by individuals within livestock associations. The Bonita Creek Watershed fell within two major ranges, the Slaughter Mountain Range (Range E) and the Bonita Range (Range F) (Figure 11). In general, the 1938 SCS report considered that the ranges contained within the Bonita Creek drainage were not severely deteriorated.

The SCS report included extensive descriptions of each range. Range E, the Slaughter Mountain Range, had the following characteristics:

> TERRAIN: suitable for cattle in all periods of the year; RAINFALL: 14" in the southern portion to 18" in the north; SOILS: Altos loam and Maverick loam; FORAGE: mainly Tobosa and gramas in the valleys with curly mesquite and grama on the slopes, inadequate browse for drought years; WATERS: not well distributed, with only three dams and two wells on the south half of the range, and one well, one spring, and one tank on the north half of the range, Bonita Creek dry except during the rainy season; EROSION: confined to the washes near the valley floor; PREDATORY ANIMALS: kept under control by trappers; PAST USE: leased from the earliest leasing period by Bryce-Mattice Cattle Company, overstocked at times and overgrazed condition (SCS 1938:86-89).

The SCS estimated that Range E had a carrying capacity of 1,587 year long (65,596 acres). In 1938, the 40 members of the Slaughter Mountain Association had approximately 1,000 head of cattle. The range managers planned construction of several projects: an additional well at the junction of Park Creek and Bonita Creek, a trail from the steep banks of Gray Mountain into Park Creek, a small earthen dam in the steer pasture in

the southwestern corner of the range, and removal of the internal division fence between north and south halves of the range (SCS 1938:86-89).

The remainder of the study area north of the reservation fence was contained in Range F, east of Range E. The SCS report described this range as follows:

> TERRAIN: very rough, difficult access to Bonita Creek which is enclosed in a box canyon, slopes of 10% to 35% making some areas practically inaccessible to cattle; RAINFALL: 14 to 16" per year; SOILS: Grinnell and Hubbard loams on the valley floor, Lassen loam on the mountain tops; FORAGE: primarily a grass range with curly mesquite, Tobosa, blue grama, good browse in draws south of Bonita Creek; WATERS: very poorly distributed, with two springs on the south side of Bonita Creek and two springs and one tank to the north, Bonita Creek almost inaccessible; EROSION: only on the gullies that enter Bonita Creek; PAST USE: Hat Cattle Company and varied lessees including Lee brothers sheep (SCS 1938:92-100).

Adjacent to the reservation fence, Range F had a carrying capacity of 1,229 head year long (55,933 acres). In 1938 the Lee brothers still had a lease for grazing of 5,000 sheep for six months or 1,250 cattle year long. The SCS report recommended its utilization as a horse pasture because of its steep terrain and difficult access to water. They recommended construction of an internal fence from the fence on Range E to the present ram pasture to the reservation boundary fence (SCS 1938:92-100).

Two additional ranges (G and M) contained small portions of the study area and will not be described in detail. Range G on the eastern boundary of the reservation was used by George Stevens' cattle and later by the Double Circle. This removed a portion of its herd in 1934 and the remainder in 1938. The SCS report concluded that despite hard use, the range had held up remarkably well (SCS 1938:101-112). Range M contained the portion of Ash Flat included in the study area. Used by the Chiricahua Cattle Company and later by the tribal herd and as a steer pasture, the range received heavy use. The SCS recommended reseeding the experimental plot and water development with the construction of a pipe line from Tule and Arsenic Tubs. Internal fences were built during the 1930s (SCS 1938:154-62).

The 1938 SCS report repeatedly stated that soil type was the major factor contributing to the

surprisingly small amount of erosion present in the Bonita Creek drainage. In the opinion of the range management team, none of the ranges had been injured beyond recovery. However, a subsequent range report, written in 1949 by Wallace E. Smith and Paul A. Buss, recommended cattle reductions for many of the ranges. The 1949 report noted that, in the Slaughter Mountain pastures, the portion known as the Horse Range had been underutilized in the past, whereas the area near the Registered Herd pasture and close to Geronimo tank had been excessively grazed. The report noted that portions of the pasture contained large amounts of filaree.

None of the range reports mention human residence within the Slaughter Mountain or Bonita ranges. However, a series of cowboys and their families had lived in the cabin at Horse Camp until it burned down several years ago. Cowboys continue to live in the cabins at Bonita Camp. "Fort Bonita," two miles above Horse Camp, has been a branding camp for over 100 years. Abandoned line shacks at the DR Well and Shorty Well indicate some former residence. Ruins at the well below Bryce Horse Camp indicate that people also lived there at one time. Many of these structures may have been built by the non-Indian lessees as temporary residences for their cowboys (Aday 1991; Richins 1991). The largest cattle tanks in the Slaughter Mountain unit are Bonita (or Big) Tank, which has a 40-acre capacity. There also was a large tank near Bull Spring, with an old solid concrete bottom. Cowboy Tank, a CCC project, is surrounded by huge cottonwoods and has a riprapped support on the front of the earthen dam. Bryce Horse Camp contains two wells with windmills dating from the 1920s and a hand dug well. Shorty Well also dates from the 1920s. Roads and trails constitute the only remaining cultural impacts in the Slaughter Mountain unit. Most of the roads have been constructed since the 1950s. Significant roads include Bonita Trail, from the junction of Route 2 near Ash Creek Ranch to Bonita Camp (35.2 mi.); Eagle Creek Trail, junction of Route 15 near Point of Pines to east reservation boundary at Eagle Creek (20.8 mi.); Park Creek-Malay Gap Rd., from the junction of Route 11 near Bonita Camp to Malay Gap (57.2 mi.); and Nine and Seven Mile Trail, Nine and Seven Mile Springs to the junction of Route 11 near Arsenic Tubs (10.4 mi.).

Impacts of San Carlos Apache Cattle Industry

Anthropologist Grenville Goodwin, who did extensive field observations at San Carlos between 1930 and 1936, believed that the cattle industry had been built up too quickly. Since cattle raising was not part of traditional Apache economy, it had not been fully assimilated. Goodwin recommended that the Indian Service pay more attention to farming than to cattle raising, since farming had been a major component of traditional economy. He further recommended that range assignments follow family groups and that cattle ranges be assigned adjacent to residence communities. He believed that even if the reservation were stocked to full capacity, income from cattle would not be sufficient to provide for the people (Goodwin 1937:22). Goodwin foresaw additional problems for the San Carlos cattle industry. He noted that the intergroup antipathies that plagued the San Carlos Reservation extended to the cattle industry as well. Members of the White Mountain band were the traditional residents of the land on the reservation, which now included many outside groups. The White Mountain band had been the most active in cattle raising in pre-reservation times, though the numbers of Apache-owned cattle were probably very small. They had taken the lead in the reservation cattle industry. They owned the largest percentage of cattle per capita. The tribe resented the intrusion of non-White Mountain bands into what they considered their traditional domain. Ash Flat, possibly the best grazing area within the reservation, lies entirely within the old White Mountain band's territory and partially within the Slaughter Mountain range. Initially, the majority of the members of the Slaughter Mountain Association were of the Eastern White Mountain band. They may have been descendants of the groups who had farm sites in the area or who owned cattle during pre-reservation times. Particularly during the 1930s, White Mountain members of the Slaughter Mountain Association did not like having members of other bands of Apache in their grazing district (Goodwin 1937:13).

In 1956 the association range units were reorganized, and the contemporary range units were set up (Figure 12). Slaughter Mountain is the smallest association, and its range designation did not change significantly because it had already received a slightly expanded territory in 1949. Cattle management has largely been the responsibility of association-hired personnel. The association employs one full-time stockman and one or two hired hands. They check waters and control the cattle. The association hires extra cowboys

for roundups. The board of directors of the association sets policy and decides on the construction of new fences, tanks, wells or other improvements. Informants stated that although there has not been significant overstocking in recent years, the absence of any drought off-take policy is a major problem. Cattle are not sold during droughts, which results in considerable stock loss. Even in recent years, cattle have been allowed to starve on the range, and carcasses collect around dry waterholes during droughts. Lack of adequate rotation constitutes a second problem. Even though one portion of the Slaughter Mountain range contains numerous internal fences, they have not been used for rotation as was intended. Much of the wire is down (Aday 1991; Richins 1991).

THE EFFECTS OF THE TAYLOR GRAZING ACT AND THE BEGINNING OF MODERN RANCHING ON BONITA CREEK

The early 1930s brought many changes to the cattle industry on Bonita Creek. In general, the numbers of cattle in the area were greatly reduced. The leases on the San Carlos Reservation were terminated, and much smaller numbers of Indian-owned cattle were placed on the ranges. In 1933 and 1934 the Southwest experienced a devastating drought which initiated cattle reduction programs with government buy-outs. Thousands of head of "drought cattle" were shipped to slaughter houses, and thousands of others were inspected and killed on the range. In June 1934, the first of many shipments of drought cattle from the Bonita Creek area left Solomonville (CGC 6/29/1934). The Taylor Grazing Act initiated a leasing system on non-Indian public land, which reduced the size of herds and the number of cattle run on most ranches. More than any other factors, the termination of San Carlos leases, the drought reductions, and the requirement of public land leases caused the demise of most of the large cattle companies in the Bonita Creek area.

After the early 1930s, Bonita Creek had a number of individually operated ranches running smaller herds of cattle on fenced ranges. Information on the allotments in the Bonita Creek area is contained in the files of Arizona Grazing District #4, approved on April 16, 1937. Cattle belonging to J. A. (Jack) Farrell, Turner West, Myge Earven, and Vic and Pete Christensen dominated the Bonita Creek area after the 1930s.

Horace Baker, John George and several other ranchers operated on a slightly smaller scale. A brief description of the major allotments follows.

Jack Farrell, who resided at the Toppy Johnson-Pete Christensen place when he first arrived in Bonita Creek in 1896, later moved to the mouth of Johnny Creek (Section 10) where he established the G-L Ranch. During the open range period, Farrell had run up to 1,000 head of cattle but his public-land permits were reduced to 60 to 100 head when allotments were formalized.

Turner West had arrived in the Bonita Creek area in 1885, and during the early years of open range ranching, he reportedly ran several thousand head of cattle. By the late 1920s, his numbers were reduced to 500 to 700 head. West, who had not formally acquired much of the range he utilized, lost access to much of his former grazing range after the Taylor Act was passed. West had made improvements on waters at his homesite, at Bear Springs, and at Cottonwood Springs (all within Section 25, T5S, R26E).

Myge Earven, the son of James Earven who came to Sanchez from Mississippi shortly after the Civil War, worked for some of the big open-range cattle companies. He worked for them as a young man and later settled on Bonita Creek, where he built a stone house. He ran cattle on the creek and in the surrounding area and did not formally acquire his ranch until after the Taylor Act. Then he leased all the school sections and homesteaded as many of the waters as he could. Earven normally ran between 400 and 500 head. Earven had improved springs, with troughs and pipe lines, at Deer Spring, Toppy Cave Spring, Turtle Dove Spring, Sycamore Spring, Hackberry Spring, Cottonwood Spring and Lines Canyon. During the 1930s and 1940s, members of the Earven family bought out several small holdings in the canyon. This included those of Bill Gossic, the Christensens, Bob Phillips, Sam Earven, John George and J. F. Jones.

After 1929, J. P. "Pete" Christensen ran cattle from headquarters at the former Toppy Johnson ranch (Figure 8 and Table 1:Site AZ W:14:15[ASM]). Christensen ran less than 50 head on land leased from the state and the public domain. Pete Christensen's family lived in Central, Arizona, and he was only a part-time resident of the Bonita area. In 1934, Pete's brother Vic Christensen acquired Bob Moore's former ranch. He had permits for only a few head of cattle and 20 horses.

Arthur Lines, for whom Lines Canyon is named, had both cattle and goats within the Bryce Mattice

allotment on the San Carlos Reservation and on Eagle Creek. This was where his headquarters were located near the pump station. Although he was mainly a goat rancher, some of his cattle grazed on Turtle Mountain and the east side of Bonita Creek. His goat operation is discussed below.

During the mid-1930s some small allotments began to change hands. The Horace Bakers bought land from the Bianes family in 1932. The Bakers bought up several other small properties within the canyon and ran several head of cattle and some sheep. In 1942 they purchased property from Myge Earven. They farmed on some of the plots of land. In 1939, W. H. Gillespie purchased a ranch in Bonita Creek for his stepson H. O. Stevens. This included the W. N. Hayward community allotment for 120 head of cattle on public land and additional property at the mouth of Bonita Creek that had belonged to the Serna family (Stevens 1991). Stevens ran his cattle east of Bonita Creek, and after he developed water he established a headquarters six miles east of Bonita creek on Turtle Mountain near Bull Gap. Waters on the Stevens allotment include dirt tanks in MacArthur Canyon, in a side canyon by Phillips Canyon, a well at Bull Gap, and a pipeline from Bull Gap to the ridge. Natural water is located in Bill's Canyon (named for Bill Gossic), Phillips Canyon (named for Bob Phillips) and MacArthur Canyon (named for Roy MacArthur).

J. F. Jones came to the Bonita area in the mid-1930s. He applied for a lease of 500 cattle and 50 horses on about 40 sections. They extended east from the middle part of Bonita Creek to the center of the present Turtle Mountain allotment. After approximately three years, he bought out several other ranchers. He claimed to normally run about 400 to 500 head in a community allotment with W.R. Gossic, Erwin Jones and J.I. Jones, each with a quarter interest in the livestock. In 1936, the Grazing Advisory Board recommended a permit for 100 cows and 20 horses in the community allotment. Jones protested, noting that he had constructed a home, work buildings and corrals in Section 26 (T5S R27E). When the Advisory Board issued a permit as stated despite his protest, Jones transferred right to Myge Earven and John George.

In 1942 Claridge and Sons and, later, Ray Claridge alone acquired the Rabb Earven allotment north of Goat Canyon in addition to the Farrell ranch, Brushy Canyon and the east half of Johnny Creek.

The Taylor Grazing Act initiated modern methods of ranching in the Bonita Creek area. In general, stocking rates were reduced and the overall condition of the ranges improved. The formalizing of leases in

the Bonita Creek area resulted in conflict, and in some cases in legal suits. Conflict over water existed between Turner West and John George, Putt Golding and Turner West, and J. A. Farrell and Turner West. Conflicting claims revolved around priority use of water sources. Several leases were community allotments in which cattle belonging to several distinct owners grazed within a single pasture. The Wests had community allotments with several other ranchers, as did the Lines and the Lees. Community relations in Bonita Creek will be discussed in the following chapter. Smaller holdings of several settlers who had fewer cattle, including Bob Phillips, Bill Gossic, Manuel Sanchez, the Serna brothers, Rosa Peña, Angel Bianes and others, will be discussed in the following chapter.

GOAT RANCHING

Both during the open range period and after the Taylor Grazing Act, a number of Bonita Creek residents ran herds of goats. Some herds were grade goats of mixed ancestry raised as much for meat as for their fleeces. However, several herds were pure-bred Angoras raised primarily for mohair. The long fiber fleeces were highly valued for the manufacture of women's garments and automobile upholstery prior to World War II. Several herds were substantial in size. A herd (or band) of goats normally consisted of approximately 1,000 nannies and their offspring. The bucks were kept in a separate pasture. Upper and lower limits for herd size were established by economics and the practicality of herding. Fewer than 500 to 800 animals were economically impractical, and a herder could not handle more than 1,800 animals. Thus herds usually varied in size from 500 to 1,800 animals although herds of approximately 1,000 were most common (Hadley, Warshall and Bufkin 1991). Unfortunately, not enough data is available for the Bonita Creek area to estimate the exact number of herds nor the size of each herd. However, former residents think of the Bonita Creek area, particularly the slopes of Turtle Mountain, as "goat country" and all informants have stated that prior to 1930 goats were very common. It is probable that from the 1890s to the 1920s approximately 10 herds of up to 1,000 animals browsed the area for at least part of the year. During the 1920s the price of mohair and the demand for goats began to decline and many goat ranchers switched to cattle. Nevertheless, surveyors notes record that as late as 1960 there were still goat ranches in the area close

to the Gila River (in T6S R29E).

In the Bonita Creek area, several members of the Sanchez family lived in the nearby town of Sanchez. They kept goat herds year round on the creek and on Turtle Mountain. Lorenzo Sanchez, founder of the town which bears his name, had three sons and a son-in-law who owned Angora goat herds. Filiberto, Moises, Manuel Sanchez and Rosa Sanchez, with her husband Refugio Peña, all ran their goat herds collectively in the Bonita Creek area. At times, they herded the goats themselves but more frequently they employed herders from Mexico to care for their goats. José Hill, a relative of the Sanchez family, lived at a goat camp called "los alisos" for many years. Alvaro Parra herded goats for Manuel Sanchez; two elderly Mexican nationals, named Isidoro and Suzano, herded for Filiberto and Moises Sanchez. The herders stayed out in camps for months at a time, remaining in one location until the available feed had been consumed. At least once a month, the Sanchez brothers packed food and supplies by burros to the distant camps. Each spring and fall, the herders brought the goats into Sanchez for clipping and dipping. In Sanchez the brothers had a clipping shed and corral. Members of the family recall the white goats descending the hill from Bonita Creek into Sanchez as a beautiful sight (LaFleche 1992).

Several exact locations of goat camps have been established; for other locations, informants have mentioned only general areas. Members of the Sanchez family kept their goats at the "ancon de los chivos" on Bonita Creek, in Goat Canyon east of Bonita Creek, at "los Alisos" in the upper canyon, and at other sites on the lower portion of the creek. They also had camps on Turtle Mountain. At different times, members of the Sanchez family and members of the Serna family kept goats at the Serna place at the mouth of Bonita Creek (Figure 7 and Table 1:Site AZ CC:3:56[BLM]). James Earven, listed as a goat rancher in the 1910 census, kept his goats on upper Bonita Creek near the reservation fence. Arthur Lines had the largest herds in the Bonita Creek area. Although the Lines headquarters were on Eagle Creek, his herders, who worked on a share basis, kept the goats on Turtle Mountain for months at a time. They rotated base camps as each area ran out of feed. The Lines goats utilized dry camps on Turtle Mountain, watering every other day during the winter (Lines 1991). Other ranchers, who had goats on the Gila River and south of the Gila, practiced a similar rotation between the home ranch and goat camps on Bonita Creek and Turtle Mountain.

The Subias and other goat ranchers often brought their herds into the Bonita Creek area when the feed was good, keeping them there for several months. Members of the Fajardo, Gomez, and Lucío families also had herds of Angora goats in the Bonita Creek area. However, exact locations of camps have not been determined. There were several goat camps on Turtle Mountain, always at locations with springs. In several places round rock corrals used to pen the goats at night can still be seen.

As browsers, goats utilize and impact a different set of plants than cattle. However, they will eat any young green feed. They have a strong preference for filaree, and in the spring when new shoots are coming up, goats prefer grass to browse plants. Their agility in climbing mountains enables them to access areas that cannot be used by cattle. Although most herders take their goats to water once a day, goats can go for more prolonged periods without water than can cattle. Therefore, the rough, rocky, higher portions of Turtle Mountain were ideally suited to utilization by goats. Since goats must be penned at night to avoid loss or predation and do not thrive if forced to walk more than five or seven miles to water and forage, they utilized the immediate area around the camp intensively. The common practice was to "close herd" goats, the herder selecting specific locations with specific feeds for browsing each day.

The impact of goats in the study area was probably restricted to a five to seven mile radius around each goat camp and to the trails that the goats incised between camps and water sources. Former goat ranchers and rangeland management specialists debate the overall impact of goats in an area. Some former goat ranchers believe that the nervous, constant movement of goats loosens soil and contributes to erosion. Other goat ranchers believe that since goats are under the constant supervision of the herder they are usually not allowed to overbrowse or overgraze an area (in contrast to cattle whose grazing habits are "self-directed"). Some range specialists assert that goats can perform a beneficial service to grazing ranges by eating out the underbrush and preventing the invasion of shrubs in grasslands. They observed that after the removal of goats, many areas experienced a sharp increase in woody plants to the detriment of grass cover. Some informants believe that goats were responsible for the distribution of certain desirable and undesirable plants since seeds were caught in their long fleeces. They note that filaree was formerly more plentiful in areas of large goat population and that it declined after goat removal. Goats were present in Bonita Creek during

the period of intense overgrazing by cattle. An estimated 10,000 largely unclaimed (or wild) horses were on the San Carlos Reservation. This complicated the process of differentiating between goat impacts and those of the area's other livestock. In comparison to cattle, goats created a more intense impact on a specific and more restricted area. Goats consumed most of the browse plants in the areas surrounding their former pens. After the goats were removed, brush returned and former pens were often filled with mesquites. Secondary impacts from goat herds include increased predator control. Because goats are highly susceptible to predation, herders believed that they attracted predators more than any other type of livestock. Herders frequently carried strychnine and laced all carcasses they found with the poison. Herders also shot all the coyotes and bobcats they encountered. Some informants believe that owners of goat herds called for the assistance of government trappers more often than cattle ranchers (Hadley, Warshall and Bufkin 1991). Individual goat ranchers, who resided at least part of the year in the Bonita Creek Watershed are further discussed in Chapter 6.

OVERALL GRAZING IMPACTS

Impacts of cattle ranching in the Bonita Creek area were most severe during the three distinct periods of drought. No detailed records survive that describe the first drought (1885-1904) in the immediate area. However, secondhand descriptions indicate that large numbers of cattle starved on the open range. During a starvation period, cattle pull out the roots of perennial grasses and severely trample soils around water sources. Since waters were limited, particularly on the reservation portion of the study area, it can be assumed that the destructive impacts of starving cattle were particularly heavy in the areas where water remained for the longest time period. The perennial-stream portion of Bonita Creek below the reservation fence would also have been severely impacted. Even during non-drought years, cattle have a natural preference for bottom lands and during the warmer months of the year will resist leaving riparian areas.

Many large cattle companies which operated on leased range were notoriously lax in protecting range resources in times of emergency. The Chiricahua Cattle Company, Double Circle, and Hat Ranch would be included in this group. Ranchers leasing reservation land, where both the Apaches and the agency

representing them appeared to be somewhat uninterested in resource protection, may have been even more negligent. Although some ranchers of the old school were careful and conscientious operators, others refused to adopt a drought off-take strategy or even to plan any emergency drought measures. One of the first generation of Bonita area ranchers who leased reservation ranges expressed a commonly-held philosophy regarding drought as follows: "The way to fight a drought is to hang up your saddle in the shed, hang up your catch rope and go to town till it rains. Then go back and see what you've got left" (Lee 1991).

The second drought occurred between 1918 and 1921. Marion Lee recalled to his son that this drought was particularly devastating because ranchers relied entirely on natural waters and were largely unable to haul in supplemental feed. The drought was preceded by a late spring freeze that killed all the budded feed on the oaks and other browse plants (Lee 1991). During the third drought (1933-1934), Turner West lost almost half the cattle in his allotment although it is not clear whether they range starved or were destroyed in the government drought reduction program. Other ranchers in the area would have been at least as severely impacted as West, who had developed several water sources on his ranges.

In addition to the impacts of cattle, herds of wild horses and wild burros (the offspring of the wood-haulers' burros) continued to be a problem through the early 1930s. Burros had been recognized as a range menace long before the Taylor Act. In 1929, 255 wild and stray horses were rounded up and held at Bonita Creek (TDC 9/23/1989). Several thousand wild horses were range killed (or sold for feed) on the San Carlos Reservation. Several hundred wild horses were removed from lower Bonita Creek during the government reduction programs (C. Earven 1992). As late as 1945, Trujillo Canyon still had over 50 wild burros, some with brands. The area had fewer wild horses but had been overrun with the descendants of the burros from the Clifton-Morenci mines. People in Morenci continued to turn them out. Bonita Creek residents recognized the wild burros as a menace. John Traylor, a Gila River farmer and occasional resident of Bonita Creek, shot all the burros he saw (Earven 1991). Unclaimed wild goats roamed the Bonita Creek area through the 1930s, descendants of the Angora herds. Additional secondary impacts from ranching resulted from several predator control programs. This included the San Carlos coyote reduction of the 1940s and the fairly steady trapping of predators that took place on lower Bonita Creek.

The present condition of lower Bonita Creek and of the grazing units on the San Carlos Reservation (Slaughter Mountain Unit and Ash Flat) attests to the high quality of local soils and the resilience of native grasses in the area. In view of the excessive grazing to which these grasslands were subjected between 1880 and 1930, the present condition indicates a remarkable recovery. The contrast between the 1909 Dane Coolidge photographs of the Chiricahua Cattle Company roundup, in which no grass can be seen, and the present photographs of the area indicate that with reduction in cattle numbers grassland revitalization has been successful. One informant described the upper portion of Bonita Creek as the "best all-around grazing county in the state." When five bands of sheep and 1,000 head of Mexican steers were removed from that portion of the reservation, "You couldn't see where it had been grazed" (Lee 1991).

In general, the most extensive impacts from cattle occurred during the period prior to 1934. The large cattle companies leased range on the San Carlos Reservation and grazed the open range along lower Bonita Creek. Cattle numbers indicate that severe overgrazing occurred particularly during periods of drought. From 1885 to 1934, grass cover was severely reduced, many native bunch grasses disappeared, and many species of exotic grasses and plants invaded the area. Perennial bunch grasses were replaced by brushy plants and cactus. Sections of ground surrounding waterholes and springs were heavily impacted by the hooves of cattle concentrating near the waters. Severe erosion, which is a frequent result of overgrazing, evidently did not occur on the San Carlos portion of the study area with the exception of creek bottoms. Stream bed erosion, which occurred largely after the 1941 flood and subsequent severe flooding, has eaten away numerous benches and several sections of the banks in lower Bonita Creek and has lowered the bed of the creek as well. This situation will be discussed in Chapter 7.

VI

HISTORIC PERIOD SETTLEMENT ON BONITA CREEK

During the historic period, Bonita Creek experienced three distinct periods of settlement. The first occurred with the Apache occupation of the area, the second between the late 1880s and the early 1930s, a period of small-scale subsistence farming, and the third after 1934 when the Taylor Grazing Act imposed a more systematic settlement pattern on the area. Intermittent Apache settlement occurred on upper Bonita Creek for at least 100 years prior to 1870. The settlement pattern of the Apache ranchería is described in Chapter 4. This chapter focuses on the second and third phases of settlement on Bonita Creek. Figure 7 shows the locations of historic-to-recent sites in the lower watershed, including recorded and unrecorded sites.

Beginning in the 1880s, Hispanic and Anglo-American settlers began to arrive in the Bonita Creek area. Local recollections and historic remains indicate that between the 1890s and 1920s at least 20 homesites were occupied on lower Bonita Creek. Population probably peaked during the 1920s. The second phase of settlement lasted until the early 1930s when the Great Depression and Taylor Grazing Act imposed population adjustment on Bonita Creek. During the transition between the second and third settlement phases, Hispanic settlers left Bonita Creek and were replaced by a greater proportion of Anglo-Americans. The third phase of settlement began during the 1930s after the Taylor Grazing Act required formal grazing leases and the San Carlos Apache Tribe required removal of non-Indian cattle from the reservation. The Taylor Act inadvertently concentrated land-holdings in the hands of fewer landowners with larger holdings. As population stabilized, Bonita Creek had fewer than a dozen residents, many of whom had additional property elsewhere. By the 1970s, most of the land owners were absentee, and Bonita Creek had no year-long permanent residents.

Information sources for this period are found in census records, property records, local newspapers, the second-hand recollections of later Bonita Creek settlers, and in the physical remains of settlement sites

along the creek. Census records often counted Bonita Creek in conjunction with the nearby settlements of San José and Sanchez, making actual residence unclear. Deeds do not tell the entire story because many Bonita Creek settlers were "squatters" who did not patent the land they occupied. This group of squatters did not file on water rights. Local recollections, however, add information to the limited documentary record. Description of the first generation of Hispanic and Anglo-American settlers relied on second-hand information, passed on by the parents of informants. In addition, remains of numerous structures and the remnants of many irrigation canals provide a physical description of settlement patterns (Seymour and Sinkovec 1992). Another important source is provided by mention of settlers in local newspapers. During the early years of settlement, the names of Bonita Creek residents appear in newspapers with surprising frequency. Perhaps because agriculture was Graham County's most important economic activity and Bonita Creek's rich alluvial soils, perennial stream, and abundant native grasses were relatively more valuable resources at the time, many articles on the area appeared in Solomonville, Safford and Clifton newspapers. In sparsely populated Graham County, the scattered settlement of farmers and ranchers on Bonita Creek took on a greater importance than at any later period.

SETTLEMENT ON BONITA CREEK (1880s-1934)

The second phase of settlement on Bonita Creek probably began during the 1880s. Residents during this phase of settlement included members of three ethnic groups, Hispanic, Anglo-American and possibly Chinese. However, settlement patterns among the three groups were largely similar.

Four factors contributed to the initiation of non-Indian settlement on Bonita Creek: the introduction of herds of breeding cattle by large cattle companies; the establishment of three nearby villages, which coincided with the initiation of large-scale irrigated farming on the Gila River; the development of large-scale mining in nearby areas east and west of Bonita Creek; and the location of Bonita Creek's agricultural resources mid-way between the two most important communities (Safford and Clifton-Morenci) in the eastern Gila Valley.

The first temporary non-Indian residents on Bonita Creek were probably cowboys or herders who

worked for the large cattle companies. Although it is unrecorded, these companies may have been responsible for the area's first structures, "line shacks" or "camps" used by the cowboys while working cattle near Bonita Creek. Cattle companies and individual ranchers minimally constructed corrals and cattle traps for use during roundups. During the 1880s and 1890s, newspapers and other documentary sources mention the existence of several ranches on Bonita Creek, some owned by large companies, others by individual ranchers. During the 1880s ranchers active on Bonita Creek included M. E. Cunningham, "the Bull Baron of the Bonita" (CC 12/21/1886); Cunningham's partner, George Olney (CC 11/30/1887); the Chiricahua Cattle Company (CC 11/30/1887); Z. C. "Tuck" Prina, initially in partnership with George Olney and later as foreman of the Chiricahua Cattle Company (SVB 8/15/1890); the Hat Ranch (Surveyors Books); the Turner and Raleigh West ranches (Mount Graham Profiles 1989; Curtis); and William Church and Albert Bellmeyer's Turtle Cattle Company (Mount Graham Profiles 1989; Lines 1991; Shiflet 1991; CC 10/25/1892). During the 1890s additional ranchers arrived, including: Wilt H. Kimball (GCB 1/5/1894); J. A. Farrell (Census and Homestead records); Elias A. Tidwell (Homestead deeds); Ben Parks (Surveyors Books) and Presley "Toppy" Johnson (Shiflet 1991; BLM records). Among the early permanent settlers on Bonita Creek were several cowboys who worked for the large cattle companies including Angel Bianes, Toppy Johnson, James Earven and several of his sons, including Myge Earven. All these individuals worked for the cattle companies and subsequently lived on Bonita Creek for many years.

According to local recollection, the majority of the earliest settlers on Bonita Creek were Hispanic. Many were related to residents of Solomonville, San José or Sanchez. These were small towns nearby that developed in conjunction with construction of irrigation projects on the Gila River. Solomonville, initially settled by Hispanics and known as "Pueblo Viejo" in the Pueblo Viejo Valley, was possibly the first permanent settlement on the upper Gila River. The village had a commissary beginning in the early 1870s, predating the 1876 arrival of the settlement's namesake, I. E. Solomon, by at least four years. Solomonville was the county seat of Graham County from 1883 to 1915. It was a bustling commercial center with several stores, a hotel, bank, schools, a newspaper and a post office (postal service from 1878 to the present). San José was established in 1874 at the time of the construction of the San José Canal. During the 1870s, the settlement

was the largest in the Gila Valley. Three miles east of Solomonville, the village of San José had a store, saloon, school, church, and briefly had postal service (from 1877 to 1878). The 1880 census enumerated 186 residents for San José (a dozen more than Solomonville). This made it the largest settlement in the portion of Pima County that was carved out in 1881 to create Graham County. Approximately five miles northeast of San José, the settlement at Sanchez was established in 1879 by Lorenzo and Juanita Sanchez. They migrated to the Gila Valley from the Rio Grande with several other Methodist Hispanic families. Many of these early settlers farmed and herded sheep for Isadore Solomon. Sanchez had a school, a church, and a store owned by Lorenzo Sanchez. The village had postal service from 1901 to 1904 (Mount Graham Profiles 1989). The mouth of Bonita Creek is only four miles east of Sanchez; San José and Solomonville are only slightly farther away. These three villages were within walking distance from Bonita Creek, and their presence provided impetus to settlement along Bonita Creek's fertile banks.

To the east of Bonita Creek, mining and smelting developed in the Clifton-Morenci area during the 1870s. Henry Lesinsky began the operations in Clifton that became the Arizona Copper Company. In Morenci, William Church initiated the works that became the Detroit Copper Company. By the early 1890s, the mines were very productive and were employing a large number of miners and mine laborers. The growing population of miners increased the demand for fuelwood for the smelters, firewood for the miners' homes, and produce and grain products consumed by the miners and their domestic livestock. This new market induced Hispanic farmers and woodcutters to settle along both Bonita and Eagle creeks. The farmers supplied their produce and wood to the Clifton-Morenci area by pack train, making frequent one day trips.

To the west of Bonita Creek, Safford was a growing commercial center, surpassing Solomonville in population and commercial activity before 1900. Bonita Creek was conveniently located at almost the halfway point between Safford and Clifton-Morenci, ideally suited to provision both communities. During the period prior to World War I when motorized transportation became more common in Graham County, the pack trip took one day to either Safford or Clifton-Morenci. This was over established trails and did not appear to be an inconvenience to the settlers on Bonita Creek.

SETTLEMENT PATTERN

By the turn of the century, the dispersed rural settlement on Bonita Creek probably contained at least 20 widely separated homesites. These were scattered along 12 to 15 miles of the creek banks. (The term homesite, rather than homestead, is used here to describe the location of a house with associated work buildings, corrals, garden, and possibly farmsite. Homestead will be used to indicate the legal act of filing for a claim to patent public land.) Nineteen historic period archaeological sites have been recorded in the canyon by Seymour and Sinkovec (1992). Oral interviews indicate the existence of additional homesites. Structures at several homesites, particularly those made of lumber, have completely disappeared. Some were washed away by flood waters, others burned down. In some cases, entire creek benches that contained cleared farming areas have also washed away (Earven 1991). Informants have collectively mentioned more than 20 settlers. Sequential occupancy by known settlers occurred in many homesites. Undoubtedly there were additional settlers whose residence along Bonita Creek was temporary, dated from the early period, and is now lost to historical memory. The most southerly homesite was that of the Serna family at the mouth of Bonita Creek; the most northerly was one mile above the San Carlos Reservation fence, an illegal intrusion by the owners of the Hat Ranch. Between these two extremes, almost every bench along the creek shows signs of habitation. Many contain remains of structures or irrigation ditches, indicating use if not actual residence (Seymour and Sinkovec 1992; Melendrez 1991; Earven 1991). Signs of settlement at approximate half-mile intervals, some closer and others more distant, indicated a rural settlement pattern along the creek. They were so dispersed that it did not resemble a village.

The homesites were similar whether settlers were Hispanic, Anglo-American or (possibly) Chinese. During the second phase of settlement, the majority of residents were Hispanic farmers and woodcutters. A few Anglo-American farmers and ranchers lived along the creek banks and on the slopes of nearby mountains. According to the descriptions of former residents, each homestead had a small cultivated area with fruit trees, an irrigation ditch, pens for domestic animals, a corral and a small house. Houses were constructed of stone, adobe or milled lumber. Initially the roofs were made of beams covered with mud plaster; later they were roofed with tin. From Sanchez, a road of sorts led toward Bonita Creek. It turned

into the canyon just above the mouth of the creek and became a trail as it continued up the creek bed. It was passable to horses, pack trains and sometimes to wagons. In periods of high water, the road was impassible through the Bonita box. This separated access between the residents of the "lower canyon," below the box, and the "upper canyon," and above the box but below the reservation fence. Residents in upper Bonita Creek preferred to access their homes by several trails that descended from both sides of the canyon above (or north of) the box. (See Chapter 7 for a more detailed discussion of trails and roads.) The separate access to the two distinct portions of Bonita Creek prevented the development of a greater sense of community in the canyon. Even during its population peak, Bonita Creek did not have a school, store, church, utility service or any structure that provided the residents with a community gathering place.

San José and Sanchez offered many of these needed services for residents of Bonita Creek. Several settlers had homes in Sanchez or San José but maintained farms or fruit orchards on Bonita Creek and resided there temporarily as the season demanded. These settlers sent their children to school in Sanchez or San José, attended church there, and used the villages' stores, dance halls, pool halls, saloons and other amenities. Although a new school district, to be named the Mejia District # 16, was planned in 1889 for the junction of Bonita Creek and the Gila River, it never became a reality (VB 9/13/1889). San José briefly had a bilingual (Spanish and English) newspaper. The publishers were Graham County recorder Eduardo Soto and Clifton correspondent J. H. Vaughan, a "distinguished pedagogue and a forcible writer for the press." They were active prospectors and reportedly had taken some rich copper ore from a mine near Solomonville (TVB 9/20/1889). The article that announced the new newspaper stated that the publishers intended to report local news concerning the Bonita area and San José. They indicated that Bonita Creek and San José were perceived as a unit and were considered noteworthy enough to merit their own news service.

EARLY HISPANIC SETTLERS

Hispanic settlers probably arrived in Bonita Creek during the late 1870s or early 1880s. For the early Hispanic settlers, dates of first residence, length of residence and locations of homesites are not exact. None of the early Hispanic settlers filed homestead claims. The first homestead deed filed by any Hispanic near

Bonita Creek was that of Ramon Melendrez in 1972. However, several Hispanic settlers acquired formal grazing rights. Purchases or exchanges of property were common among Hispanic residents, and sale records exist for properties although there were no initial homestead deeds. Hermenegildo Barrera and members of the Sainz, Serna, Saiz, Peña and Chavarría families all transferred properties in the area (Deeds from Graham County Recorder's Office). Some early Hispanic residents were temporary. Others lived for several years on properties belonging to absentee owners. The rest worked for the large cattle companies and occupied structures (including caves in which improvements had been made) supplied by the ranches. Later residents have the impression that many early Hispanics on the creek may not have been citizens, and as illegal aliens they were reluctant to engage in legal transactions with the government (Baker 1991). Among Hispanic settlers, several extended families resided on Bonita Creek including two or three Sanchez brothers and their sister Rosa Peña. The Benavides brothers were Bonita Creek residents for many years. Several members of the Fajardo family had interests on the creek as well.

The partial list of Hispanic residents of Bonita Creek includes members of the Bianes, Serna, Sanchez, Fajardo, Ortiz, Baja, Chacon, Perez, Gomez, Cueto, Zorilla, Guerra, Marine and Peña families. Census records mention Bernabe and Joaquin Benavides, Eucebio Gómez and his wife Refugio, and Erasido Ernandez. José Baja had a farm in the upper portion of the creek prior to 1920. Exact homesite locations have been determined for some of these families. However, our information is incomplete. To complete the study researchers would like to obtain more information on these families.

The description of known homesites will begin at the southern portion of the study area and move northward. At the mouth of Bonita Creek, the Serna family had a small farm with an orchard and a diversion dam to water the orchard. Simon, Mario, Ubaldo and Santos Serna all lived on Bonita Creek from time to time. Members of the family also had a farm in Sanchez. They were relatives of Marcial Serna, the pioneer Methodist minister in Sanchez. He became a convert to the Seventh Day Adventist Church in 1899 and established that congregation in the town. Another relative, P. Serna, was president of the Brown Canal Company (GG 2/14/1908). The Sernas built a stone house which the Bureau of Land Management restored in 1991 (Figure 15; Figure 7 and Table 1:Site AZ CC:3:56[BLM]). The Sernas' homesite had additional

outbuildings (no longer standing), an extensive orchard, a vegetable garden and a large blackberry patch. Moving upstream, Benino Guerra had a farm where he had filed a claim for 150 acres of land and 100 miners inches of water from Bonita Creek. Near this farmsite, Vidal Marine claimed 80 acres and another 560 acres of grazing rights. These claims date from 1912 and 1925.

Farther upstream, still in the "lower canyon," the Angel Bianes family lived on the west bank of the creek where corrals are still standing today. Angel Bianes was born in Las Cruces during the late 1860s and migrated to the Pueblo Viejo Valley with his mother as a very young child. He subsequently worked for several large cattle companies. He settled on Bonita Creek and began to farm there prior to 1900, remaining in the canyon until the 1930s when he sold his property to Juan Chacon. On the Bianes farm, a large tufa stone house was washed away in a flood (Figure 17). It was located immediately downstream of the present ruins of a lumber house of later construction. The Bianeses, and later the Chacons, farmed all the little flats both above and below the homesite on both banks of the creek. Hermenegildo Barrera also owned property on this immediate section of the creek. These properties were sold in 1932 to Horace and Jesse Baker, and later they became part of the Myge Earven and later the Ray Claridge ranches (Melendrez 1991; Baker 1991; Recorders Office deeds). Above the Bianes farm, Jesus Saiz had a small farmsite. He initially lived in a cave near the fig trees he planted on both banks of the creek. These figs have grown to be very large and are still living today (Figure 7 and Table 1:Site AZ CC:3:66[ASM]). Saiz had an irrigated garden on the west side of the creek. In later years, Sam Earven built a cabin at this site. Slightly upstream, Filiberto Sanchez and later Refugio Peña and his wife Rosa Sanchez Peña lived at "el ancón del chivero" (the goat herder's corner) below the City of Safford Water Yard. José Baja operated a farm in this portion of the creek as well.

In the "upper canyon" above the box, the Ortiz family lived in the "Old Lady Gay" house for several years (Figure 7 and Table 1:Site AZ CC:14:5[ASM]). They claimed the country on Brushy Canyon and on the ridge to the north of the canyon. Members of the Ortiz family including Carmen Ortiz and several of his brothers ran cattle and goats and did some farming. The Benavides brothers, Bernardo and Juaquin, occasionally lived at or near the Toppy Johnson homesite near the reservation fence.

In 1915 an unnamed Mexican resident occupied a homesite between the Hat Ranch headquarters

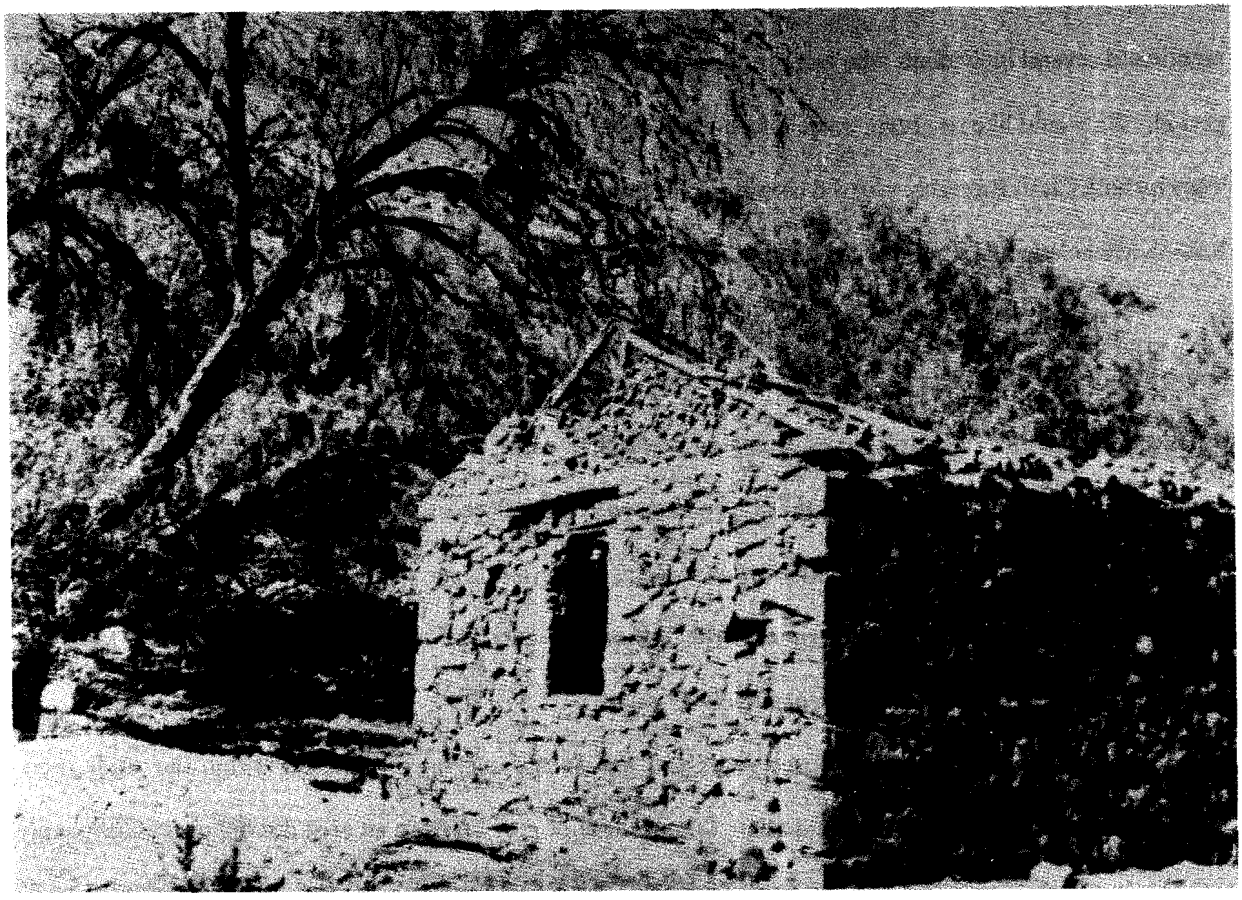


Figure 14. Serna stone cabin at mouth of Bonita Creek prior to restoration (courtesy Graham County Historical Society).

(north of the reservation fence) and the Toppy Johnson place (Surveyors Notes). This would be the most northerly Hispanic homesite on the creek.

Some settlers like Bernardo and Juaquin Benavides did not reside in one place continually. They gained a living working for the large cattle companies, doing odd jobs for other ranchers, and cutting wood. When the Benavides brothers first arrived, they occupied a cave and later lived in the Serna's stone house at the mouth of Bonita Creek and in several camps on the slopes of Turtle Mountain. Informants have mentioned several individuals who were present on Bonita Creek, possibly living there part time or for a brief period. We would like to obtain more information about the residence of these individuals on Bonita Creek. They include Claro Ramírez, who did considerable trapping, Severo Ríos and members of the Chicane family. Ramon Michelena had a community grazing allotment on Bonita Creek although he may not have lived there.

Hispanic settlers made their livelihood from woodcutting, farming and small scale livestock raising. Some had cattle, and others earned a living as miners and prospectors or part-time cowboys. Several settlers produced handicrafts and implements, including reatas, hair ropes and bridles. Most of them had horses and cows, some had goats and pigs. All those who transported produce or fuelwood had burros. Much of the contact with the outside world was with Morenci. Hispanic settlers made the trip to Morenci more often than they made the trip to Safford. The trip over the Safford-Morenci Trail through Bellmeyer Saddle took one day from Bonita Creek and was approximately 15 miles.

Several Hispanic families raised goats and maintained several goat camps within the study area. Since herding goats was a mobile occupation, the presence of goat herds in an area did not necessarily imply that the owner or herder had a permanent residence. Herders stayed with their goats throughout the year. They rotated them on a regular basis between a set of goat camps. The herder often resided in a temporary structure or even in a cave. Structures at the camps often consisted of a tin or stone shack with associated pens and corrals. The existence of goat camps indicated that human and livestock impacts at least equivalent to those of the typical Bonita Creek homesite were imposed on the immediate area. The largest goat herds were those owned collectively by the Sanchez family. Manuel Sanchez had goat camps near Honeymoon Wash and on Turtle Mountain. His herders sometimes lived in a tin shack in an area that did not have an

Figure 15. Tufa stone house, probably constructed by Angel Bianes (ca. 1900), at Bianes-Chacon-Baker homesite, destroyed by flooding during the 1940s (courtesy Jesse H. Baker).

access road. Filiberto Sanchez had goats, at least part time, at the "ancon de los chivos." Rosa Sanchez and her husband Refugio Peña lived at the "Old Lady Gay place." Peña also had a goat camp on the west side of Turtle Mountain. Ivaldo Serna and Simon Serna ran both goats and horses on Bonita Creek. Two elderly Mexican nationals from Aguascalientes, named Suzano and Isidoro, herded goats for both the Sanchez and Serna families. The herders often lived at the Serna homesite at the mouth of Bonita Creek (LaFleche 1992).

Additional goat herds, owned by people who resided south of the Gila River or on Eagle Creek, were often present for brief periods on Bonita Creek. Vidal Gómez, a prosperous Spaniard who had migrated from Spain to Clifton had a goat camp at Hackberry Spring on the slope of Turtle Mountain (Figure 7). José Perez had goats somewhere on lower Bonita Creek. The Cueto and Zorilla families had goats on Eagle Creek and on the south side of the Gila River, which were occasionally taken into the Bonita Creek area. Pedro Subía had Angoras on the Gila River, and Esteben Lucío ran several herds of goats on Turtle Mountain east of the present Stevens ranch. All these herds were occasionally present on Bonita Creek indicating at least a temporary goat camp for the herder (Melendrez 1991). Chapter 5 contains more information on goat ranchers.

Hispanic settlement on Bonita Creek lasted until the early 1930s. Economic conditions during the 1930s induced many Hispanic residents to move elsewhere, considerably reducing the total population of the Bonita Creek area. The impact of the Taylor Grazing Act on these settlers is discussed below.

THE CHINESE ON BONITA CREEK

Chinese settlers arrived in Graham County during the late 1870s. Chinese laborers were employed in the Clifton-Morenci mines from several years after the mines began operation, possibly 1876, until 1883. This was the year following both the disastrous Clifton cave-in and the Chinese Exclusion Act of 1882. Up to 500 Chinese laborers worked in the mine (Ramenofsky 1984). Chinese laborers received $40.00 per month (and board), while Mexicans received $50.00, and Americans $75.00. Chinese companies in San Francisco and New York furnished entire groups of workers known as "gangs." The mining companies conducted all business related to the laborers through the Chinese labor suppliers and a designated gang leader at the mine.

They never conducted business with individual Chinese laborers. The mining companies were interested only in the number of men in the gang, the amount of work done, and the food that was consumed. Little money was paid to the workers, and wages were frequently issued as credit in San Francisco or New York. Occasionally credit was issued in banks or commercial firms in Silver City, New Mexico. Mining companies seldom obtained a list of individual names. A business entry for July 27, 1879 reads: "Barnett & Black in a/c with Longfellow Copper Mining Company . . .. By freight on 53 China men and their baggage from Casa Grande to Clifton, estimated at 14,000 pounds @ 3 1/2 cents . . . " (Barr 1940a:6). In 1878, Chinese were employed to gather fuelwood and transport it on their backs to furnaces operated by Mexican laborers for use in the ore reduction process. In 1879, Chinese laborers worked on the construction of the Longfellow Mine and the Clifton smelter (Fong 1980:15). The terms of these Chinese labor contracts indicate that working conditions at the mines were minimally unpleasant for Chinese laborers.

Chinese were present in other areas near Bonita Creek from the late 1870s. They worked as truck farmers, shop-owners, and vegetable vendors in Solomonville and Clifton (SVF and CC). Several Chinese families lived in nearby Solomonville. By the 1890s that town had enough Chinese settlers to support Woo Kee and Company, a dealer in "Chinese goods" (Ramenofsky 1984). A subsequent owner of this business, Lee Wah, was shot and killed during a robbery in the store in 1915 (GG 12/24/1915). Chinese settlers also operated restaurants at many of the railroad stations along the Gila Valley Globe and Northern route (Myrick 1980).

The presence of at least one Chinese settler on Bonita Creek is a persistent, widespread portion of the local historical lore. No hard data has been uncovered concerning Chinese residence on the creek. Several informants indicated that the previous generation of Bonita Creek residents had spoken to them of at least one Chinese settler (Lines, Melendrez, J. Earven, C. Earven, George). Local lore relates that the Chinese came from the Clifton-Morenci area after a mine-shaft explosion killed several of their countrymen. According to some stories, the explosion had been set purposely. The Chinese laborers fled to Bonita Creek for safety. They grew vegetables and fruit to supply the mine settlements. They transported their produce by pack animal over the Safford-Morenci Trail (Earven 1991). It is more likely that the arrival of Chinese

settlers coincided with the 1883 termination of all Chinese labor contracts in the Clifton-Morenci mining operations. The Chinese would have then sought other means of livelihood in nearby locations.

When the Chinese settler or settlers first arrived, they lived on the flat above the "Old Lady Gay" house. This is also known as the "China man orchard" (S3 and S10 T5S R27E). According to informants, traces of rocks from the first Chinese house can still be seen above the Old Lady Gay house. They presumably constructed the Old Lady Gay house at a later date. Chinese farmers are also credited with settling the flat above the "Moore Place," (NE 1/4, NW 1/4 Section 3). They built a stone house near the present corral (Figure 7 and Table 1:Site AZ W:14:15[BLM]). The stone cabin at the Moore place had only one room. The stone house at the Gay farmsite had two or more rooms and an additional stone outbuilding (Seymour and Sinkovec 1992). Subsequent settlers admired what they considered to be particularly fine masonry in these two structures, the exceptionally thick walls and evenly cut stones in the "China Man-Old Lady Gay" house. The more refined stone work reinforced the assumption that Chinese were responsible for the structure's workmanship. The Chinese were assumed to have brought these construction skills with them from China.

EARLY ANGLO-AMERICAN SETTLERS

The first generation of Anglo-American settlers on Bonita Creek include several of the ranchers described in the preceding chapter. None of the owners of the large cattle companies that operated in the area became residents of Bonita Creek. However, several cowboys who worked for the big companies settled in Bonita Creek. They worked part of the year for the companies and operated their own smaller ranches and/or farms as well. Members of the Earven family were among the early settlers who worked for the companies. E. L. Tidwell and Jack Farrell, two ranchers who appear as residents in records dating from the 1890s, may also have worked for the large companies. Angel Bianes worked for the "Three Cs" and for the Double Circle. Toppy Johnson may also have come into the area as an employee of one of the companies.

Members of the Earven family were among the earliest settlers of Bonita Creek. James Earven migrated from Mississippi to Mexico after the Civil War. He later came to Arizona where he worked for

the Chiricahua Cattle Company and the Double Circle (J. Earven 1992). After several years working for the cattle companies, Earven homesteaded a farm on the Gila River and developed a homesite on Bonita Creek. He is listed in the 1910 Census as a Bonita Creek goat rancher. His son Myge Earven and Myge's son Cowboy Earven continued to live on Bonita Creek. This made the Earven family notable among the few multi-generational resident families.

Members of the extended Earven family lived in many different locations on Bonita Creek. James Earven's original residence was near the Toppy Johnson place. The log house that he constructed a half mile above the Clifton-Morenci trail was washed away during the 1944 flood. James also patented Earven Spring which became the first water source on Bonita Creek acquired by the City of Safford. James's son Myge Earven (b. 1893) lived at the "Old Lady Gay" place at the Bianes-Chacon homesite. For some time he lived at Sycamore Spring (Figure 7 and Table 1:Site AZ W:14:11[BLM]) in the log house constructed by Bob Phillips. In 1937, Myge and his wife Beulah Traylor Earven owned no patented land and resided on Section 26 on the east side of Bonita Creek on public domain. Myge was primarily a rancher and had 400 head of cattle on leased public range in that year (BLM records). Myge's brother Sam Earven also lived on Bonita Creek at the place known as the "Sam Earven flat," the homesite previously occupied by Jesus Saiz. The homesite had a corral north of the cabin and a large garden on the east side of the creek. A board that was used to support the wash basin can still be seen grown into the trunks of two big sycamore trees at the site. Cowboy Earven, Myge's son, lived in the Sycamore Spring house as a child. As an adult he lived at the Jones place (originally constructed by Bob Phillips but sold later to the Jones family). Cowboy later lived at the Art Lee place (the "Peanut Farm"). However, the Lee house was washed away during the 1944 flood while Cowboy was serving in the army. In 1944 Myge Earven sold his holdings to Fay Rabb, who subsequently sold to Ray Claridge. In 1972 Cowboy purchased the Claridge ranch which included Myge's original holdings. Several other members of the extended Earven family either ranched or farmed on Bonita Creek. Bill Traylor and John Traylor and his wife Minnie, two brothers of Mrs. Myge Earven, farmed and occasionally ran cattle on the creek (Earven 1991).

Jack A. Farrell arrived in Morenci in 1884 and moved with his family to Bonita Creek in 1896, first

occupying the Tidwell-Johnson-Christensen homestead. In 1897, he purchased property belonging to the Kimball estate. He established his ranch on one of the largest of the benches on Bonita Creek at the mouth of Johnny Creek (Figure 7 and Table 1:Site AZ W:14:4[ASM]). He lived there from 1897 until the early 1930s. The evidence of farming on this site is extensive, and more than 10 acres were under cultivation for most of the years of his residence. Farrell's house was made of stone with lumber additions, some of which burned down in later years. His cattle ranged throughout the Johnny Creek basin. Farrell was occasionally in partnership with Turner West (West 1992).

Toppy Johnson, whose real name was Presley Cantrell, was one of Bonita Creek's best known early settlers. When he first arrived in the Bonita Creek area, he lived in the cave known as "Toppy's Cave" for several years. He moved to the Tidwell place in 1897, where he lived in a one-room stone house, the walls of which are still standing today. Here he operated a vegetable farm and cattle ranch until 1929 when he sold to J. P. Christensen (Figure 17; Figure 7 and Table 1:Site AZ W:14:14[ASM]). According to local folklore, Toppy was a reclusive, independent, strong-minded bachelor with a flowing white beard. He started out with one cow and built his herd to well over 100 head (Earven 1991). In 1929 newspapers and Bureau of Land Management records reported that the ranch consisted of 586 acres deeded land, a good two-room 28 x 20 foot house, a corral, three fenced pastures (of 700 acres, 50 acres and 20 acres respectively), and 228 nut and fruit trees (BLM records). In extreme old age, he refused to leave Bonita Creek to move closer to medical care. In 1930 the Earvens found him in a coma alone in his stone cabin. Jim and Myge Earven strapped Toppy to a door, suspended the door between two burros and took him to the Safford hospital where he died within a few days (J. Earven 1992). See photograph of Toppy Johnson at his stone cabin.

Allen Turner West (b. 1862) and Raleigh West settled with their families within the study area, west of Bonita Creek. Details of the ranch operation are discussed in Chapter 5. Part of the group of Mormon pioneers known as the Arkansas Travelers, the Wests immigrated from Arkansas via New Mexico and arrived in the Gila Valley in 1884. Several sons of Thomas Cummings West (the brothers Turner, Raleigh and John) operated ranches west of Bonita Creek. Their sister was married to David Tally who also had a ranch west of Bonita Creek (GCG 3/18/1938). A portion of the house at Turner West's home ranch (Figures 8 and 9),

Figure 16. Stone house at Toppy Johnson ranch in 1930s. The man standing is Toppy Johnson; the horseman is Henry West, son of Turner West (courtesy of Velma West).

now owned by Kennedy Curtis, is still standing. The house, which was moved from its original location across the creek after problems with flooding, is typical of those in the Bonita Creek area (Figure 18). Farming at the ranch was limited to a small orchard of some 20 trees. The major impacts from their presence in the study area are from cattle and from some trail and road construction. However, as the area's largest noncorporate rancher, Turner West's relations with other smaller ranchers, farmers and squatters figure prominently in the social history of the area. The conflict between Turner West and John George is discussed below.

Members of extended families frequently settled in relatively close proximity. The presence of the families of two or more brothers, sisters or cousins living in separate but nearby residences was relatively common among the Anglo settlers on Bonita Creek. Two of the largest extended families, the Earvens and the Wests, were discussed above. After the 1930s, two members of the Christensen family and their brother-in-law Art Lee all lived on Bonita Creek. Three members of the Jones family and two members of the Phillips family settled in the area for several years.

Besides the former company cowboys, the ranchers, and their extended families, other early settlers included Moroni Hicks and his wife Lucinda, Townsend Wamsley and his wife Annie, and two cowboys named Brooker and Hoffman (1910 Census). Little is known about "Old Lady Gay", the wife or possibly the widow, of the manager of the Metcalf store. During the 1920s Bill and Minnie Eaton lived at the second farmsite known as the "Chinaman" place, or Bob Moore property, later purchased by Vic Christensen (Figure 7 and Table 1:Site AZ W:14:15[ASM]). According to local lore, Mrs. Gay was the daughter of George Yorke. He was the pioneer rancher from whom Yorke Canyon is named and who was killed by Apaches in Doubtful Canyon near San Simon in 1881. Mrs. Gay arrived during the territorial period, lived in the house reportedly constructed by the Chinese, farmed and had cattle (Figure 7 and Table 1:Site AZ W:14:5[ASM]) (Earven 1991). She evidently lived alone, as no mention of Mr. Gay was ever made to any of the present informants. There are no homestead records or property records for her homesite. "Gay," a single entry with no first name, is listed in early surveyors' reports and in the 1910 census. Bonita Creek had several temporary residents. During the early 1920s, Ed Fulcher and his family experienced considerable hardship

Figure 17. House at Turner West Ranch; John West in door (courtesy Velma West).

while living at Toppy's stone cabin. The Fulchers were horse traders. They may have been active in gathering some unclaimed and unbranded horses that ran wild in the Bonita Creek area and on the San Carlos Reservation. In July 1921, two young cowboys, Putt Golding (later Graham County sheriff) and Shorty Eaton, who worked for the Hat Ranch, discovered the body of Mrs. Fulcher in the cabin. They transported the body mule-back secured to a door, 15 miles to Morenci over the Safford-Morenci Trail. Golding and Eaton found it difficult to ascend the steep portion of the trail over Turtle Mountain. In Morenci, it was determined that Mrs. Fulcher had died of a gun shot wound and had committed suicide. Rumors that the wound was not self-inflicted were common (West 1992). When the cowboys arrived at the Morenci hospital, Ed Fulcher was already there taking care of his son Sidney. He had been shot in a gun fight near Mule Creek, New Mexico (Shiflet in the EAC 5/23/1984 from a report in the July 1921 Clifton Clarion). After the incident the Fulchers did not resume residence in Bonita Creek.

MOONSHINING

During Prohibition in Graham County (1910 to 1933), residents of Bonita Creek like residents of many other isolated, remote rural settlements throughout Arizona, found that they were able to produce value added products from their fruit orchards and grain fields. Several of Bonita's residents took the opportunity offered by Prohibition to expand their production. In the business of illegal liquor, moonshiners were the producers while bootleggers were wholesalers involved in transportation and sale of the liquor. Moonshiners in Bonita Creek produced illegal liquors with a wide variation in quality, potency and taste. Bonita's many side canyons provided shelter for clandestine activities, and the proximity of the New Mexico state line offered easy escape. Bonita Creek, located near the "main" road (and on a major trail) between the Clifton-Morenci mines and the villages of San José, Solomonville and Safford, was ideally situated to supply local pool halls and cantinas with liquor. Several of Bonita's residents had customarily made some form of liquor for home consumption. Don Suzano, the goat herder who lived at the Serna place, made "mula blanca" corn liquor, known as "white lightning" in English. At the Serna farm, Don Isidoro's wife Dominga made beer which she sold to miners who worked at the nearby placer mine (LaFleche 1992). Minnie Eaton made brandy from

the apricots at the "Old China Man Orchard" in a copper still which Suzy George later used for washing clothes (George 1991).

Prohibition was adopted in Graham County several years prior to its adoption in other parts of Arizona (GG 10/21/1910). During its enforcement, several arrests and attempted arrests were made. Officers made one of Prohibition's "largest hauls" near the mouth of Bonita Creek in November 1922, confiscating a 55-gallon boiler and 180 gallons in mash. They destroyed the still but did not manage to apprehend the moonshiners. Constable Angel Bianes was sent to Bonita Creek to arrest Don Suzano for making moonshine. However, Bianes inadvertently spilled the evidence, perhaps out of sympathy for the elderly and well-respected goat herder (Melendrez 1991). In 1921 several arrests were made at the San José pool hall for sale of illegal liquor. It had probably been supplied by Bonita Creek residents (GG 6/24/21). A garage and repair shop in Morenci contained a false floor under which illegal liquor was stored, much of which was transported from Bonita Creek (Earven 1991). The remains of a moonshiner's escape ladder can still be seen nailed to the cliff face in a side canyon on the east side of Bonita Creek above the Claridge ranch house (Figure 7 and Table 1:Site AZ W:14:20[BLM]).

Informants have observed that many "old bachelors" lived on Bonita Creek. The absence of a school is one explanation for the preponderance of men without families. Another explanation is the possibility of producing moonshine liquor without detection. This activity, during the 23 years in which the sale of liquor was illegal in Graham County, accounts for several part-time residents in the canyon.

CHANGES DURING THE 1930s

During the early 1930s, a devastating drought reduced the number of livestock in the Bonita Creek area (see Chapter 5) and initiated a transfer of properties and an exodus of former settlers from the canyon. The onset of the Great Depression and the passage of the Taylor Grazing Act in 1934 also contributed to the process of depopulation. The Taylor Act imposed a regularized leasing system on livestock owners. It required ownership of deeded land to obtain a grazing lease, thereby eliminating "squatters" who had not homesteaded the land they occupied. This portion of the act proved to be an unexpected disadvantage to

small-holders, particularly Hispanics, who did not have enough land to acquire a lease. A larger percentage of Hispanic settlers, many of whom did not read or write English, had neglected to obtain land patents or formal leases. In general, throughout the Southwest, small landowners and "squatters" were forced to "prove-up" or vacate their property. This was the case in Bonita Creek where many squatters and residents who had not patented the land they occupied either sold out or traded off their holdings. Several of Bonita Creek's fairly large ranchers also went out of business. The Talleys and the Goldings sold their interests in the area at this time.

During the early 1930s, many Hispanic settlers who left Bonita Creek were replaced by Anglo-American ranch owners. Ramon Michelena had a grazing right for cattle, without accompanying deeded land, which he transferred at this time. In 1932 Hermanegildo Barrera sold the former Bianes-Chacon property to Horace Baker. The following year, W.W. Hayward bought a community allotment right for 120 cattle and horses on public land at the mouth of Bonita Creek. He acquired grazing rights formerly belonging to members of the Serna family including Simon, Reyes, Maria, Ubaldo and Santos Serna. This transaction transferred a lease without the possession of any patented land. Hayward transferred the grazing right and associated water rights to H. O. Stevens in 1938 (Stevens 1991; Recorders Office). After the passage of the Taylor Act, which recognized nine goats as equivalent to one cow, many settlers who owned goats but did not own any patented land were forced to give up their goat herds. During this period Myge Earven purchased the farms and goat ranches of Manuel Sanchez, Rosa Peña, Carmen Ortiz and the Chicane family. Most of the goats were removed at this time.

After the 1930s the majority of Bonita Creek settlers were Anglos. Members of the Earven family stayed on in the canyon, as did the Wests. Several relatives of the Earven family including Sam Earven, who lived near the Saiz farm and later by Spring Canyon had farms and cabins along the creek. Bill Traylor, a brother to Beulah Traylor Earven, had a farm between the Clontz and Sanchez farms on the Gila River. He spent a lot of time in Bonita Creek where he had a few head of cattle. New arrivals included two Christensen brothers, the Christensen's brother-in-law Art Lee, Robert A. Moore, two members of the Phillips family, and three members of the Jones family.

Bob Moore, an elderly bachelor, operated a small farm at the former "China Man" Eaton homesite. Moore filed a homestead for 428 acres in 1936 (T5S, R27E, S4). Bill Eaton had made the original entry on the property in 1927, indicating that the Chinese settlers had left prior to that time. In 1933 Moore constructed a fence on the south side of the homestead running from the box on Bonita Creek to the reservation fence on the west. Moore kept cattle to the north in what was known as the Turtle Pasture. Some old farm machinery and a corral can still be seen against the bluff. Cowboy Earven and Art Lee purchased the property during the late 1930s. They built a house that was washed away during World War II (either the 1941 or 1944 flood). Vic Christensen later purchased the property.

Two members of the Christensen family acquired ranches on Bonita Creek. Pete Christensen of Pima bought the Toppy Johnson farm in 1929 and operated it as a ranch for 30 years. He expanded the farm, planting a substantial pecan orchard, and raised several acres of grain crops. He ran cattle on the allotment adjacent to the farm. Pete made improvements and expanded the lumber house, the ruins of which are still standing immediately north of Toppy's stone cabin. In later years Pete Christensen and his wife lived full-time on Bonita Creek. Vic Christensen purchased the former Bob Moore farm where he ran cattle and operated a small farm for many years. He did not live permanently on Bonita Creek because he had a large family with school age children. However, the Christensens resided on Bonita Creek when cattle or farm work demanded. Art Lee, a relative of the Christensens, lived below the Johnson-Christensen place, above the Moore-Christensen place, near the point at which the Morenci Trail exits Bonita Canyon (Figure 7). Art Lee's house was washed away during one of Bonita Creek's periodic floods. Corrals are still present at the homesite which also had some fruit trees and a farm plot.

In 1932 the John George family settled on Bonita Creek. Their residence on the creek presents a case study of Depression era life and of the conflict between smallholding homesteaders and the owners of larger ranches. John Edgar George was an Anglo originally from New Mexico, but was known by his childhood nickname "Colored," a name that stuck with him through life. When George and his wife Suzy first moved to the Bonita Creek area, they lived in tents with their two small daughters and an older stepson. They employed a tutor for the children since there was no school in the area. In 1936 the Georges applied

for a homestead but the application was denied because George had previously used his homestead rights. However, after four years residence with no legal rights, they were able to obtain a grazing lease from the state (Sections 16 and 32) for a small herd.

Prior to obtaining the lease, George had constructed a two-room log house on Johnny Creek a few miles above the confluence with Bonita Creek (Figure 19). He also installed a number of range improvements: a corral, a 35-foot-deep hand-dug well near the house that did not give permanent water, and a retention dam at the Johnny Creek spring which provided water for cattle when the other sources had dried up. Turner West, who had used the spring at Johnny Creek for many years prior to George's arrival, objected to George's presence, and a conflict developed between West and the Georges over access to the spring. In 1935 West built a corral near the spring and constructed a cattle trap around it to keep George's cattle out. West maintained that only the Wests, the Talleys and E. L. Tidwell had traditionally watered cattle there and claimed the spring by priority right. In retaliation, a group of cowboys including George and Cowboy Earven rode from their camp at Sycamore Spring to Johnny Spring. They burned the corral and cut the trap fence between two small posts. The following day, law officers came to the George house. They did not find "Colored," arrested Mrs. Suzy George and took her with her two small daughters to Safford where they jailed all three of them for the night. The conflict resulted in a fist fight between George and West and in a law suit which was eventually thrown out of court (George 1991).

George's struggle to obtain a lease large enough to allow him to continue in the cattle business is a good example of the conflict between economic necessity and range management. George's original application to the Grazing Advisory Board, established by the Taylor Grazing Act, was for 300 cattle and 25 horses with a claim for two wells and three water holes. It was denied with a notation that the range in this area was overgrazed. After receiving his first permit for 50 cows and 25 horses, George quickly lodged a complaint noting that Turner West had been given many more public land privileges. In October 1936 George received notice that his lease lands were overstocked. The following December the permit was reissued for 50 cows and 25 horses as part of a community allotment with Pete Christensen, Vic Christensen and Myge Earven. George subsequently acquired range rights that had belonged to J. E. Jones and was

issued a temporary permit in 1937 for 80 cows. Later that year he was granted a permanent individual allotment of 1,600 acres around the homesite for 72 cows and 15 horses. In 1938 he received a permit for 40 cattle in the individual allotment and 69 cattle in the community allotment. Despite the increases, the permits did not allow him to support his family. In the fall of 1938 he sold his range rights to Vic Christensen and Art Lee and moved his family to Duncan where Mrs. George still lives.

During the 1930s, Bob Phillips, who had originally developed homesites at Sycamore and Hackberry springs (Figure 7), lived at a small farmsite on Bonita Creek. Later it was occupied by the Jones family where he operated a small farm. Myge Earven and Bob Phillips also developed Sycamore Spring and Hackberry Spring; Phillips homesteaded and built cabins at both locations. Phillips first settled at Hackberry Spring where he lived in a tent with his wife Betty. He later moved to Sycamore Spring where he built a cabin of cottonwood logs and constructed a concrete-floored water-storage tank next to the spring. Phillips and Earven built a range division fence from the company corral on Bonita Creek northeast along the ridge top to tie off the bluff above White Tank. He kept cattle to the south, and Earven kept cattle to the north. Myge Earven bought out Phillips's interest in Sycamore and Hackberry springs, and Phillips built a house across the creek from the cliff dwellings near the Lee Trail. The price for Hackberry Spring was reportedly two saddle horses (C. Earven 1991). Phillips then constructed a lumber house, corrals and horse trap on the east side of Bonita Creek. It was across from the most southerly of the larger cliff dwellings, near the trail to Sycamore Spring and across the canyon from the first automobile road that connected Sanchez to the west side of the canyon, near the Lee Trail (Figure 7 and Table 1:Site AZ CC:2:140[ASM]). Phillips remained at this homesite for only a short time after the death of his wife.

Several members of the Jones family arrived in Bonita Creek during the early 1930s. J. E. Jones purchased the lumber house, corrals and barn that Bob Phillips had constructed on the east side of Bonita Creek. Although the lumber house washed away in one of the floods of the 1940s, some of the foundation and part of a wood stove and bed frame can still be seen today. During the mid-1930s, J. E. Jones applied for 500 cattle and 50 horses on about 40 sections of land on central Bonita Creek. This was as far north as the center of the present Turtle Mountain allotment. He claimed to normally run about 400 to 500 head.

Figure 18. "Colored" George's cabin in Johnny Creek, constructed 1933-1934; photographed in 1960 courtesy Kennedy Curtis).

He ran his cattle in partnership with his sons Erwin and Ivan Jones and William R. Gossic, each having a 1/4th interest in the livestock. In 1936 the Advisory Board recommended a permit for 100 cows and 20 horses in the community allotment; Jones protested, noting that he had a home with additional buildings and corrals in Section 26 T5S R27E. However, the Advisory Board issued the permit as stated despite the protest. Jones later transferred the grazing right to Myge Earven and J. E. George. The Jones sons sometimes lived in the cabins at Hackberry and Sycamore springs.

William Gossic, Jones's son-in-law, built a house on Bonita Creek in the NW 1/4 SW 1/4 Section 11 (T5S R27E) (Figure 7). His homesite was later purchased by Myge Earven and was formally relinquished to the federal government so that proper allotment could be made. Gossic had a permit for 70 head during the late 1930s.

Horace and Jesse Henry Baker purchased the Bianes-Chacon homesite (in S8, T6S, R28E) in 1932. They lived part time on Bonita Creek during the 1930s and early 1940s (Figure 7 and Table 1:Site BC-4). They had a larger ranch and farm on the Gila River where they stayed during the winter. The Bakers spent summers on Bonita Creek until they sold the property to Myge Earven. The original Bianes-Chacon house was a long tufa stone structure with a mud and brush roof which was later roofed with tin. It washed away during the 1944 flood (Figure 16). After the flood, the Bakers occupied a second lumber house that stood immediately below the stone house. The concrete slab behind the lumber house is still present, although most of the house has fallen down. The Bakers had 700 head of sheep and ran cattle on Bonita Creek. They continued to do some small scale farming and kept up the orchards on most of the benches formerly farmed by Bianes and Chacon.

In 1933 W.W. Hayward purchased the Serna homesite along with a community cattle allotment for 120 cattle and horses at the mouth of Bonita Creek (Figure 7 and Table 1:Site AZ CC:3:56[ASM]). In 1938 William Gillespie purchased the ranch for his stepson Harold O. Stevens, a grandson of Eagle Creek pioneer settler George Stevens. After 1939 H. O. Stevens lived part time at the former Serna farmsite, managing cattle on his allotment from that headquarters. The Stevens allotment, which extended to the east of Bonita Creek, remained unfenced until the 1960s. The government put in fences after agreements with all of the

bordering ranchers to the east and north. Stevens continued to maintain the orchard and did some limited farming as well (Stevens 1991).

SETTLEMENT SINCE THE 1940S

During World War II, population in the Bonita Creek area began to diminish. With the increased use of refrigerator trucks and railroad cars, the market for local produce was taken over by large-scale commercial producers who supplied chain-stores and supermarkets. The destructive floods of the 1940s discouraged the resumption of subsistence farming and therefore of settlement in the canyon. Many settlers, particularly those with children, found it necessary to live closer to town in areas supplied with more amenities. By the 1950s rural electrification reached most settlements in Arizona, and its absence in Bonita Creek was more noticeable. By the 1960s, there were almost no full-time residents living in the canyon. Ray Claridge (and later Cowboy Earven) and Kennedy Curtis operated the area's two largest ranches. They were put together through the acquisition of many smaller farms and ranches. These ranchers resided in Bonita Creek only when cattle work demanded their attention. At other times they lived closer to town. Today, there are no permanent residents in the canyon although one cowboy lives in the house constructed on the Claridge ranch part-time.

IMPACTS OF SETTLEMENT

Farming

Farming constituted the largest single impact from settlement. The many terraces (or benches) with rich alluvial soils along the creek made Bonita Creek a desirable farming area. Severe frosts were less common in the canyon, and the presence of an easily accessible perennial stream provided water for irrigation at all times of year. However, Bonita Creek's narrow floodplain limited the size of farms and prevented the development of extensive farming along the banks of the creek. Prior to 1940, repeated flooding in the canyon often washed across fields and gardens and damaged crops without destroying the farm sites themselves. Beginning with the devastating floods of 1941 and 1944, however, flooding became more

destructive and terraces and benches were washed away. According to informants, prior to the 1944 flood there were many more terraces in the canyon. The extent of undisturbed arable land was much greater than it is today.

During the historic period, three distinct groups of farmers planted subsistence farms and small commercial farm plots along the banks of Bonita Creek. The first group consisted of Apache farmers who planted plots of corn and squash for at least a century (the mid-eighteenth century to the 1870s). The Eastern White Mountain band, residents of the area, had an estimated total population of 1,500 to 2,000 in pre-reservation times. According to Grenville Goodwin (1942), White Mountain Apaches farmed seven major farming areas, one of which was the headwaters of Bonita Creek. In 1919 Frank Olmstead, the engineer in charge of the Gila River flood control project, noted that during the nineteenth century Eagle Creek had 100 Apache farmers. Unfortunately, Olmstead did not mention the number of Apaches who had farmed on Bonita Creek in previous times. It can be assumed, however, that as one of the seven "principal farm sites" of the Western Apache, Bonita Creek would have had a similar (or possibly slightly smaller) number of farmers. If a group of 100 Apache farmers maintained farms of one half acre per family, the usual size for Apache subsistence farms, on Bonita Creek during the late nineteenth century, there would have been up to 50 acres under irrigated cultivation at that time. Farming was probably concentrated on the headwaters of the creek. This was on the area later included in the reservation, and perhaps extended for some distance along the perennial portion of the stream. Apache farmers commonly constructed check dams in side creeks to slow the impact of water during flood events. They irrigated their corn and squash fields by constructing temporary sand, brush and gravel dams in the creek and turning water into a system of ditches for flooding the entire field (Buskirk 1986). Some environmental historians believe that the most significant ecological impact of Apache farming was caused by the numerous small check dams (Dobyns 1981). This was a practice that has recently been resumed for flood control in several experimental ranches. Additional impacts were created by clearing fields, the use of fire to remove brush and field stubble, and the irrigation systems.

Farming by non-Indian farmers probably began during the 1880s and expanded after the resolution of the Apache conflict (1886). Informants all have the impression that farming was long established prior

to their first observations. Remnant orchards with very old fruit trees and the presence of very large fig trees indicate that the orchards date from the late nineteenth century. Although there is no hard data for the initiation dates, the number or size of early farmsites, all information indicates that farming reached its maximum extent during the period between 1890 and 1920. The majority of informants for this report were not familiar with Bonita Creek until the early 1930s. However, we are fortunate to have two informants who observed the creek during the 1920s. They recall a much larger extent of farming during the 1920s than at later periods (J. Earven 1992; Curtis 1991-1992). Informants all have the impression that farming had probably been more extensive in previous decades than it was during the 1920s. There were possibly 20 to 30 separately operated small farms along the creek banks (Bammann 1992; Earven 1991; J. Earven 1992; Baker 1991; Melendrez 1991). At that time subsistence farming was more common. Demand from the Clifton-Morenci area was at its peak. Local farmers had not yet encountered competition from less expensive produce transported in refrigerator railroad cars and refrigerated trucks. The first generation of Hispanic settlers relied on subsistence farms for the majority of their food and sold excess produce and fruit to miners in the Clifton-Morenci area. Although several farms had 10 to 15 acres under cultivation, the majority probably averaged two to five acres. All of the farms were located along the perennial portion of the stream below the reservation line.

By the 1920s, there were approximately 30 acres still under cultivation (Olmstead 1919; Curtis 1991-1992). Informants agree that during the period prior to destructive flooding, the banks of the creek had many more raised benches than at the present time. All of the benches, even the smallest ones, were cultivated with at least a small garden patch or an orchard. Informants agree that the soil was in better condition and that fewer cobbles were present (Bammann 1992; Earven 1991; J. Earven 1992; Baker 1991; Melendrez 1991). On one section of the creek there was a one and a half mile stretch over which burros, carrying produce and fuelwood, passed so frequently that they had created a hollowed out tunnel in the ground under the tree trenches (Bammann 1992). From the 1930s, the number of individual farms and the quantity of farmed acres steadily decreased. After the destructive floods of 1941 and 1944, farming never resumed its former proportions in the canyon.

Farming methods included the construction of irrigation ditches, known as acequias in Spanish, for the diversion of water from the creek. Several ditches had wooden head gates which could be closed when water was not needed. Smaller ditches branched out from the main ditch to carry water to all portions of each field. In some cases, metal pipes were used for the diversions. Ditches were not more than 2 feet deep and 2 feet wide. Farmers diverted water from the creek by constructing a temporary dam of brush and sand below the headgate. When water became high enough behind the dam, they opened the gate and flooded the field. Some farmers kept water running into their fields all the time. The ditches at Pete Christensens farm (Toppy Johnson place near the reservation fence) were the only ones lined with concrete. Therefore, ditches required annual cleaning and maintenance. Crops included alfalfa, wheat, corn, beans, melons, chilis and other vegetables. One farmsite, known as the "peanut farm," was presumably planted with peanuts. Initially, farm equipment was horse-drawn. Several farms had plows, mowers, rakes, disks and other heavy equipment. By the 1930s farm plots were fenced to prevent destruction by livestock, including unpenned pigs, horses, burros and cows. Many farmers constructed small sections of rock and brush protection at vulnerable points along the banks to prevent erosion on the edges of their fields.

Informants mention several farmsites being "better" than the rest. This indicated that they had richer soils on larger benches and were the best maintained of the area's farms (C. Earven 1992). Foremost among the better farmsites was that at the Chacon-Bianes-Baker homestead. Angel Bianes farmed the benches, or ancones as they are called in Spanish, adjacent to his house on the west side of the creek. He also farmed two benches downstream on the east side of the creek and two benches upstream on both sides of the creek. Bianes planted four or five acres in chili, squash, beans and a small amount of wheat. He packed the produce to Morenci on the backs of four or five burros for sale in the two stores he operated there. At the height of the season he made approximately two trips per week, a round-trip, taking approximately two days. Bianes also sold peaches, pears, and other fruit from his orchard (Melendrez 1991). Angel Bianes told his son-in-law that when the Bianes family arrived in Bonita Creek (before 1900), the farm already had mature fruit trees. This indicated that some unknown farmer had worked that land prior to their arrival. J. A. Farrell's farmsite is also recalled as one of the better farms with a larger, flatter bench available for

cultivation. Farrell had a fine orchard with several kinds of apples in addition to peaches, apricots and plums. Several trees are still standing today. The Farrell farm was probably the largest in Bonita Creek, with an area of 15 to 20 acres available for cultivation in one area. Pete Christensen, near the reservation fence, also cultivated about 15 acres of hay and had a substantial pecan and fruit orchard.

Two farmsites, the "Old Lady Gay" place and the Moore place, were reportedly cleared and levelled by Chinese farmers at a very early period. Both farmsites had stone houses, orchards and small cleared areas for crops. Both farmsites were on larger benches with excellent soils. During the 1920s, Carmen Ortiz farmed at the "Old Lady Gay" place, and the Eatons farmed at the Moore place.

After the 1930s transition from Hispanic to Anglo-American operated farms, farming methods probably did not change to a significant degree. The Anglo farmers may have planted more hay and grain crops than their predecessors. The object of farming had shifted from subsistence and produce market farming to the production of supplemental feed crops for cattle and horses. The Earvens employed farming techniques representative of the majority of Bonita Creek's farmers during the 1930s. They used mules and a mower to cut hay. They never used a bailer, but stacked the hay. The dump rake and some old implement parts are still present at the former farm at the "Old Lady Gay" place.

During the 1930s there were approximately seven farmsites that ranged in size from 4 to 20 acres. Between the major farmsites were many other small benches that had fruit trees or small gardens planted on them. Major farmsites cultivated at this time are listed in order beginning upstream at the reservation fence and moving downstream, north to south. Pete Christensen purchased the former Toppy Johnson place on upper Bonita Creek approximately one mile below the reservation fence in 1929. He operated the largest farm on the creek, planting hay on the large flat above his house on the east bank. His hay field was approximately 15 acres. He also planted several acres of pecan trees, some of which are still living. Bob Moore, who homesteaded during the 1930s at the farmsite reportedly cleared by Chinese farmers and later farmed by the Eatons, had approximately 4 acres planted with fruit trees and alfalfa hay. This farm was later operated by Vic Christensen. Art Lee, a relative of the Christensens, planted 3 to 5 acres by his house on the west bank of the creek. The farm plot was referred to as the "peanut farm" because he planted peanuts.

Jack Farrell continued to farm approximately 10 acres at the mouth of Johnny Creek. If this farmsite is that originally worked by William Kimball during the 1880s, Farrell farmed a smaller acreage than Kimball had, since the Kimball farm was listed as a 20 acre farm. Myge Earven planted hay, fruit trees, and vegetables at the "Chinaman-Old Lady Gay" place (the former Carmen Ortiz farm). Sam Earven had a small farm at the former Jesus Saiz farm. The Bakers farmed at the former Chacon-Bianes farmsite. At the mouth of Bonita Creek, the Haywoods and later the Stevens continued to gather fruit from the Serna orchard and to plant some crops. Several other settlers (Jones, Gossic, Sam Earven, George) had smaller plots, some of which were no more than a vegetable garden.

Farming continued on approximately the same scale until the time of World War II. Then the first of several major floods washed away many creek benches and destroyed the soil on many others. Prior to that time, the creek had often come up four or five times a year, washing over fields without doing much damage (Earven 1991). Both the 1941 and the 1944 flood washed out all the crops, removed entire terraces, and destroyed several houses. After these floods, farming never resumed in the canyon on its previous scale. In addition, during the 1940s, marketing changed significantly and many small farmers went out of business throughout Arizona.

Other Impacts of Settlement

Direct impacts from settlement at homesites along Bonita Creek are still visible today. They are largely limited to cleared areas for homesites and farms on benches along the creek. Direct impacts from settlement were probably limited to a maximum of 60 acres of land scattered along the creek below the reservation fence. In these areas native vegetation was removed, the land was levelled and cleared, and irrigation ditches were constructed. Some large trees must have been removed during clearing, although none of the informants has mentioned this, since clearing had already taken place when they first observed the canyon. The clearing of benches eventually contributed to the destabilization of creek banks. The absence of trees in these areas allowed flood waters to pass over the cleared land more rapidly. Irrigation ditches, particularly after they were abandoned, contributed to the initiation of erosion. Some limited rip-rap bank

protection was constructed along the banks in many of these farmed areas. The bank protection may have increased destabilization along the banks below the protected sections.

Secondary impacts from settlement include impacts from livestock and from trail and road construction. Domestic livestock (as opposed to commercial herds of cattle or goats) were allowed free range and heavily impacted vegetation in the area close to homesites. Small livestock trails between preferred pasture areas and homesites contributed to erosion. Horse trails for access into the canyon provided additional disturbances. Settlers' use of the creek bed for an access route through the lower canyon contributed to disturbances of the creek bed. The automobile road also contributed after it was constructed during the late 1930s.

A more extensive settlement with community services did not develop on Bonita Creek for several reasons. The narrow floodplain prevented large scale farming and limited the number of settlers the canyon could support. The relative remoteness of the area and the roughness of the terrain discouraged settlement, particularly after the arrival of motorized transportation. Bonita Creek was partitioned off by both political and natural boundaries. The San Carlos Reservation fence prevented access and use to non-Indians and effectively divided the creek into two distinct political units. A natural barrier further divided the perennial portion of the creek below the reservation fence. The Bonita box, a deep, narrow portion of the canyon with steep escarpments, divided the non-reservation portion of the creek into the "upper canyon" and the "lower canyon," with access from two different directions rather than directly up the canyon from the mouth of the creek. The box became impassible in times of high water, and at all times of the year it prevented easy access, except by foot or horse. Automobile roads were not developed into the canyon until the 1930s, 15 to 20 years after the use of motorized transportation became common in other parts of Arizona. It was impossible to reach the edges of the upper canyon by automobile until the 1930s when new roads were built and old roads improved. Road access to the upper and lower canyon came from two different directions, further separating settlers in the two portions. Settlers in the lower portion of the canyon near the mouth of Bonita Creek came from Safford or Solomonville by the lower road. Settlers who lived on the upper portion of the canyon near the reservation fence first arrived by a road that crossed the reservation. Later

they arrived by the road that entered near the Earven/Claridge ranch. The separate access roads tended to separate settlers and discouraged a sense of community that developed in other isolated dispersed rural settlements. However, the presence of 15 to 30 families living and farming along the creek for a 40 to 50 year period had considerable impact on the Bonita Creek drainage. Further details of this impact are discussed in the following chapter.

VII

ENVIRONMENTAL CHANGE ON EL BONITO

A variety of human induced impacts that have affected geographic alteration in the Bonita Creek drainage are discussed in this chapter. Landscape description for the area is limited, and no scientific data describing plant communities, geographic forms, or animal communities exists for the period prior to the 1960s. We are fortunate, however, to have a few nineteenth century descriptions of the Bonita Creek area along with abundant anecdotal information from the twentieth century. Comparisons between the early written descriptions, the information contained in the anecdotal material, and observation of the present condition of the study area give indications of the sequential stages of land change within Bonita Canyon and in the surrounding area. For the purposes of this report, an attempt is made to distinguish land change that has natural, or climatic, causes from land change that has been induced by human impacts. This chapter begins with early descriptions of the area and continues with observations of specific human impacts. This includes mining, harvesting of fuelwood and wild plants, hunting and trapping, fire, trail use, road building, well and dam construction, water extraction, and incidental land uses. Livestock grazing, farming, and homesite construction have been discussed in preceding chapters. A major focus of all discussions of Bonita Creek ecology has been flooding, since the canyon through which the creek flows is in many places narrow with a small floodplain. Severe flash flooding must have always occurred, particularly along the box canyon portions of the drainage. An effort is made to determine the extent to which human impacts altered the severity or frequency of flood events.

"EL BONITO"

The drainage now known as Bonita Creek has undergone a series of name changes. The Apache name for the creek has not been ascertained. Undoubtedly, Spanish explorers gave their own name to the

drainage. They probably called it either the Rio San Carlos or the Río Bonito, or possibly referred to it by both names at different times. James Ohio Pattie, the first Anglo-American traveller to describe the creek (1826), did not mention it by name. William H. Emory, who travelled down the Gila River in 1848, called it the Río San Carlos; within a few years, most Anglo-American explorers and surveyors referred to it as the Río Bonito, the name that appears on the 1869 military map of the territory (Robert 1869) and the 1877 New Map of the Territory of Arizona (Mallery and Ward 1876-1877). During the 1890s, the term Rio Bonito and Rio Bonito Valley (GG 9/17/1897) as well as the names Gila Bonito Creek (Surveyor's Book 2821) and Bonita Creek (Graham Guardian) appeared in local documents. Through the 1940s, surveyors employed the names Gila Bonito Creek or Río Bonito more often than Bonita Creek. Hispanic settlers on the creek always called it El Bonito and refer to it by this name today (1992). Old-timers, both Hispanic and Anglo, often make reference to "the Bonite country" and speak of "Bonite Creek." However, by the mid-1900s, Bonita had become the most commonly used and the most formal of the many versions of the name for the creek and canyon.

GEOGRAPHIC DESCRIPTIONS BY EARLY ANGLO-AMERICAN TRAVELERS

Pre-Settlement Period

James Ohio Pattie was possibly the first Anglo-American to view the Gila River Valley. In 1825 he descended the Gila with a party of trappers, camping in a "huge cavern in the midst of the rocks," which historians have thought to be in the vicinity of Bonita Creek (Bateman 1986). During the night a storm frightened away the trappers' horses. Pattie and his companions tracked them through the snow across the river and "up a creek, that empties into the Helay on the north shore." Pattie entered a cave on the creek, where he encountered a bear that "reared himself erect within seven feet." After promptly dispatching the bear with his gun, Pattie observed that the bear was the "largest and whitest" grizzly he had ever seen. The trappers extracted 10 gallons of oil from it and dried its meat. The following day, they continued downstream to a point on the Gila, "where trapping had not been practiced." Pattie remarked on the plentiful timber and abundance of "musquito" trees along the Gila, the excellent land for cultivation, and the abundance of Indians

along the San Carlos, which they called "the deserted fork" because it did not have beaver (Pattie 1988:34-37). On their return trip several months later, the starving trappers stopped at "Bear Creek" (Bonita Creek). They retrieved the oil they had stashed and killed four deer and several turkeys (Pattie 1988:45). On a subsequent trip in 1829, Pattie found that the Gila had been so heavily trapped during his absence that the few remaining beavers had become "shy and retiring" (Pattie 1988). After Pattie's initial expeditions, a veritable onslaught of trapping by American and French trappers nearly exterminated beaver in the Gila watershed (Dobyns 1981:105-116).

The next geographic description of the Bonita Creek area is contained in Lieutenant William H. Emory's *Notes of a Military Reconnaissance*, his report of General Kearny's 1846 journey to California during the Mexican War. Kearny's Army of the West left Santa Fe and followed a route down the Rio Grande, then continued west to the Santa Rita del Cobre mines, and southwest to the Gila River. On October 20, 1846 the troops crossed the Gila and camped on the south bank under a "high range of symmetrically formed hills overhanging the river." During the following days they crossed and recrossed the river many times, observed signs of beaver, wolf and deer and feasted on quail, goose and teal. On October 22, they camped on a high bluff above the river that they named Steeple Rock. October 23, Emory observed the first of many Indian ruins. On the following day he saw two additional ruined villages with remains of structures 60 by 20 feet in size. On October 26, deep gullies and impassable arroyos forced them to travel 1,000 feet above the river on the mountain slopes for a distance of more than 16 miles. On the north side of the river they passed high mountains that followed "a regular curve" as far as the "mouth of the San Carlos." The mountains were "deeply indented in two places by the ingress into the Gila of the Priete (Black) and Azul (Blue) rivers." Both the steepness of the mountains and the swiftness of the river at this point impressed Emory (Emory 1848:60-65).

Emory's geographic description indicates that the creek he called San Carlos was actually Bonita Creek. Emory noted that the "San Carlos" ran through a narrow canyon with "immense cavities" on both sides that contained the remains of fires and bones. At the mouth were the remains of two ruined buildings, a rectangular house foundation and an adjacent circular structure on a nearby mound. Both were made of

unhewn stones, and both were surrounded by pottery. Digging revealed the presence of a solid packed dirt floor, similar to those used by "the Spaniards" of that period. Emory thought the ruin to be the remains of a shepherd's house, and the circular building a look-out. Upstream on the "San Carlos" he discovered a series of little caves that contained a "settlement of tarantulas." The grass at this camp was inadequate. Below this camp (at Bonita Creek), the Gila changed color and became slightly saline. After a two-mile ride Kearny's party emerged from the "Black" Mountains and again entered the Gila Valley, which widened out gradually to the base of Mount Graham (Emory 1848:66-67).

Captain A. R. Johnston of the First Dragoons, who also kept a journal of the trip, described the mouth of Bonita Creek as follows: "Opposite our journey, the Black and Blue rivers come on the north-eastwardly; the Black courses south, with a branch in the mountains called Bonita; the course of the Blue southeast; they head in the mountains north of the Gila, and may be sixty miles long; they come into the Gila about six and a half miles apart. Near our camp a small stream called the St. Charles comes in; all three of these streams flow through canyons. The diluvion here is very thick, and of a rocky nature, which, with the basalt, make the walls of the canyon vertical. Near our camp are old horse signs and trails, and old Indian wigwams of willows about five feet high, and covered with willows and grass. Near where we left the Gila today were the ruins of two ancient houses, shown only by the foundation stones and the pieces of pottery" (Emory 1848:584). Johnston locates the stream correctly and his diary reveals that the name Bonita was already in use at this time. Unfortunately, neither Johnston nor Emory discuss the source for any of the place names they use.

Three years later, several Forty-niners on their way to California penned their impressions of the mouth of Bonita Creek. Gold seekers followed both banks of the river, many of them using Lieutenant Emory's report as a guide. By 1849, emigrants often referred to the trail along the Gila as the "great stealing road of the Apaches" or the "Devil's turnpike" (Green 1955:60). On July 14 and 15, 1849, Robert Green and the members of the Arkansas Company camped below the mouth of the river "Don Carlos," (Bonita Creek) observing "the ruins of many old mud houses and lots of pottery laying about this bottom." Green was distinctly displeased with the Gila River Valley: "there is no game worth mentioning along this river, no

country, no people, no timber, no fresh water, no grass, and no comfort" (Green 1955:65).

During the summer of 1852, John Russell Bartlett and members of a boundary survey party traveled east up the Gila River, surveying the new border between Sonora and what was then New Mexico Territory. Although Bartlett visited other portions of the Gila River drainage, he did not follow the Gila downstream below the junction of the San Francisco River. Therefore no description of the confluence of Bonita Creek is included in the journal of his travels. During October and November 1852, Bartlett party-member Lieutenant A. W. Whipple performed the actual survey of the section of the Gila between the San Francisco and San Pedro rivers (Bartlett 1965:597-602). His notes make no specific mention of Bonita Creek but describe the banks of the Gila as being thick in brush and undergrowth.

The next description of the area was included in Lieutenant George M. Wheeler's 1873 report of the first general geological survey of southern Arizona. Geologists with the survey party diverged from the main route between Camp Apache and Camp Bowie to "explore the South Fork of the White Mountain, and the Prieto and Bonito Rivers, and to ascend Mount Graham." Geologist G. K. Gilbert noted the presence of Gila conglomerates "of local origin" extending up the Río Bonito 15 miles and down the Gila for more than a hundred miles (Gilbert 1873:541). Biologist Oscar Lowe described large fishes, principally of the genus Gila in the Francisco, Prieto and Bonito rivers. He observed that the occasional swamps found in the region, particularly near the abandoned Fort Goodwin, were "the source of fever and ague." He noted, however, that the swamps could be drained. He believed that the Pueblo Viejo Valley (as the area near Solomonville, San José, and Sanchez was called) had great agricultural capacity, although at the time, it had only one recently arrived farmer (Lowe 1873:593).

When Emory traveled down the Gila River, the trail was impassable for wheeled vehicles, and his wagons had to be left behind. During the California gold rush, only mule-back parties used the route. Constructed during 1857-1858, the national wagon road from El Paso to Fort Yuma, known as the Leach wagon road, passed along portions of the banks of the Gila River below the confluence of the San Simon (Jackson 1942:218-32). By the late 1860s, the "road" was probably no more than an open space with ruts on the river bank, maintained informally through the voluntary efforts of travelers. In 1867 travellers mentioned

that it washed out in high water (Rustling 1874:381). By the 1870s, the Gila "road" could be traveled by wagon from the New Mexico border to California. During the summer of 1877, Mrs. Robert Irion, on her way from Pueblo, Colorado to the Silver King Mine in Arizona Territory, kept a diary of her wagon trip down the Gila. She complained that the "road was perfectly awful," the dust intolerable, and the going bumpy. She noted that although the grass on the mesas had burned up, it was good in the river bottom. She encountered many Apaches and observed the remains of many large irrigation ditches, in the area below the confluence of Bonita Creek (Irion 1877).

Surveyors' Field Notes

Cadastral surveys give some indications of land condition and ecological change along Bonita Creek. Early surveys often contained summary notes on the general conditions found within townships. These summaries, which appeared at the conclusion of external township surveys, usually included comments on grass, timber, and soil quality, and noted the existence of any roads, cultivated areas, or settlements within the township. Although surveyors' comments contain subjective judgments and reflect individual experience, many surveyors wrote relatively specific descriptions of land forms and vegetation, which can be used to measure subsequent impacts or to determine sequential changes in plant communities or land forms. Surveyors included specific site descriptions for monument or marker locations. They classified timber according to size, (palo verde did not qualify as timber, nor did mesquite unless the tree had grown to an unusual size) and judged the soils from first to fourth rate according to color, depth and quantity of rocky material. Surveyors descriptions included in the report follow a chronological order. (Figure 20 highlights the major cadastral boundaries mentioned in the following discussion of surveys that commented on the Bonita Creek Watershed.)

In 1874 Theodore F. White conducted the first of the cadastral surveys. Although White did not write a final township summary, his descriptions of monument locations indicate general land condition for the years immediately prior to Anglo-American settlement and intensive cattle grazing. Following a westward route along the boundary between T6S and T7S, through R27E and R28E, White's group of surveyors noted

cottonwood and willow along the Gila, good soil in the creek and river bottoms, some grass on the mesas, a few trees, a long stream 60 links wide (Bonita Creek), and few trees or timber on most of the mesas. Along the Gila they used willows fourteen inches in diameter to take their readings (Book 1574).

Twenty years later, between June 1893 and December 1895, Alfred L. Trippel and Philip Contzen surveyed a line through Ranges 26, 27, 28 and 29, destroying all previously erected monuments. Contzen wrote fairly detailed descriptions of his observations. The survey of T6S, R26E included comments that the township had poor quality timber, with permanent water only found in the SW quarter of Section 31 where the township's only settler, W. F. Skinner, lived. Copper mining claims were located in Sections 1, 2 and 12 (Book 660). During the same survey, Contzen noted that T6S, R27E was composed of mesa land and mountains, with the exception of Sections 35 and 36 (near Sanchez), which had rich soil capable of producing abundant crops with artificial irrigation and where a number of settlers lived. Mining claims were located in Sections 7 and 17 (Book 662). The surveyors noted that the Gila River, which measured 100 links in width, was subject to overflow (Book 1591).

Contzen described T6S, R28E (the township in which the confluence of Bonita Creek and the Gila is located) as an area that contained "extra dense mesquite growth" on the dry washes tributary to the Gila River. He noted the presence of canals and roads near the river. He again destroyed all corner monuments previously set by Deputy Surveyor A. L. Trippel and surveyed the meanders of the river. The township had one settler, S. Molina, who owned the only cultivated tract of land north of the Gila River (in the south half of Section 31 downstream from Bonita Creek on the Gila). The Southern Pacific was boring for coal at that time. Contzen noted that the township was well watered by the Gila and by Bonita Creek (which joined the Gila in the center of the township), that Section 7 contained excellent grazing land, and that "some mesquite" was found along the Gila. Bonita Creek was 150 links wide (more than double its width in the previous survey) and flowed E-SE. At the steep portion of Bonita Canyon, the creek bed contained mesquite and sycamore timber which he distinguished from scrub or undergrowth. In Section 35 he noted the presence of running water (12 links wide) in the canyon and a trail ascending the steep sides of the canyon (Book 1547). In section 31, the east boundary of T6S R27E had a road running NE to W-SW, a wire fence running

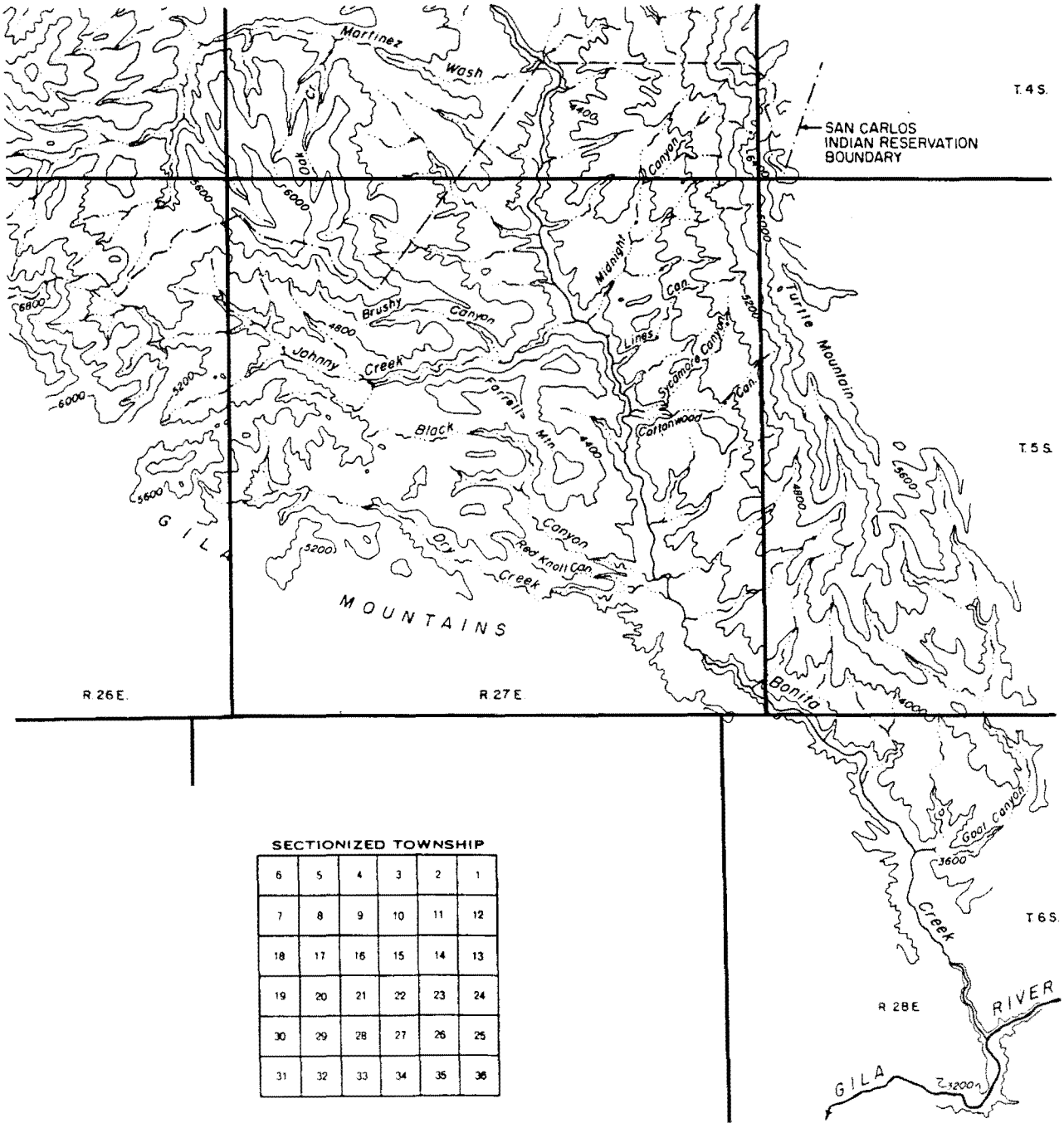


Figure 19. Cadastral boundaries referred to in surveyors' notes.

east cottonwood and west, a second wire fence running north and south, a plowed field, and a ditch six links wide next to the Leonidas Sanchez house. In Section 19, the township's east boundary passed over another trail (Book 1547).

On the south boundary of T6S R28E, Contzen noted a dense undergrowth along the right bank of the Gila River, where he used a cottonwood of 36 inch diameter as marker. He noted the presence of willow timber, a road, canal, and dense undergrowth along the Gila with arrowwood and greasewood (Book 1592). In general, Contzen described the land in T6S, R27E, R28E and R29E as rough, rugged and precipitous. The township line crossed over deep rough canyons with very few living streams. He noted that only portions of T6S, R27E and R28E should receive an internal survey (Book 1521), implying that only these areas were worthy of settlement.

After another 20 years, cadastral surveys (both external and partial internal surveys for individual townships) resumed. Between 1916 and 1919, William Kimmel conducted internal surveys of several townships in the Bonita Creek drainage. The field notes for T5S R27E, a township dissected by Bonita Creek, included extensive comments on the township's settlers and improvements. By 1919 four residents had habitations along Bonito Creek: Suzie Moreno, Gay, J.A. Farrell, and José Baja. Baja had a fenced field under cultivation in the NE quarter of Section 26. The township had no roads "worthy of the name," but numerous trails followed the spurs and canyons and the creek. Communication with settlements on the Gila was chiefly by pack horse. Range fences crossed some of the lines of survey. Kimmel noted that the timber was of negligible value and in an area inaccessible for marketing. He therefore considered that cattle raising and limited fruit and crop farming were the only industries possible in the area. He remarked on the presence of ancient Indian ruins in the SE quarter of Section 26 at the confluence of a tributary canyon on the southwest wall of Bonita Canyon. Additional prehistoric dwellings were located just west of the line between Sections 10 and 11 as had been noted in Arthur W. Brown's 1918 boundary survey. He further remarked that no surface indications of mineral deposits were present in the entire township (Book 3286).

Moving northward, Kimmel described the small portion of T4S R27E that is below the reservation fence. He noted that bottom lands near "Gila Bonita Creek" contained a "heavy growth of sycamore timber"

with trees ranging from 12 to 36 inches in diameter; a few small walnut trees; and several species of small hardwood trees, occasional "poplar" (cottonwood), and a scattering of cedar on the ridges ranging up to 12 inches in diameter. Bonita Creek, which was fed by springs three or four miles above the township boundary, was the only source of water in the township. There were no settlers in the township and no wagon road, although trails led to Clifton-Morenci, Solomonville and Safford. He observed that the entire township was "covered with an abundant growth of good grass and small patches of the creek bottom can be irrigated." He considered the soil to be third rate ("shallow and rocky"), except for patches of rich alluvial loam along the creek bottom. He noted the presence of three small groups of old cliff dwellings in a poor state of preservation in Section 27 (Surveyor's Book 2767).

Kimmel noted that the area near the abandoned reservation boundary (Sections 34, 35 and 36) contained fourth-rate soils, a scattering of pine and cedar, an undergrowth of catclaw and cactus, and good grazing. In the sections of the survey that crossed Bonito Creek, sycamore predominated although a few small walnut trees and several species of hardwoods and some "poplar," ranging from 12 to 36 inches in diameter, were present. On the higher slopes, he found a scattering of pine timber up to 12 inches in diameter. Bonita Creek, the only water in the township, averaged 30 links wide and 6 inches deep, flowing south through a canyon 10 to 15 chains wide with precipitous walls. The soil was fourth rate except for small patches of first-rate alluvial loam along the stream bed. Most of the township was covered with malpais rock. The entire township was covered with an abundant growth of good grass, and small patches of the creek bottom could be irrigated. Three small groups of old cliff dwellings, all in Section 27, were in a poor state of preservation. He observed no settlers (Book 3287), although we know that Toppy Johnson was living on this portion of Bonita Creek at that time.

In 1923 William Thorn and Benjamin Kinsey surveyed T5S R26E. They noted that a few portions of the township had third-rate soil, while most of it was of poorer quality. Although the township had a scattering of cottonwoods near springs and along washes, most of the surface was covered with a dense undergrowth of greasewood, scrub oak, cedar, mesquite, catclaw, buckbrush, manzanita and cacti. There were no watercourses carrying permanent flows but there were numerous permanent springs. Mining claims in

Sections 34 and 35 and a number of prospect holes and shafts in the southeastern portion of the township indicated mineral exploration. One settler named Watson lived in the north half of section 25 near Bear Spring. His improvements consisted of a reservoir in section 5, known as the Big Springs Reservoir, two corrals (one in Section 6 and one in Section 25), two houses (one in Section 25 and one in Section 26) a water pipe line from a spring in Section 26 extending southwesterly to a tank on the south boundary of Section 35, and range fences in the northwestern and southeastern portions of the township. A road from the Big Springs Reservoir in Section 5 extended southwest toward Pima. Another road from Watson's ranch in Section 25 extended south toward Safford. A number of old roads in poor condition traversed the southern part of the township. Grazing was only fair (Book 3581).

After the 1920s, surveyors took development for granted and survey notes contain less information on settlers and improvements. However, the 1931 notes for the resurvey of the southern portions of T6S R28E, which includes the confluence of Bonita Creek with the Gila River, described major ecological change in the area. "Heavy floods had changed the channel of the river to such an extent...that its present position bore little resemblance to its former position, at the time Deputy Contzen made the original survey" (Book 3913).

In 1947, subdivision surveys of T6S R28E included Section 5, through which Bonito Creek Canyon passed. Surveyors noted that the collection gallery of the Safford water system was buried beneath the canyon bed at the center of the section and that the pipe line followed the bottom of the canyon southeasterly. They mentioned mesquite, sycamore and hackberry trees along the creek (no mention of cottonwoods) and a thick growth of greasewood found over the entire section (Book 4358). The 1955 reestablishment of the Contzen survey noted that Bonita Creek was 150 links wide and 2 feet deep where it crossed through T6S R28E. Surveyors noted that soil was fourth rate, no timber was present, and the entire township was covered with rocks. A graded road passed through the southern portion of the township. The Gila River bottom contained a dense willow and mesquite undergrowth and a scattering of cottonwoods, and Bonita Creek had a fairly heavy growth of cottonwood and sycamore trees with some scattered mesquite undergrowth. A rancher lived in Section 16 (near the confluence of Bonita Creek and the Gila). Stockraising

was carried on in the central and eastern parts of the township, but was "very limited as the area is too rough and rocky and there is not sufficient rainfall to produce a good stand and growth of the native grasses." Several settlers living in Section 31 (near Sanchez) had fields under irrigation. Additional cultivated land was in the SW 1/4 of Section 29, with a number of deep irrigation wells in Section 31, which supplemented irrigation water from the Gila (Book 4489). In 1958, T5S R28E east of Bonita Creek had no settlers, and stockraising was limited by the township's roughness and inadequate native grass. Phelps Dodge had the Walnut Springs (one of the homesites on the Turner West ranch) area surveyed (T5S R26E) noting the presence of the Outlaw lode, Beggarman lode, and Walnut lodes No. 1 through 5 near the corner of Section 25, 26, 35 and 36 (Book 4579).

By 1960 the portions of the Gila River that pass through T6S R28E had recovered some of the former heavy stands of willow, but not the cottonwoods or other large trees. By 1960 barbed wire fences and dirt roads were commonplace. One ranch was located in Section 16, and settlers lived in Sections 29 and 31 where they had fields under cultivation (Book 4616). Floods had cut the bank of the Gila River 3 feet deep in the northwest corner of T6S R29E. Surveyors noted that several goat ranches were located in the township (Book 4617). In 1960, T6S R27E east of Bonita Creek displayed a "long history of mineral exploration, as evidenced by the numerous remains of mine dumps, tunnels, shafts, buildings and other traces of past activity." It had a major road and numerous bulldozed roads and jeep trails. Seventy percent of the land was under mineral claims, and a new shaft was underway in Section 5. The township had no natural waters, but numerous stock tanks and one windmill (at Anderson's ranch) had been developed (Book 4687).

Flood Control Surveys

In addition to the cadastral surveys of townships, several governmental agencies performed special purpose surveys. In 1919, Frank Olmstead conducted a flood control survey of the Gila River Watershed, in which he evaluated Bonita Creek for the possible construction of flood-control check dams. His description of the drainage included the portion of Ash Flat, approximately one-quarter of its surface area, that drains into Bonita Creek. He remarked that the watershed areas of the Bonita were not "very

abundantly clothed with vegetation" at that time. Bunch grass grew on the mesa lands and afforded pasturage for "many herds of cattle." Large trees on the river bottom included cottonwood (most common), sycamores, and black walnut (Olmstead 1919).

Olmstead noted the presence of the Farrell ranch nine and a half miles above the mouth of the creek at the head of the box canyon. He noted that not more than 30 acres were under cultivation on Bonita Creek. Several opportunities existed for retarding dams which could be constructed economically by blasting the vertical side walls. However, since Bonita was not a major silt bearer, no retarding dams were recommended. Eagle Creek appeared to be more heavily affected by flooding than Bonita Creek, since it had been more heavily disturbed by mining and by the presence of over 100 Indian farmers with an "appreciable area under cultivation" (Olmstead 1919:77-78).

In 1935 after Gila River flooding continued, the Army Corps of Engineers and the Soil Conservation Service prepared a flood-control survey for the portion of the Gila above Bonita Creek (GCG 10/25/1935). In 1935, chief engineer Knapp of the Army Corps of Engineers and P. B. Fleming completed the Gila Soil Conservation Project No. 25, a flood-control study for the Soil Conservation Service. The report included recommendations by H. T. Corey, an internationally known expert on flood control and erosion prevention, for 12 flood retention dams on the Gila, San Francisco, Bonita, Eagle and San Simon drainages. The goal of the engineers was to avoid repetition of the devastating floods of 1905 and 1916 through construction of retention dams intended to prevent build-up of flood waters in tributaries (GCG 10/25/1935).

San Carlos Reservation Boundary

The south boundary of the San Carlos and White Mountain Reservation (a single administrative unit for years) received considerable attention. Initially surveyed in 1883, the boundary was fully resurveyed in 1915, with additional partial township surveys for portions of the boundary. Paul Riecker, U.S. Deputy Surveyor, conducted the first survey between May and October 1883, beginning at the flagstaff at Camp Goodwin and moving in an easterly direction. On reaching the Bonita Canyon area, the survey party found the terrain so rough and difficult to survey that chaining could not be used, and distances down "Bonito"

Canyon had to be shot. Nonetheless, they were able to raise the necessary markers on the rougher portions of the boundary west of Bonita Creek, between Monuments 10 and 16, and recorded descriptions of the shapes and locations of all monuments. The line between Monuments 13 and 14 ran over high rocky ridges and deep canyons down into Bonito Canyon. At Monument 14, on the east bank of Bonita Creek, the surveyors set a marked granite boulder into the ground and raised a monument of stones 4 1/2 feet high near a cottonwood 36 inches in diameter. Monument 15 was "a monument of stones, 7 ft. high 6 ft. base, ...near one of the cliff dwellings, which are in the perpendicular walls on east side of the cañon and somewhat south of this monument.....This monument is raised upon a sharp rocky peak rising abruptly from Bonito Cañon." Monument 17 was raised on the "highest mountain east of Bonito Creek it is flat topped with rocky bluffs near its summit." A subsequent monument was raised "upon a permanent round mountain, flat on top and rocky toward the south, it slopes toward north and east toward Eagle Creek and south and west toward Bonito Creek and is on the summit of the main range of mountains." Turtle Mountain was not mentioned as such, evidently not having received the name at the time. On reaching the termination point of the southern boundary survey, the southeast corner of the reservation was set from the astronomical monument on the territorial boundary between New Mexico and Arizona, near the Silver City-Clifton road, a point 59 miles distant from Camp Goodwin.

The surveyors noted that the "Gila Mountains are throughout rocky and barren, with but little water, and occasionally a few scattered trees, there is some grass. This survey was accompanied with a great deal of hardship to everyone engaged with it and without the utmost perseverance it would not have been accomplished." The survey contains numerous remarks on specific locations of "first rate" soil, good grass, cottonwood or mesquite "timber," or areas of dense undergrowth of willows. The survey concludes with Riecker's comments which express the prevalent Anglo-American perception of Indian land use and which may have contributed to justifications for subsequent deletions of large portions of the reservation:

> Throughout this survey I have found no parcel or piece of cultivated land along the boundary line run by me, not one acre is utilized for any purpose whatever by the Indians. Near San Carlos near my meander lines I found a few small pieces of poorly cultivated land. The land in the Gila Valley

is of the richest kind and there is fine grazing along its bottom, north of the Gila Range of mountains there is an extensive plateau 30 to 40 miles long and 10 miles wide which if it could be utilized by white men, would make as fine a stock range as can be found in the U. S. Along the Coalfields or any part east or west of the same, the Indians have never and no doubt will never make use of any of the lands of the reservation. There are many indications of mineral along the south boundary, but with the exception of the work near the Coalfields, which I estimate to amount to $20,000 nothing has been done in the way of development. Herewith enclose the original of a protest handed me by the original discoverer of the Coalfields at the time of making the survey requesting me to incorporate the same in my report, I can only state that it was not an easy matter for them to know whether or not they were trespassing on the Reservation or not, owing to the mountainous character of the whole country. They could certainly not tell, without an accurate survey [Paul Riecker U.S. Dep. Surveyor, August 4th, 1883 (Book 1961)].

In 1915-1916, H. L. Baldwin conducted a resurvey of the reservation boundary. The amended survey was strictly external, beginning at the initial point at Camp Goodwin, continuing to the summit of the Gila Mountains, and continuing to the southeasterly corner of the reservation. Its completion was intended to settle the "controversy of long duration on the part of the Indian Agent at San Carlos and the cattlemen who graze their cattle on or near the south line of the reservation." Baldwin began his survey on the summit of the Gila range almost directly north of Geronimo, and followed the watershed in a southeasterly direction, keeping close to the watershed at all times. The survey crossed Bonita Creek about one and a half miles below the Hat Ranch, thereby "taking in" three ranches, the Hat Ranch, the Toppy Johnson ranch and a small place owned by a Mexican farther down the creek." Surveyor Baldwin was in possession of the only copy of the field notes of the original survey and of the document that established the reservation. The surveyors placed iron posts with copper caps at each half mile, each bearing a respective number, in order to prevent future controversy (GG 11/19/1915). Only after this survey was completed did fencing of the reservation begin.

Near the summit of the Gila Mountains, at the sixtieth mile of the survey, the party located a very

large spring which they noted was the regular watering place of hundreds of cattle. In their search for the previous well-described monuments, they found many missing or moved. Monument 10 had been scattered. Monument 11, at the highest peak of the Gila Mountains, was in place and in good condition. This monument was used as a signal for Bryce Station in the primary triangulation for the USGS, and the bronze triangulation tablet marking the station was still in place. No remains of Monuments 12 and 13 could be found. Nearing Bonita Creek, direct measurement again became impossible, forcing topographer Baldwin to use triangulation. At Bonita Creek, the surveyors constructed a rock monument (3 feet x 3 feet in height) on the west bank of the creek, 60 feet above the bed of the stream. Deputy Surveyor Kimmel noted that the water in the creek was 20 links wide, 6 inches deep, clear and pure, with very large sycamores along the creek and little or no undergrowth.

Surveyor Baldwin met with two of the ranchers occupying reservation pastures, J. W. Mattice and Toppy Johnson. Mattice, who leased the pasture that extended from Monument 6 and to the trail west of Monument 11 northward to Bonita Creek, showed Baldwin the old bearing tree for Monument 8. Baldwin noted that stockmen had generally considered that this tree indicated the reservation line, although it was actually a mile distant from the true line. Mattice informed the surveyors that all monuments east of Number 8 had been destroyed by "parties whose interests centered in the Hat Ranch," and that the stem on Slaughter Mountain (Monument No. 9) had been bodily carried to and placed on one of the Twin Buttes, "a couple of miles" from its proper location. Mattice also corrected Riecker's location for the site of the "Apache Massacre" (of Mr. Slaughter for whom Slaughter Mountain and the Slaughter Mountain Unit of the San Carlos Reservation were named) at Monument 8, informing him that it actually took place about two miles southeast of Slaughter Mountain.

Concerning Monument 15, Toppy Johnson, whose ranch was adjacent to the Hat Ranch, informed the survey party that it was "common knowledge that all monuments East of Slaughter Mountain were moved by Ben Parks, who at one time owned the Hat Ranch.... Parks tore down Monument No. 15 in 1897, and came...to Jim Harris' camp at "the Tanks" and talked about it." An unnamed county surveyor, who did some survey work in 1895 for reservation lessee Albert Warren, had pointed out the stem for Monument 14 to

Johnson. The county surveyor also told Johnson that even though the monuments had all been destroyed, he had found them and had succeeded in running the line through the upper field of the Hat Ranch. Johnson also told the surveyors that George Olney (future Graham County sheriff) had cut "the I R off the Monument 15 stem in 1890." Surveyor Baldwin subsequently discovered Monument 15 in a good state of preservation, and decided that it had either been rebuilt by some person unknown, or possibly that Monument No. 16 might have been the one intentionally destroyed. The present Monument 15 was clearly in its original position, "for I find marks upon a rock 1 ft. wide, 2 ft. long, and 1 ft. above ground, south of monument -the letters W M I R...." Nothing could be found of Monument 16, however, and the surveyors suspected that it was the monument destroyed by Parks. Monument 17 was in good condition, and from it the surveyors could see the southeast corner of the reservation, reestablished by William B. Kimmel in 1913. Baldwin ended his comments by noting that he had attempted to place the boundary as nearly as possible in the location described in the original intent of its establishment (Book 2821).

Guy R. Veal resurveyed the portion of the reservation boundary in T4S and T5S R27E in 1919 (Book 3380). The surveyors noted that the Hat Ranch headquarters building, still standing at the time, was about a half mile up stream and on the opposite side of the canyon from the cliff dwellings, within the reservation. During the survey, all corners established by Baldwin were destroyed and new ones constructed (Book 3380).

In 1934, surveyors again performed fragmentary resurveys and retracements of the south boundary of the reservation, passing through T4S R21E and R22E and T4S R27E with subdivision lines in T4S R28E. In T4S R27E the boundary line passed across several rocky washes that surveyors noted, for the first time, were subject to "violent erosive action during stormy weather." Some markers had been washed out by storm action. They considered T4S R28E to be a "very rough township." It had one road through Section 26 and another leading into Section 12, little timber except for a scattering of pinyon and juniper on the hills and some oak and sycamores in the gulch bottoms, and three permanent springs (SE 1/4 of the NE 1/4 of Section 28; NE 1/4 of the NW 1/4 of Section 28, and SE 1/4 of the SE 1/4 of Section 17). Considerable mining that had taken place in Sections 1, 12 and 13 had stopped, and stockraising was the only industry (Book 4107).

Indications of Land Change in Surveyors' Notes

These surveyors' field notes provide several useful descriptions of specific locations. More importantly, they offer a generalized picture of a sparsely inhabited, rugged, rocky, poorly-watered landscape, dissected by a running creek with fertile, arable banks and large groves of trees. A gradual change is indicated by the descriptions. The first survey, by Theodore White in 1874, notes the existence of "a few trees or timber" on "most of the mesas" near the mouth of Bonita Creek (Book 4107). For surveyors, timber was a specific designation indicating large trees. None of the later surveys mention timber on the mesas. The earlier surveys more frequently mention dense undergrowth along the Gila River and on Bonita Creek. In 1915, surveyors on the San Carlos boundary specifically noted that there was no underbrush present in the creek bed. Probably the most important indication of land change is given by the complete absence of remarks on creek bed erosion or disturbances to the banks of the Gila River prior to the 1920s. Field notes from the 1920s, however, state that the Gila had changed its course so much as to be unrecognizable. During the 1930s, survey notes mention for the first time that creek beds near the reservation boundary were subject to severe erosive action during storm events.

Surveyors notes for the reservation boundary also provide the land use historian with indications of the causes of much of the land change. Although the surveyors attempted to strictly fulfill the original intentions of the executive orders that established the White Mountain and San Carlos Reservation, they inadvertently expressed the current attitude that Indian land use was negligible, even non-existent, and that such intentional non-use justified a reallocation of resources. It was evident to them that if the Indians were not going to "use the land," someone else should have access to it, either mining companies or stockraisers. The field notes describe an intense, although non-violent, conflict over access to the area's resources. Those individuals or companies able to occupy this apparently unused land were willing to move boundary monuments, make illegal intrusions on reservation land, or to severely overstock their ranges. In this way could they maximize the economic returns on their portion of the available resources.

EARLY TWENTIETH CENTURY GEOGRAPHIC DESCRIPTIONS

During the early 1900s, some observers began to express concern for the deterioration of the grasslands and watercourses near Bonita Creek. Kirk Bryan discussed the specifics and the causes of this deterioration in an article entitled, "The Date of Channel Trenching in the Arid Southwest." In 1926 Fred Winn, a long-time Forest Service administrator and resident of Graham County, penned a poignant response to Bryan's article. Winn lamented the loss of the land and river conditions that Pattie had described along the Gila River. By the 1920s, the idyllic river observed by Pattie a century before with its "high grass which covered the heavily timbered bottom," had been converted into a "boulder strewn stream....with scarcely a vestige of grass for miles." Winn deplored the present condition of the Gila at the time: "the innumerable canyons and arroyos which are tributary to the west Fork of the Gila are deeply scoured by flood waters due to the grazing off of the adjacent hillsides." Winn commented that 25 years prior to his writing, when he first observed the area (1901), conditions had been even worse. "The pity of it is that the West Fork of the Gila River is still within an unsettled and undeveloped region. The damage has been done, not by extensive cultivation or by stock owned by many settlers or farmers, but for the most part by individual owners of large herds. The Forest Service has long been attempting to better conditions by reducing the size of the herds and by better distribution, but the damage has been done and the remedy, if effective, will never bring the West Fork back to its pristine glory" (Winn 1926:17).

MINING

No remains of mining dating from the Spanish or Mexican periods have been uncovered in the Bonita Creek area although it is possible that some prospecting took place despite the Apache's intense defense of the area. The earliest mining exploration in the Clifton-Morenci District probably occurred in 1865 when members of Colonel Carleton's regiment of California Volunteers passed through the area. Trails into the district originated from the Santa Rita Copper Mines and Silver City, which had been mined by Spaniards and Mexicans since the 1820s or possibly even earlier. The first smelting operations took place at Rock House in Chase Creek Canyon in 1872-1873, where Henry Lesinsky, in cooperation with Bob and

Jim Metcalf, discoverers of the mineral deposits, established the San Francisco Mining Company. Lesinsky financed the construction of a small Mexican adobe furnace that had a blast supplied by a hand bellows. This early inefficient smelter consumed enormous amounts of fuel, rendering only about two and a half to three pounds of ore to a pound of charcoal (Barr 1940a:4).

During the years of conflict between the Apache and the U.S. Army, many of the soldiers stationed at Fort Goodwin or San Carlos and many of the local ranchers and cowboys undertook some casual mineral exploration. The 1873 strike at Gold Gulch, two miles from Morenci, proved the area to be rich in placer gold and inspired exploration for gold throughout the Eagle and Bonita creek areas (CE 7/7/1911). Mining exploration near Bonita Creek increased during the 1890s after the valuable copper deposits in the Clifton-Morenci area had been developed and the nearby Lone Star District had been established. In 1893 William E. Thompson, Wood Pilling, Jim Crawford and a "fourth man" located a number of claims along Bonita Creek and in the Turtle Mountain area between Bonita and Eagle creeks. The prospectors built an "arastra," a Spanish style rotational crusher mill, two miles below their mine [location undetermined] on Bonita Creek. They packed ore to the arastra on burros (GCB 11/24/1893). During the late 1890s, the Qualey brothers expanded production in the Lone Star District with construction of a smelter, large adobe office buildings, and boarding houses on the Gila near Solomonville to process ore from the district (GG 5/27/1898). After 1900 the "Bonita group of copper claims," 10 miles northeast of Safford and east of the Lone Star group near Bonita Creek, underwent active development. By 1907 the Bonita claim had a shaft 80 feet deep and was producing copper bearing ore (Graham Guardian Supplement 1907).

Placer mining occurred on both Eagle and Bonita creeks although it began earlier and was more extensive on Eagle Creek. Mexican miners had made a living from placering gold near Clifton for years, and undoubtedly they had prospected along Bonita Creek, since "placer gold had made its appearance as far down the Gila as the mouth of Bonita Creek" (CE 6/2/1911). In 1911 placer mining was stimulated by the development of the Frisco Placer Mining Company seven miles below Clifton on the Frisco River. Geologists believed the ore vein, which contained both copper and gold-silver ores, to be connected to an intrusion of monzonite porphyry in the foothills above Eagle Creek (CE 7/7/1911). The original placer mines near the

mouth of Bonita Creek may date from this time or they may have been established at an earlier date. During the early 1920s, three to five men and a number of mules worked regularly at the mine (Melendrez 1991). In 1928 a group of Phoenix mining entrepreneurs did considerable development on the "old placer mines" at the mouth of Bonita Creek, installing a sluice and other machinery (GCG 1/13/1928). Again in 1938 these "old" placer claims underwent another expansion by Schwinmer Placer Mining Company of Detroit, Ohio, with the installation of new machinery capable of handling 3,000 yards of rough ore per day (GCG 7/22/1938). The mines did not prove to be as profitable as investors hoped but have been worked intermittently until recent years.

Another group of mines and prospects, somewhat more distant from Bonita Creek, underwent some degree of development during the first quarter of the century. In 1915 the Sanchez Copper Corporation was incorporated (GG 9/24/1915), and some mining took place at the site. By 1920 the San Juan Mine, south of Cottonwood Springs, had undergone considerable development (GCG 3/5/1920). By 1934 mines in the nearby Lone Star District, the largest in the vicinity of Bonita Creek, were shipping lead, molybdenum and occasional lode gold.

In general, mining did not lead to significant human impacts on the Bonita Creek study area. Although Turtle Mountain and the area west of Bonita Creek are covered with the physical remains of mining exploration, with the exception of the placer mines, the ore recovered was never abundant enough to lead to mining activity that would have imposed major impacts. The chief impact from mining exploration in the immediate Bonita Creek area was the development of a network of many small dirt roads, particularly west of Bonita Creek near the Gila. The immediate area around the placer mines has been severely disturbed. However, it is unlikely that any mineral deposits from slag piles or that any leaching of undesirable compounds has resulted from the relatively small amount of mining that has taken place in Bonita Creek. Frank Olmstead noted in his 1919 flood control report that the banks and creek bed of Eagle Creek, where considerable mining had taken place, presented a much more disturbed appearance than did Bonita Creek, where mining had been much less extensive (Olmstead 1919:77-78).

HARVESTING OF FUELWOOD AND WILD PLANTS

Fuelwood

After 1872 when the Longfellow Mine went into operation, the extraction of copper in the Clifton-Morenci area caused indirect but significant impacts to Bonita Creek. Soon after Bob and Jim Metcalf located the lode, Henry Lesinsky developed it into a major mining operation. By 1876 the mines employed 400 laborers, mostly Chinese and Hispanic. Until 1883, "work gangs" of Chinese laborers gathered wood for making charcoal (Barr 1940a:7-9). Mine records indicate that between 1875 and 1900 the steam boilers that ran the crushers, mills and blast furnaces for the smelter consumed an average of 500 cords of oak and mesquite fuelwood per month, with an additional consumption of large numbers of juniper mine props (Bingham 1991). The original steam boiler at the Frisco works consumed an average of four cords a day until 1891. The steam boilers powered the original concentrator, the hoisting plants and the smelters, and all continued to be powered by fuelwood until 1900. By that year the firewood supply had become severely limited, and the price had risen to $10.00 a cord. Within two or three years after the mine began operation, the immediate area around Clifton had been completely denuded, and resourceful Mexican wood haulers were forced to travel considerable distances to obtain wood (Barr 1940b:6). By the 1880s wood cutting for the steam boilers extended to Eagle Creek, only eight miles from the mine, and subsequently it extended to Bonita Creek only 15 miles away. Some informants believe that the entire area of Turtle Mountain was deforested for fuelwood prior to the early twentieth century, when the mills and furnaces at the mines converted to petroleum fuels (Lines 1991).

Demands for fuelwood came from the area west of Bonita Creek as well as from Clifton-Morenci to the east. Isadore Solomon, who arrived in Pueblo Viejo (Solomonville) in the spring of 1876, produced large amounts of charcoal for the Clifton-Morenci operation from mesquites growing along the Gila River and along other nearby streams. The charcoal process consumed most of the mesquite trees on the floodplain of the Gila River in the immediate area of Solomonville, a location several miles farther from Clifton than is Bonita Creek. The cut trees were stacked in layers in huge mounds, with air spaces left between layers. They were then covered with dirt and native grasses. When set afire the piles smoldered

for days until only the charcoal was left. Solomon's delivery wagons cut the first wagon road between Solomonville and Clifton. With increased consumption, Solomon delivered 25 wagon loads of charcoal on a daily basis (Ramenofsky 1984:48-53). Unquestionably, the charcoal industry consumed some of the Gila River mesquite bosques near the confluence of Bonita Creek, and possibly on Bonita Creek itself.

Miners in the Clifton area consumed additional fuelwood for cooking and heating. According to several informants, wood hauling constituted the major use of the Safford-Morenci Trail (Lines 1991, Melendrez 1991). Below Bellmeyer Saddle, the remains of a stone corral used by the woodcutters to pen their burros can still be seen (Lines 1991). At the García Ranch, on Eagle Creek above the pump station, 30 burros would make the trip to Clifton, loaded with 25 pounds of wood on each side of the pack saddle (Lines 1991). Burros were kept in a large public corral in Clifton.

Prior to the 1901 construction of the Morenci Southern Railway which hauled freight and ore between Clifton-Morenci and Guthrie on the Lordsburg line, most of the mine timbers for the Phelps Dodge mine were procured locally. In 1901 Ira Harper was still furnishing the company with lumber and logs from as far away as the Blue and Pine Flat (in the White Mountains). By that year, the supply of large trees had become so severely limited that Forest Reserve regulations were made more restrictive (Barr 1940b:81). It can be assumed that any trees large enough to have been used as mine timbers in areas near the mines had long since been cut.

The railroad consumed additional fuelwood and issued numerous contracts for hundreds of cords of wood. In 1897 C.Y. Webb, who had a contract to deliver 200 cords to the railroad, was arrested for cutting mesquite wood on government land without a permit. He defended his action, noting that in 1895 U.S. District Attorney Ellinwood had advised him that the Supreme Court had declared mesquite not to be timber, and that cutting it would therefore not be an offense (GG 4/9/1897).

Although Bonita Creek lore includes the persistent story that many fuelwood cutters operated in the area prior to 1910, Bernave and Joaquin Benavides are the only confirmed fuelwood cutters known to have lived and worked full-time in Bonita Creek. It is not known when the brothers arrived in the area, but they were listed in the 1910 census as residents of Bonita Creek. The bachelor brothers lived sometimes at

Toppy's Cave and at other times on the creek, moving with the season and their work. Both brothers cut fuelwood, and Joaquin transported it on his burros to the Clifton-Morenci area where he sold it for cooking fuel at 50 cents a burro-load, packing several burros for each trip. Jim Earven recalled that he continued selling fuelwood until extreme old age (J. Earven 1992). Ramon Melendrez recalls that as late as the 1930s the old men were still hauling fuelwood to Clifton-Morenci and still had a herd of burros (Melendrez 1992).

During the first three decades of this century, professional walnut pullers removed walnut stumps and walnut trees throughout southern Arizona. Furniture companies used the wood as veneer on high quality furniture. The desired wood patterns were contained in the stump and the lower portion of the trunk, referred to as the "burl." Removal of the entire stump was required, and walnut "pullers" employed winches, trucks and mechanized stump-pulling equipment to extract entire root systems from the ground. The process created severe disturbance to the area immediately surrounding the removed trees. During the late 1920s or early 1930s, walnut pullers contacted the Earven family concerning stump extraction on Bonita Creek. They rented horses from the Earvens, and Jim Earven guided them up the creek. However, they decided that the accessible trees were too small and were not the desirable type of walnut (J. Earven 1992). Several years later, shortly before World War II, stump pullers returned to Bonita Creek. However, they had difficulty getting their large trucks up Bonita Creek, used the upper road to get into the creek bed, and removed only a few trees (Baker 1991).

Cutting Wild Hay

Until the army presence at the reservation ended in 1899, Apaches cut wild hay for the quartermaster stationed at San Carlos. As quartermaster, Britton Davis purchased "black grama grass," which Apache women and children cut with butcher knives, tied into bundles weighing from 15 to 50 pounds, and delivered to the post. "Some of the women and children trudged several miles with their bundles on their backs...others brought the larger portion...on a community pony" (Davis 1929:44). It is possible (but undocumented) that some limited wild hay harvesting took place in Ash Flat or other well-grassed areas of the Bonita Creek watershed.

Harvesting Other Wild Plants

Apache residents of Bonita Creek consumed large amounts of mescal (agave). They harvested pinyon nuts and acorns from oaks at the higher elevations of the study area. In later years, Hispanic residents probably gathered selected groups of wild plants, which were used as medicine and for foods (see Hadley et al. 1991 for a more extensive discussion of wild plant gathering in areas similar to Bonita Creek.) Anglo-American residents of the creek recall making preserves from wild grapes (Baker 1991) and gathering honey. Impacts from this type of casual wild plant gathering were probably minimal.

Distribution of Imported Plants

Former residents of the canyon blame each other for having intentionally distributed the highly undesirable foxtail grass that is so predominant on the lower portions of the drainage. Foxtail grass was not abundant until after the 1950s and has steadily increased since that time (Melendrez 1992). Residents note that two other imported exotics were formerly more abundant. Filaree has declined on the slopes of Turtle Mountain and there is less Bermuda grass on the benches along the creek.

WILDLIFE

Impacts of Trapping and Hunting

Wildlife in the Bonita Creek area included bear, wolf, mountain lion, mule deer, beaver, badger, bob cat, raccoon, ringtail cat, coatimundi, turkey, Bighorn sheep and a large variety of small game. Consumption of wild game accelerated sharply with the arrival of non-Indian settlers. Apache residents of the area hunted for deer, antelope, Bighorn sheep, small game and pack rats, but Apaches did not eat turkey, and did not trap beaver or kill predators. Within two decades after the arrival of the first trappers, beaver were nearly exterminated in the area (Dobyns 1981). Early settlers consumed large amounts of wild game and trapped predators without restriction. Prior to 1900, the reduction in game animals had become so severe that an organized effort to limit hunting and trapping had been initiated within Arizona territory.

During the pre-settlement period, the earliest descriptions of the area's wildlife were penned by

James Ohio Pattie who first descended the Gila River in 1825. He trapped successfully for beaver and described abundant wildlife in the general Gila area. His famous encounter with the grizzly in the cave probably took place on Bonita Creek. On a second trip, Pattie and his party "killed plenty of mountain sheep and deer, through no bears" on the Black (Salt) River (Pattie 1988:34-37). Other early visitors described abundant wildlife between the Gila River and the White Mountains.

Hunting was a major activity for army personnel, ranchers and miners. Lieutenant Thomas Cruse recalled that while stationed at Fort Apache during the Apache hostilities, he frequently hunted to supply game to the post. Cruse participated in a one-day pre-Christmas hunt which rendered 25 deer and 40 or 50 turkeys weighing from 12 to 25 pounds. He remarked that the flocks of turkeys appeared to be so numerous that they "seemed to cover a five acre lot" (Cruse 1941:45). A few years prior to the establishment of the San Carlos Reservation, John C. Cremony recalled killing 87 antelope during one drive with Apache scouts (Cremony 1868:203). At the San Carlos post, both the officers' and the enlisted mens' mess frequently served game, and turkey was particularly popular. Apache scouts cooperated in turkey hunts, although they would not eat the birds. The scouts made pre-dawn attacks on turkey roosts and killed the birds with clubs. The hunting party then shot the turkeys that escaped from the roost. Scouts assisted the troops in making drives for antelope, which were commonly seen in herds of 80 to 100. Scouts also made drives for small game including rabbits, coyotes, prairie dogs, gophers and occasionally deer (Slavens n.d.:16-17).

As population increased, so did the pressure on game animals. By the 1880s, a number of full-time professional hunters supplied local mining settlements with fresh game (Brown 1985:201). During the summer, hunters sold powdered, pulverized venison to the miners at Clifton (Brown 1985:201). By the mid-1890s, the supply of game animals began to diminish so noticeably that the territorial legislature enacted game protection legislation. These early regulations applied to areas like Bonita Creek but were probably not well enforced. The 1897 territorial "Game Law" entirely prohibited the killing of female antelope, bobwhite, camel, female deer, doe elk, mountain sheep, pheasant and prairie chicken, and entirely prohibited the sale of hides or meat from antelope, elk, deer, mountain goat, mountain sheep and turkey. It stipulated seasons for the more abundant game animals but prohibited the sale of meat from any game animals out of

season (GG 8/20/1897). However, these early regulations were largely unenforceable, and early settlers recall hunting at all times of the year and trapping for predators without obstruction.

During the 1920s, state agencies continued the effort to counteract the decline in game animals. Wild turkey remained relatively abundant in the area of Eagle and Bonita creeks and were used to restock the dwindling flocks on Mount Graham (GCG 3/1/1929). During the mid-1940s, the Federal Wildlife Restoration Division of the State Game Department made a number of wildlife releases. As a result of these restocking programs, the number of turkey and antelope in Graham County increased (GCG 2/9/1945).

Predator control constituted a separate category of wildlife management. As cattle numbers increased, professional bounty hunters and trappers controlled the number of predators for local ranchers. William Sparks (aka "Timberline Bill") hunted in the Bonita-Eagle creek area from the time of the establishment of the first mining camps. He recalled that in Bonita Creek "bear of several varieties, cinnamon, black, brown and silvertip, as well as mountain lions, were plentiful, and until the advent of the cattlemen, were only killed when the hunters were in need of bears' oil for cooking; or in the autumn, just before the hibernating animals holed up, when the fur and skins were at their best" (Sparks 1926). During the late 1800s, many of the larger ranches employed full-time trappers to catch predators. It is likely that the Hat Ranch, the Chiricahua Cattle Company, and the Double Circle all employed trappers or at least encouraged their cowboys to trap predators. After the Predatory Animal and Rodent Control (PARC) branch of the Biological Survey (part of the US Department of Agriculture) was authorized on June 30, 1914, a more systematic approach to the extirpation of large predators developed. During World War II, ranchers made greater use of governmental agencies for predator control and new records were set for the destruction of predatory animals, including bears, bobcat, coyotes, mountain lion and wolves (GCG 7/30/1943). It was at this time that PARC became more active in the Bonita Creek area.

The San Carlos Reservation pursued a less active predator control policy than the non-Indian portions of the study area. Although individual Apache cattlemen killed coyotes whenever possible, the commissioner of Indian Affairs would not allow a coyote reduction program on the San Carlos Reservation during the 1940s. He believed that coyote extermination would "upset the balance of nature." In 1943 A. J.

Murie, brother of naturalist O. J. Murie, conducted a formal study of the coyote population on the reservation. After several months of observation, he concluded that coyotes killed few baby calves and recommended against a predator control program (Lasley 1988:5.2-5.5). However, after a severe rabies outbreak in 1944 during which several Apaches and reservation personnel were bitten by rabid coyotes, the Indian Office sent government trappers to the reservation. Within a few months 2,100 coyotes had been destroyed (Lasley 1988:8.4). Lions occasionally killed colts in the tribal horse herd pasture. During the 1940s, Don Thompson, a professional lion hunter, kept hounds on Ash Flat for hunting both lions and bears (Lasley 1988:6.6). However, less trapping and hunting appear to have been done on the San Carlos Reservation that in the areas south of the reservation fence. Below the reservation fence, local ranchers believed that the predator population was constantly resupplied from the Apache Reservation.

Predators, particularly mountain lions, were a frequent problem to lower Bonita Creek ranchers because the creek and canyon provided them with a natural migratory route between the higher elevations of the White Mountains and lower areas on the Gila River. Informants mentioned several trappers and professional hunters who were active south of the reservation boundary in the Bonita Creek area: Ted Ferguson hunted and trapped lions; Earl Long, a professional hunter, caught an estimated 60 to 65 lions in the study area. As late as the 1960s, ranchers employed private trappers and hunters to control predators on Bonita Creek (Lines 1991; Shiflet 1991). Workers on the Safford water system thought of one local trapper as a "resident game warden" (Garcia 1991).

A few local residents were casual trappers for the commercial market, selling pelts to buyers who supplied the fur garment market (Earven 1991). Claro Ramírez trapped predators and trapped fur-bearing animals for sale of pelts as did Burt Earven and other members of the Earven family (C. Earven 1991). However, commercial trapping of fur-bearing animals for the commercial market appears not to have been a significant activity in Bonita Creek.

Observations on Wildlife

Although little systematic data describing Bonita Creek wildlife is available, the following anecdotal

information has been gleaned from conversations with former residents and individuals familiar with the area. Information is presented relating to specific species.

Wolf

Wolves had been common in the area during the nineteenth century, particularly in the upper Bonita Creek watershed. The area of Ash Flat that supported herds of elk and antelope was prime wolf habitat. None of the informants mentioned problems with wolves, and it can be assumed that they had largely been extirpated in the Bonita Creek area by the time included in the recollections for this report (ca. 1910-20). In 1939 a cowboy on the McEwen ranch, north of Ft. Thomas and west of the study area, killed a "lobo" (solitary) wolf "said to be the largest of its kind ever found in this section of the state" (GCG 3/3/1939). The event was considered to be unique enough to merit mention in the newspaper.

Bear

Both grizzly and black bears have been observed in the Bonita Creek area. On January 25, 1825, Pattie stumbled into a cave on Bonita Creek occupied by a grizzly. He and his companions killed the bear, which he described as the "largest and whitest bear that he had ever seen" (Brown 1985:22). Pattie correctly distinguished between black bears and grizzlies and described grizzlies near the Gila River's dense riparian vegetation, their preferred river bottom habitat. Portions of upper Bonita and Eagle creeks also provided ideal grizzly habitat: rich riparian deciduous forest, with wild grape vines and creepers, dense screening cover, and many caves. Wildlife biologist David E. Brown maintains that the east-central portion of Arizona, including the San Carlos Indian Reservation, was the heart of grizzly country in the state. According to Brown (1985:79), more grizzlies were reported and they persisted longer in this area than in any other part of the state. Between 1885 and 1905, grizzly habitat disappeared through excessive grazing and flooding (particularly the 1904 and 1905 floods) that washed away riparian vegetation, including underbrush and wild berry supplies. As grizzlies began to infringe increasingly on livestock, they were extirpated from southern Arizona. During the spring of 1888, William Sparks was attacked by a grizzly, still dragging the trap in which

he had been caught, about 15 miles above the Double Circle Ranch at the forks of Eagle Creek. Although wounded in the leg by the grizzly, Sparks was able to shoot and kill the animal. Sparks noted that although even in June, the hard time of the year for bears, this grizzly was fat and sleek. This, combined with his presence in low country, indicated that he was a consumer of domestic stock, most likely Double Circle beef (Brown 1985:209). As late as 1915-1916, Biological Survey hunter Walter P. Taylor reported in his field notes that 15 grizzlies were verified as killed in the "Nantan" Districts of the San Carlos Reservation (Brown 1985:128), directly north of the Bonita Creek area and within the migratory range of individual bears. Black bear were also abundant prior to 1900. Samuel Tillman, accompanying the Wheeler survey party in 1873, remarked that there were "abundant indications of bears. They had well beaten paths in each of these canyons" (Smith 1991:315).

Beaver

Beavers have always accessed the Bonita drainage from the Gila River. Although heavily trapped during the nineteenth century and greatly reduced in numbers at that time, beaver were never extirpated from the Gila. Beaver were mentioned in the reports of Pattie, Emory, and several Forty-niners. The first description of beaver by a field biologist was that of W.W. Price in 1894, while on an eight-month collecting expedition in Arizona and Sonora for the American Museum of Natural History (New York) and the Field Museum (Chicago) (Allen 1895:256). Through resupply from the Gila, Bonita Creek maintained an irregular and limited population of beavers and occasionally had beaver dams. Dams were never large enough nor were they frequent enough to disturb the creek. Informants state that a few beaver were almost always present on Bonita Creek. They do not recall any trapping (after the 1920s) for beaver. During periodic flooding events, both beavers and their dams were washed into the Gila, but the beavers quickly returned (Earven 1991; Baker 1991; Melendrez 1992). As late as the 1950s, members of the construction crew working on the Safford water system improvements bathed on a regular basis in the reservoirs created by beaver dams a few miles below the reservation fence. During the 1960s, water department construction crew members staying in the cabin closest to the reservation fence again bathed in the ponds backed up by beaver dams.

In the 1960s, there were at least three dams below the reservation fence (Garcia 1991). There are small dams on the lower creek at the present time.

Mountain Lion

Because of its steep escarpments, bluffs, and direct connection to rough, high-elevation mountain ranges, Bonita Creek was considered to be a "mountain lion paradise" (Lines 1991). Ranchers made a major effort to keep mountain lion numbers under control, both through individual hunting and professional trapping. Private lion hunts organized by local ranchers were regular events in the area. In 1928 Fred Talley became lost while hunting lions in the mountains near Bonita Creek (GCG 11/9/1928). In 1929 Arthur Dankworth trapped a female mountain lion on the West ranch near Walnut Springs and distributed her three cubs to local residents who wanted them for wild animal shows (GCG 11/8/1929). Earl Long, an official government trapper for PARC and ADC, actively trapped lion in the Bonita Creek area for many years.

Although lions were routinely trapped on the portion of the study area south of the reservation fence, they were largely "uncontrolled" on the San Carlos Reservation portion of the Bonita Creek Watershed. In the Slaughter Mountain unit, the Bonita Creek area of the reservation, cattle numbers sharply decreased during the late 1920s and early 1930s with the removal of non-Indian lessees' livestock. There were few, if any, permanent residents in the Slaughter Mountain unit, and stockmen on that range were present only intermittently. The isolation and absence of human activity allowed for a continual resupply of lions from the higher elevations of the reservation. For several years, the Inter-Departmental Tribal Cattle Association (IDT) had a horse herd on the upper portions of Bonita Creek. When the horses proved to be unprofitable and were removed, the lions were deprived of their usual supply of colts, their preferred food, and they began to kill calves off the reservation. The effect of the horse herd removal particularly impacted the Claridge ranch. The Claridges and other ranchers noted a sharp increase in calf kills as soon as the horse herd was eliminated (Lines 1991). As late as the 1960s, the Claridges employed a retired government trapper to trap lions. He reportedly caught approximately 65 lions during a five year period on the Claridge ranch (Earven 1991; Claridge 1991).

Deer

John Russell Bartlett remarked that the border survey party found deer "in the mountains and along the bottom-lands of the Gila, but not in large numbers" (Bartlett 1965:ii, 562). John Lasley, manager of the San Carlos registered herd, noted that deer were present in "some of the cattle ranges" of the San Carlos Reservation, indicating that they were not particularly numerous on upper Bonita Creek. The Bonita Creek deer population has probably experienced fluctuations similar to those in other areas of southern Arizona, including occasional shifts between a preponderance of whitetail deer and a preponderance of mule deer (Hadley, Warshall and Bufkin 1991:262-263). However, informants state that in lower Bonita Creek within historical memory mule deer have always been more common than whitetail, as is the case throughout the Gila Mountains. White tail deer were limited to higher elevations, were more numerous on the higher elevations of San Carlos Reservation, and were occasionally observed on Turtle Mountain. They were infrequently observed in the lower elevations of Bonita Creek.

Other Mammals

Pattie hunted for Bighorn sheep in 1825. They were subsequently extirpated in the area and were reintroduced. Bighorn sheep have been observed on Table Mountain since their reintroduction from New Mexico (Lines 1991) through a program of the Arizona Game and Fish Department. Water department workers frequently observed Bighorn sheep in the canyon during the 1950s upgrade of the collection galleries.

Elk, common on the higher elevations of the San Carlos Reservation, may have used Bonita Creek as a corridor to travel from the reservation to the Pinaleño Mountains (Garcia 1991).

Bats and bat caves were formerly more common on Bonita Creek. Residents and water department construction workers noticed the presence of many bat caves on Bonita Creek (Garcia 1991).

Many pack rat nests were in the Bonita Creek area. Around some nests dynamite caps, evidently left by miners, were uncovered (Garcia 1991).

Raccoons are not common in Bonita Creek. Several informants remarked on the surprising scarcity of raccoons along the creek in an ecological setting that would seem ideally suited to them. Informants who

lived for many years on the creek noted that they rarely observed raccoons or raccoon tracks (Earven 1991; J. Earven 1992; Baker 1991).

Coatimundis, a new species in Bonita Creek, started arriving during the late 1940s or early 1950s. They were not observed prior to that time (Earven 1991; J. Earven 1992; Baker 1991).

Several informants noted the presence of many more javelina prior to the 1950s and in larger groups.

Fish

In 1846, Major Emory (1848) fished for "Gila trout" in the Gila River. Bartlett's survey party also caught the fish with hook and line and found them very palatable (Bartlett 1965:11, 192). Several former residents recall fishing for "suckers" in Bonita Creek. Children caught fish on hooks. The Earven children used a scraper to divert a portion of the creek flow into a shallow spot and then scooped up the fish (Earven 1991). Jesse Baker recalled that her chickens consumed so many suckers that the eggs had a fishy flavor (Baker 1991).

Rare and Endangered Species

Several species on the rare and endangered list are present in Bonita Creek and are listed in Minckley et al. (1979).

Wild Burros and Horses

In Bonita Creek herds of wild burros were more common than wild horse herds. At Clifton, burros were used to haul water to the reduction works, to haul ore out of the mines, and to haul fuelwood and charcoal to both the reduction works and to miners' homes for heating and cooking. Hundreds of mules pulled the ore cars to the smelters, and thousands of burros carried the fuelwood and water on their backs from the mountains and canyons surrounding the mines (Ramenofsky 1984:33-42). Beginning in 1879, a mule-powered ore-car railway was used to haul ore from the mines to the reduction works. By 1891 the steam boilers had been replaced, although the wood fired concentrator was retained until 1900. By 1900

Eagle Creek water was pumped into the mines, the reduction works, and Clifton homes (Barr 1940b:5-6). With modernization and conversion to other types of fuel, the demand for burros and mules decreased. As other fuels began to power the mining operations, unneeded burros and horses were turned loose and quickly formed herds of wild or semi-wild animals, concentrating in areas between the mines and Bonita Creek, particularly on Turtle Mountain. The San Carlos Reservation had an estimated 10,000 wild horses during the 1920s (SCS 1938). Possibly one fourth of these would have been on Ash Flat and on the upper Bonita Creek watershed.

In the immediate area of Bonita Creek, the largest semi-wild burro herds were those claimed by the Benavides brothers. Fuelwood cutter Joaquin Benavides, who packed cordwood to Clifton-Morenci, used a large herd of burros. Many of these were descendants of the burros turned loose at Clifton. Some of Benavides's burros were branded with a B on the jaw; others he claimed as part of his herd were wild or semi-wild and were unbranded. Although less common than wild burros, during the 1920s there were several hundred wild horses in the Bonita Creek area. Bernave Benavides had a herd of at least 40 mares, some of which were branded "JJ Quarter Circle V." His mares grazed the western facing slopes of Turtle Mountain and mingled with wild horses on the mountain. Shortly after 1934, both Benavides brothers, who had not obtained formal lease land, were required to give up their herds by the Taylor Grazing Act (J. Earven 1992).

Prior to the Taylor Grazing Act both state and federal agencies had made several attempts to rid grazing ranges of these unwanted wild burro and horse herds. However, these efforts were largely unsuccessful. The Taylor Act held individuals who acquired leases responsible for the removal of unclaimed or condemned livestock from their allotment. At the same time, both state and federal drought emergency livestock reduction programs, initiated during the 1933-34 drought, called for the removal of all unclaimed burros and horses. Several Bonita Creek settlers participated in the removal of the local wild horse and burro herds. In 1934, Turner and Wesley West, Bernave Benavides, John Traylor and several members of the Earven family including James, Sam, Robert, Myge and Jim Earven, helped gather the drought-weakened animals. They drove the horses and burros in small herds into a box canyon near Midnight Canyon where they held them over night. The following day they drove them into the railroad shipping pens at

Solomonville. Some of the better stock, particularly a group of broomtail mares, were purchased by a horse buyer from Arkansas at $10.00 a head. Others were sold to feed companies. The cowboys range-shot the animals that were too weak to drive or were in areas too rough to gather. Approximately 300 head were gathered and shipped including many of the Benavides brothers' mares and burros (J. Earven 1992).

The presence of the wild burros and horses augmented the detrimental impacts of other livestock in the Bonita Creek area. Rangeland specialists estimate that because of hoof impact and increased motion, horses and burros loosen soil more quickly and do greater harm to rangeland than cattle.

TRAILS

Early surveyors' records note a "multitude of trails" leading into Bonita Creek from the west. On the east side of the canyon, a major trail between Bonita and Eagle creeks, known as the Safford-Morenci Trail, passed through Bellmeyer Saddle. These trails were developed during the early years of Hispanic and Anglo-American settlement (1880s) and may have followed previously established trails developed by the Apache or their prehistoric predecessors. The trails were used by cowboys working for the area's large cattle companies, by wood-haulers who packed fuelwood from riparian areas to the Clifton-Morenci mining operation, and by local settlers who sold produce to the miners at the Clifton mines. These trails, the only access into the canyon until the 1930s, continue to be used today. Descriptions of some of the area's more significant trails follow, beginning at the north of Bonita Creek and proceeding downstream.

East Side

The Safford-Morenci Trail through Bellmeyer Saddle, or Morenci Horse Trail, begins in Safford, follows a road that goes by Rest Haven Cemetery to Lone Star Mine, continues to the West Ranch, goes down Johnny Creek, up Bonita Creek, past Toppy Johnson's cabin to Toppy's Cave by Wild Deer Spring, crosses the divide between Bonita Creek and Eagle Creek at Bellmeyer Saddle, goes down into Smith Canyon, down into Eagle Creek near the Pumping Station, through Gold Gulch, and into Morenci. It was used to haul produce and drive cattle for sale in Morenci, Clifton and Metcalf. The Morenci Trail was

constructed to replace an older horse trail as a shorter and faster way to get to Morenci. Only suitable for foot traffic, no wagon road was made on it later. The Safford-Morenci trail was also called the "Company Trail" since it was used by the early cattle companies to reach Eagle Creek and Morenci. There are several short trails that access the Safford-Morenci trail on the east side of Bonita Creek: (1) near the Toppy Johnson cabin; (2) at the Art Lee place, where the trail is chiseled out of the bluff on the east side of the canyon wall near the Earven corrals and the ramp constructed by Ray Claridge; (3) at the Old Lady Gay place; (4) at Midnight Canyon through Midnight Saddle to Morenci; (5) at the Blue Horse Trail that can be taken north to access the Morenci Trail; and (6) at the trail to Sycamore Springs, which connects to the Morenci trail near Toppy's Cave. The Morenci Trail is described in Surveyor's Book 2821: "a prominent trail intercepted Bonita Creek at the reservation boundary."

Blue Horse Trail is at the point where Bonita Creek opens up onto the flat on Midnight Canyon. Heading north, the trail takes off up the west canyon wall. It was named for a blue horse that fell off and died while cowboys were camped on the flat opposite the trail. The trail is very steep and not used much by cattle.

The trails to Hackberry Spring and Sycamore Spring were converted into roads during the 1940s after Bob Phillips and members of the Earven family had constructed cabins at both springs. They connected to the Jones trail on the west side of the canyon.

The Blue Rock Trail went through Bull Gap.

West Side

The trail from Pima to the Hat Ranch, used by the Bryces as well as Hat Ranch cowboys, came from the Pima Gap road to Horse Camp on the reservation and followed Bonita Creek downstream to the Hat Ranch.

Johnny Creek Trail connected the Farrell ranch to the West ranch. The Johnny Creek trail was mainly used by the Wests and Farrells.

Upper Lee Trail was possibly named for Lee Talley, a member of the Talley family who ran cattle

in the area from the 1880s until the 1920s. This trail was used to get supplies off the ridge to the creek bottom. It required chaining the wagon wheels, tying a drag behind the wagon, and pulling it down the slope to the bottom. The trail was converted into a car and truck road during the late 1950s by a mining company doing exploration on Turtle Mountain. A wrecked drilling rig is at the bottom of the canyon draw.

The Lower Lee Trail is downstream, immediately below the Upper Lee Trail in a location where cattle can get up the west bank. While constructing the trails, Lee Talley camped in a cave overhang by the lower trail.

The Twin Knolls Trail is half-way between the Upper and Lower Lee Trails on the west side of the canyon near the Chacon-Bianes-Baker homesite. It does not drop off the ridge into the canyon and gives no direct access into Bonita Creek.

The Jones Trail (later converted into a road) accessed Bonita Creek from the west, directly across the canyon from the Sycamore Spring Trail. This was also called the 13 Trail, across from Sycamore Spring Trail.

The Wagon Trail, downstream from the 13 Trail, accessed the canyon near the big fig tree. It was also used for access between the West ranch and Bonita Creek.

ROADS

Although no road was formally constructed into Bonita Creek prior to the 1930s, it is likely that wagons penetrated the canyon as far as the box by the early 1880s, shortly after wagon travel was possible on the Gila route. Outside the immediate Bonita Creek area, a toll road which connected Clifton to Solomonville was in operation from 1899 to 1916. (See the photograph of the toll house.) It was constructed by Angel Bianes, "a prominent settler in Buena Vista (San José) and Bonita Creek," and by former Graham County supervisors A. H. Bennett and Jerome H. Vaughn. The toll wagon road shortened the distance from Clifton to Safford to 35 miles, eliminating several miles from the old route that went by way of Coronado (GG 10/5/1900). It also placed a major road in closer proximity to Bonita Creek. More improvements were planned for the road between San Carlos and San José district in 1912 (GG 4/26/1912) but they did not

materialize.

Initially, access by automobile to the upper canyon was through the reservation by way of the Pima Gap road to the Horse Camp and then down Bonita Creek to the Hat Ranch and Toppy Johnson place. The first car road in the lower Bonita Creek area went to the Turner West ranch and to Walnut Spring. The road eventually went as far as the western edge of the canyon across from the Jones house near the trail (later road) to Sycamore Springs on the east side of the canyon. An automobile road was not constructed into Bonita Canyon itself until the late 1930s when the Safford Water Company installed its collection galleries.

The history of road construction in Eagle Creek, a drainage similar geographically to Bonita Creek 10 miles to the east, is very different from that of Bonita Creek. Eagle Creek had wagon road access from Morenci, the nearest town, from the earliest period of Anglo-American settlement. The wagon road went directly up the bottom of Eagle Creek canyon. It washed out in January 1916 and again in the October flood of 1916, marooning many freight wagons in the creek bottom where they remained for years. In 1928 a new road from Clifton to Eagle Creek was surveyed, shortening the distance by 12 miles from the Coronado Trail to the Double Circle Ranch and the Woolroe post office (GCG 7/6/1928). In 1930 the US Forest Service completed the road up Eagle Creek connecting to the Coronado Trail (CCE 8/30/1930).

In contrast to Eagle Creek with its many road improvements, a direct road from Safford to Bonita Creek was not constructed until the installation of the City of Safford Water Company's collection system during the late 1930s. The road continued up the canyon as far as the collection galleries. During the 1950s, the road up the creek bed was again "improved" when the water company modernized the collection system. Possibly because of the longer existence of an automobile road, or possibly due to greater wagon travel at an earlier date, Eagle Creek has reportedly suffered more erosional damage than Bonita Creek. Bonita Creek was relatively free of erosional damage until the early 1940s, after the construction of the water company road. It is noteworthy that the two floods of the early 1940s were the first to wash away entire benches, farmland and houses. The construction of an automobile road up Bonita Creek is possibly the most important factor contributing to ecological change along the creek. Ramon Melendrez, who worked on the road construction of the 1930s, noted that the engineers attempted to place the road directly up the creek

bed, and that in doing so they were forced to remove a large number of trees (Melendrez 1991). He believes that the road construction contributed to major instability of the creek bed and creek banks.

FIRE

Arthur Lines, one of the "Arkansas Traveler" group of Mormon pioneers who arrived in southern Arizona during the early 1880s and became one of the area's earliest livestock raisers, told his son that prior to 1900 Apaches set fires on upper Bonita Creek, in Ash Flat and on Turtle Mountain. Apaches commonly used fire to clear underbrush for planting fields, to facilitate hunting by opening the understory, and as a device for driving game (Dobyns 1981). After Apache removal from most of the study area, fires appear to have been less common. No fires in the Bonita Creek area were reported in the newspapers. Few fires were mentioned in the interviews. It can be assumed that natural fires were drastically reduced with the extreme reduction in ground cover that occurred during the period of intense grazing (1885-1934). With less abundant grass and brush, natural lightening caused fire became less frequent. Although fires are not included in the San Carlos Reservation records for the Slaughter Mountain grazing unit, it can be assumed that after the 1930s reduction (by half) in cattle numbers with the removal of non-Indian cattle, as the grass cover increased, the incidence of lightning-caused fire increased. On the non-reservation portion of the study area, only one major fire was noted. It occurred during the 1960s when 10 sections on Turtle Mountain burned (Lines 1991).

WATER SOURCES AND FLOODING

Springs

Major springs appear on USGS topographical maps of the area. Informants were told by members of the preceding generation that shortly after the turn of the century almost every spring in the Bonita Creek study area either had a resident settler or was being used by one of the cattle companies. Toppy Spring, Sycamore Spring, Hackberry Spring, Bear Spring, Johnny Creek Spring, Walnut Spring and Cottonwood Spring have all been "developed" or "improved" with spring boxes or other water collection or retention

devices. They still have signs of these former structures. There are few anecdotal accounts of springs having dried up. In contrast to other areas of southern Arizona, most of the springs that produced water during the early years of the century are still active. Informants state that Turtle Mountain has many small springs "if you know where to find them" (J. Earven 1992). Springs on Turtle Mountain include the spring in Trujillo Canyon, Hot Springs Canyon, Smith Spring, Stove Canyon Spring, Guswelt Canyon Spring, Big Spring and many other smaller springs.

Floods

It is difficult to reconstruct an exact flood history for Bonita Creek because early settlers frequently did not keep records, and after the 1940s, absentee owners were often not present during flood events. Although the flood history for Bonita Creek does not always follow that of the Gila River, flooding often occurred in both drainages at the same time, particularly during the winter months when rains are more generalized and widespread. During the summer and fall months, the rain pattern is distinct from that in the winter. In summer, Bonita Creek often has flash floods which occur after rain has fallen far upstream although rain may not have fallen in the immediate area. In these cases, rains far north in the mountains provide the flood waters. Conversely, several major floods have occurred on the Gila, when Bonita Creek waters did not rise at all. A table of known flood dates appears as Appendix C.

Area-wide floods, which included Gila River floods and high water or actual flooding in most major tributaries (including Bonita Creek), are discussed here. Flooding occurred during the fall of 1888, following a severely dry summer (Barr 1940a). In August 1890, a major flood, considered to have been the worst up to that time, damaged all of the irrigation canals below the mouth of the San Simon Creek (GCG 8/8/1890). A major flood occurred in 1891 during late summer. Another destructive flood occurred in 1895 (Barr 1940s). In December 1905, floods widened the channel of the Gila, caused damage at Clifton, washed out railroad tracks along the river and took out the San Carlos bridge (GG 12/1/1905). Floods occurred again in November and December 1906, causing major disasters in the Clifton-Morenci area (Barr 1940a:31).

During the spring of 1915, repeated high waters in the Gila rendered the river unfordable to

automobiles for three months. Officials suggested shipping autos from Ft. Thomas to San Carlos by railroad in order to cross the river by the San Carlos bridge. Local newspapers urged the placement of a propeller-powered flat car at San Carlos to ferry machines across the river (GCG 4/2/1915). In January 1916, the "biggest snow storm in years" covered the Gila Valley and surrounding mountains, causing the Gila to overflow its banks, undercut the Pima bridge, and spread over farms and ranches from Solomonville to William Gillespie's ranch (GCG 1/21/1916). The July 1917 rains were also widespread, extending from Aravaipa Canyon and other portions of western Graham County as far east as Clifton. The resulting flood on the Gila inundated farmland several feet deep, washed out the Heckel railroad bridge six miles east of Solomonville near Bonita Creek, and left the valley without railroad service (GCG 7/18/1923).

In 1937 generalized winter rains increased snow melt and brought about a big runoff in the Gila, with major damage to the town of Duncan (GCG 2/12/1937 and 2/19/1937). In October 1941, the Gila flooded after exceptional downpours in the mountains of western New Mexico, flooding an area up to seven miles in width from Cliff, New Mexico 60 miles to the west. The flood left 350 people homeless in Duncan (GCG 10/3/1941) and flooded numerous ranches along the Gila as far downstream as Safford (Baker 1991). After passing through the rock canyon above Solomonville and Sanchez, the flood spread out over farm lands throughout Graham County. The flood cut away the north end of the Safford bridge.

During the devastating 1941 flood, the Graham County Guardian commented on changes in the Gila's channel and stream bed that local residents believed contributed to the severity of flooding and that distinguished the 1941 flood from previous floods. "Although old time settlers in the valley said that the amount of water in the flood was much less than in previous floods, damage was greater for the reason the channel of the river was overgrown with vegetation from weeds to trees, which retarded flow of the large amount of water to the extent it left its course and spread out higher over more land along the river bottom lands than ever before." Because the flow of the river was slowed down by the presence of vegetation growth, the flood did not come with the force nor in a single high crest through the lower valley as it did in New Mexico and the Duncan Valley. Between 50,000 and 75,000 acre feet were in the main flood. Coolidge Dam Reservoir probably gained 100,000 acres of storage water (GCG 10/3/1941). Former residents claim that

the 1941 flood ran 30 feet high through the narrows in Bonita Canyon. The City of Safford water pipes were washed out and were never found. Repairs to the system were delayed, and it took two to three months to restore water service to Safford. The rain started on the Indian Reservation and then moved down to Solomonville. Flat hail stones an inch and a half wide fell in the Solomonville area destroying the cotton crop (C. Earven 1991).

While working on the San Carlos Reservation with the registered herd, John Lasley penned a description of the initiation of a 1941 flood on Ash Flat. "One day a huge cloud formed over the Natanes Rim resulting in a cloudburst over Ash Flat and especially around Arsenic Tubs. It rained so hard that we had a first hand view of a "Flash Flood" so often spoken of in Arizona. A little valley just south of Arsenic Tubs for a short while developed into a river a lot like the Missouri river. The water ran muddy and swiftly, sweeping everything before it" (Lasley 1988:5.5). Floods from the Ash Flat area fed directly into Bonita Creek, and this flood may have been the late September 1941 flood that proved so destructive to farmland along Bonita Creek.

In September 1944, another severe flood occurred, again washing out fields, irrigation canals, and destroying homes along the Gila River. By October considerable progress had been made in the restoration of washed-out canals (GCG 10/20/1944). However, this flood was so severe on Bonita Creek that entire benches along the creek were washed away as well as several houses and other structures. The floods of 1941 and 1944 created the most noticeable permanent damage in Bonita Creek. Both floods washed away irrigation ditches on Bonita Creek and considerable farmland along the creek banks. Several of the "ancones" (benches) farmed by the Bianes family disappeared entirely during the 1940s along with the orchards that had been planted on them, others were irreparably damaged by deposits of debris, stones and sand. The flood of 1944 washed away several homes along Bonita Creek, including the houses of the Earvens, the Bakers and Art Lee (Earven 1991; Baker 1991). After the 1944 flood, farming never resumed its previous extent in the canyon.

Subsequent floods specific to Bonita Creek are recalled for 1961 (July), 1965 or 1966, 1972 and 1983. The flood in 1961 washed out many large cottonwoods and washed out at least three beaver dams (Garcia

1991). The flood of the mid-1960s changed the course of the creek to some degree (Garcia 1991).

As early as the 1890s, controlling the potential for damaging floods on the Gila had become a major concern. Several dams on tributaries and on the Gila River itself were proposed for both flood control and water storage. The major focus of Frank Olmstead's 1919 survey was flood control. He carefully analyzed the potential contribution to flood waters of each of the Gila River's tributaries including Bonita Creek. Olmstead noted that on Bonita Creek, the comparatively scant vegetation on steep slopes created rapid run-off, and that only a small percentage of the rainfall was retarded. "Floods in Bonita Creek are quite common and are torrential in character." Mr. Charles Boggs, a Safford cattleman, told Olmstead that on one occasion he observed Bonita Creek rise to a height of 5 feet in 15 minutes, but in 4 hours' time it had returned to its normal flow. Mr. Farrell, "owner of the ranch at the head of the box canyon," who had lived on Bonita Creek for 21 years prior to Olmstead's interview, stated that floods usually crested within an hour and that water flow usually returned to normal after eight hours. Olmstead also noted that during the "great flood" on the Gila (January 1916) Bonita Creek was not in an unusual flood condition. Although a large detrital cone had built up at the creek's mouth on the Gila (Figure 21), in general, Bonita Creek's flood waters did not carry a large silt content (Olmstead 1919:77-78).

Measures recommended in the 1919 report were not successful in controlling Gila River flooding. Residents of the Gila Valley agitated for flood control for many years; petitions to Washington noted that over 12,000 acres of prime farm land had washed away (GCG 7/7/1933). During the early 1930s, author Ross Calvin did the research for his well-known book *River of the Sun*, which stressed the impact of flooding on the local economy of the Gila Valley. In 1935 H. T. Coney prepared a subsequent flood-control survey for the Gila watershed above Bonita Creek. In contrast to Olmstead's report, the 1935 study recommended the construction of a flood control dam on Bonita Creek (GCG 10/25/1935). However, no flood control dam was ever constructed on the Bonita Creek drainage.

After the 1929 completion of Coolidge Dam, Arizona Edison applied for a permit to build a power dam above Bonita Creek on the Gila River. Construction of this dam would have created a reservoir extending up river as far as Guthrie containing 130,000 acre feet of water (CGC 4/19/1929). In 1933 Gila

Valley farmers pushed for the inclusion of a flood-detention dam as part of the National Industrial Recovery Act (CGC 7/7/1933). Plans for additional dams along the Gila did not materialize. The Soil Conservation Service practiced another flood-prevention strategy removing "weeds, trees and timber" from the river bed, which permitted swifter passage of flood waters, prevented water from spreading on the valley floor, and allowed for greater collection in Coolidge Reservoir (GCG 2/19/1937). It is not known whether the brush-and-tree-removal strategy was ever practiced on Bonita Creek. However, the SCS maintained a camp in Ash Flat in the San Carlos Reservation for several years during the 1930s and practiced brush removal with large bulldozers on that portion of the watershed (Quinn 1992). During the period of agitation for dam construction, the distribution of Gila River water was settled by the Globe Equity No. 59 adjudication of 1935, which distributed irrigation waters according to priority rights for the years 1868 to 1914 inclusive.

Despite all attempts to control the damaging impacts of flooding it is clear that on both the Gila River and on Bonita Creek, flooding became progressively more destructive with increased impacts of humans and livestock and with the cumulative tamperings of well-intentioned residents and engineers. In 1919, Bonita Creek rancher Jack Farrell discussed Bonita Creek flooding to flood control expert Frank Olmstead. Farrell described frequent floods that did not have destructive impacts. Although crops might have been ruined and the terraces temporarily disturbed during the pre-1940 floods, the terraces themselves were never destroyed until 1941 after 60 years of intensive grazing throughout the watershed and the construction of the water department road directly up Bonita Creek.

Downcutting and In-filling

Residents and water department workers familiar with the creek for over five decades noted that both downcutting and in-filling have taken place over time. Changes in the level of the creek are indicated by the presence of "old Indian hieroglyphics," which water department workers observed on the west side of the canyon above the Claridge ranch house. The pictographs were located on the canyon wall so close to ground level above one of the terraces that workers thought that either the people at that time were extremely short, or the land had filled in considerably (Garcia 1991). This in-filling took place over a period

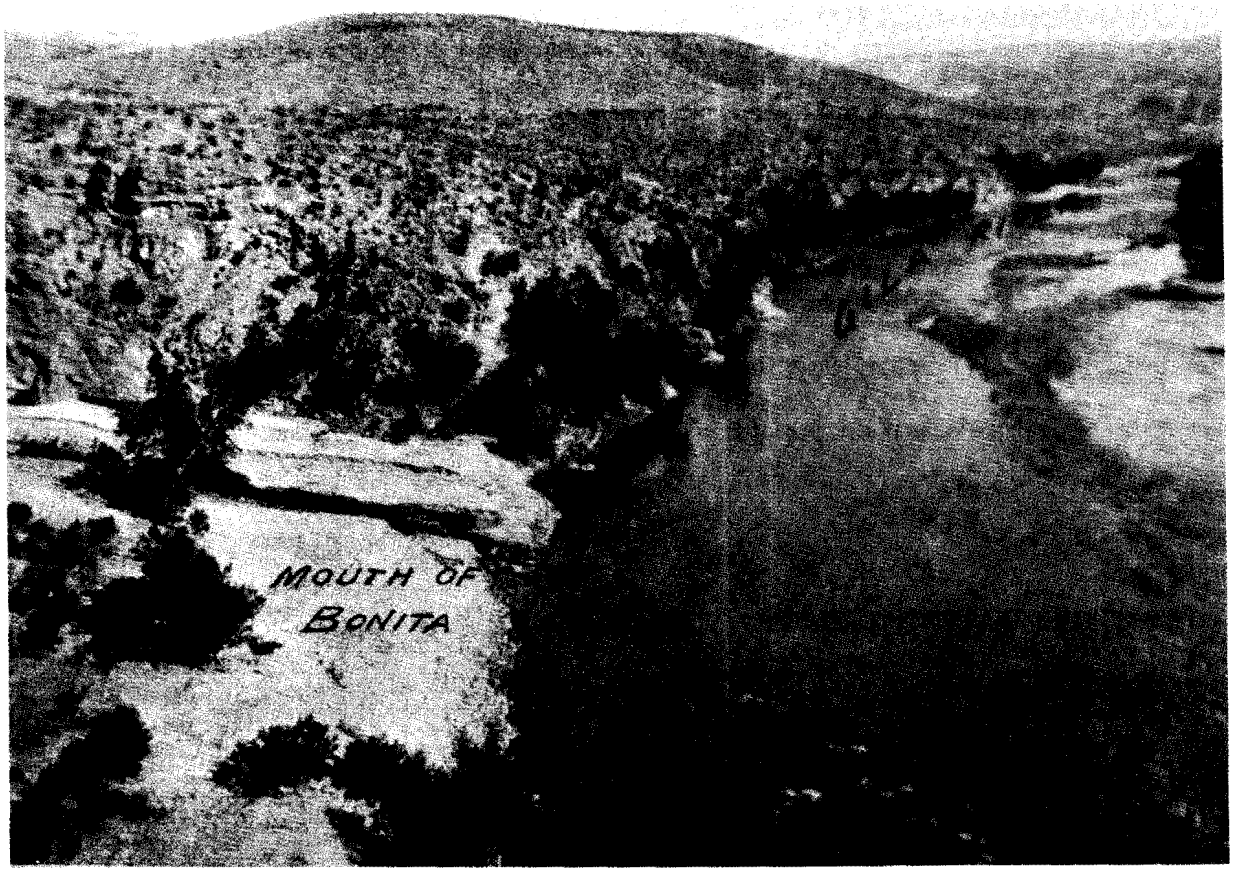


Figure 20. Mouth of Bonita Creek and view of Gila River, 1919 (photo by Frank Olmstead for the Gila River Flood Control Survey).

of many centuries. In contrast, the short-term action of the creek since 1900 has been to lower the level of the creek bed. Former residents noted that until the early 1940s, temporary irrigation diversion dams could be raised to a level adequate to divert the water into the head of an irrigation ditch in a few hours time because the level of the creek and the level of the irrigation ditches on the banks were almost the same (Earven 1991; Melendrez 1992). For the most part, the brush and sand dams needed to be only 2 to 3 feet in height. At the present time, the level of the creek bed is approximately 6 to 12 feet below the level of the few remaining irrigation systems along the creek. Downcutting has doubled or tripled since the 1940s. In most places, the creek bed is 10 to 12 feet deeper than it was when farming was practiced. On Bonita Creek downcutting has become so severe since 1940 that it would no longer be possible to irrigate farmed terraces by means of temporary diversion dams.

The Gila River has also downcut. At the confluence of Bonita Creek, downcutting has been so drastic that the level of the Gila is more than 20 feet below the level of the mouth of Bonita Creek. The area below the Serna cabin near the mouth of Bonita Creek was formerly flat with almost no drop-off into the river (Melendrez 1992).

THE SAFFORD WATER SYSTEM

First Phase of Construction

The Safford Municipal Water Company constructed its first water system in Bonita Creek during the late 1930s (Table 3). A second phase of modernizing and upgrading took place during the early 1950s. Both phases employed a similar concept for water collection, but the methods of collection differed. During the first construction period in 1937, the Weiland company of Pueblo Colorado was employed to construct the system. The system consisted of a series of interconnected wells. The city of Safford had purchased several water rights, mostly from the Bureau of Land Management, along the creek for the installation of wells. Land surrounding the water rights was purchased in order to protect the water sources and to prevent mineral exploration (Garcia 1991). The system consisted of 12- and 15-inch cast-iron pipe buried in the stream bed at a depth of 18 inches. The wells were connected by pipe and fed into a central pipe system that

carried the water to Safford. The cast-iron pipe line in 20-inch sections went directly down the creek bed, crossing the creek 30 or 40 times. Two or three retarding dams were constructed across the creek (between the galleries and Well #6) to slow the movement of water and prevent the pipes from washing out. The original dams were rails placed vertically into the creek bed with strips of war-salvage metal landing mat (in strips 20 by 2 feet long) placed between the rails. The mat was welded vertically with spaces left between. Remains of the original retarding dams can still be seen in the creek below the "City Yard," or "The Meadows," the local names for the water company's work area.

Table 2. Chronology of the Water System

7/6/1937	Safford City Council issued Request for Proposals
9/9/1937	Notice to Proceed issued to Weiland and Co. of Pueblo, Colorado
9/18/1937	Actual work began at Bonita Creek
12/9/1938	Completion of water system
1941	Floods wash out system
1944	Floods wash out system
1951	Work on collection galleries and updated transport system began
1952	Addition of extensions on collection galleries
1964	Added Well #14
1970-71 and 73-74	Construction of new retardation dams.

All work on the water-collection system was done in compliance with federal standards of Public Works Administration and standards adopted by the Arizona Industrial Commission after the pipe was allowed for greater collection in Coolidge Reservoir (GCG 2/19/1937). It is not known whether the brush-and-tree-removal strategy was ever practiced on Bonita Creek. However, the SCS maintained a camp in Ash Flat in the San Carlos Reservation for several years during the 1930s and practiced brush removal with large bulldozers on that portion of the watershed (Quinn 1991). During the period of agitation for dam installation, backfill was placed in the empty trenches. Brush and trees were cleared only along the pipeline.

The contract for the 1937 work explicitly specified that the ground surface was to be "restored to the same condition as it was before the work commenced, and all surplus material...removed" (Water Department, Weiland Contract # 65).

Once completed, the water system was immediately recognized as a "unique and effective system for collecting underground water." In 1938 a group of Future Farmers of America visited the Water Company's project at Bonita Creek. Mr. Weiland and the engineer for Safford escorted the group. Frank Sainz, who had been camp director, and Newell Barney, an engineer on the project, explained how the system operated (GG 8/26/38). Although unique and effective, both the original pipe system and the retardation dams eventually proved unsatisfactory. The original buried pipe system was repeatedly washed out of Bonita Creek and deposited in the Gila River. After approximately one year, the areas behind the retarding dams had filled in. The cable ties on the dams often snapped during large floods, causing all the material contained behind them to wash out. In addition, the corrugated 15-inch collection pipes failed to screen out foreign materials (Garcia 1991).

Second Phase of Construction

In 1951, the City decided to completely redesign the water system, determining on an unusual collection and transportation system that featured pipes attached high on the canyon walls. The city council awarded the contract for the pipeline revision to the Phoenix engineering firm Headman, Ferguson and Carollo. The Phoenix engineers provided class-150 asbestos cement pipe with lead caulked joints, increasing the main pipe to 16 inches, with branch and smaller lines at 12 inches. All tunnels were placed at a minimum depth of 2 feet.

The collection gallery, a cluster of wells tied together in the bottom of the creek, was constructed at this time. The galleries were placed at a depth of 20 feet in the bottom of the stream in the shape of a 300-foot-long Christmas tree, with lateral collection pipes extending out from a central core. The galleries collect 2,100 gallons per minute. Water from the collection galleries enters the piping system directly, without passing through any storage facility. Below the galleries, the 16-inch pipes are suspended on the wall of the

canyon for six miles. The 16-inch pipe then forks into 12-inch pipe on the north and 10-inch pipe on the south side of the Gila River to carry water to Solomonville and Safford. Several wells have emergency boosters.

Improvements included the installation of two sand traps and approximately 400 feet of perforated collecting pipes 20 feet deep near bed rock. During the early 1960s, two new retardation (or check) dams were built. They consisted of a series of large metal boxes (10 feet tall) placed vertically across the creek bed, suspended loosely by metal cables, and submerged 5 or 6 feet below the surface. The boxes quickly filled with gravel. They were placed in a manner that gave them a 4 to 5 foot arc, providing greater flexibility so that they were able to drop during flooding rather than snapping. They proved to be effective waterflow retardation systems and are still in place at this time (Garcia 1991). The check dams had multiple purposes and successfully stopped changes in gravel and sand composition during construction and protected the galleries from any scouring action. According to Water Department personnel, they have also been effective at maintaining a reservoir of granular material and have been somewhat effective at preventing downcutting, keeping the stream bed at its present elevation. Water company officials believe that they do not increase the instability of the creek bed downstream. The canyon is so narrow that no problem exists with keeping the channel within a particular location. However, below the check dams, the stream bed has downcut (Squier 1991).

The system is unique in Arizona, and only one other system in the United States (Medford, Oregon) is similar. For many years, Bonita Creek has supplied 100 percent of Safford's and the adjoining area's water during the six winter months, but is supplemented by well water during the summer. The Safford Water Department considers the new system to have a unique feature in water collection. During the 1950s phase of construction, the water department placed the remodeled collection galleries at a sufficient depth so that they would be unaffected by surface water. The Water Department maintains that below the action of the surface water, the galleries did not absorb stream flow (Squier 1991). The Water Department considers that Earven Spring, the site of the collection galleries, is not fed by the stream and that water analysis indicates that the water in Earven Spring, below the creek bed, is distinct from that in the stream, with subterranean

water of a different composition than surface water. Water Department personnel have observed that subsurface flow appears to be connected with distant areas to the north of Safford and note that activity in the water table can be predicted by drought or the abundance of rain or snowfall in the White Mountains. For years, water department personnel have observed that precipitation in the White Mountains affects the quantity of water in the collection system. They assume that the underground water is connected to underground and surface waters hundreds of miles north (Squier 1991). Water department personnel note that after the installation of the galleries, none of the big cottonwoods or willows in the immediate vicinity of the water source dried, an indication that the subterranean water is unconnected to the surface. Data included in the hydrological study of Heindl and McCullough (1961) do not entirely support the observations of the Safford Water Department, and these data indicate that subsurface and surface water are connected.

After acquisition of the original water supply at Earven Spring, the Water Department has continued to assure its water supply through the purchase of additional water rights. Wells, although unnecessary for water supply, have been sunk in order to keep the water rights and to create a back-up that could be used to supplement the water supply if necessary. Each well has been given a number and is tied into the water system. Since completion of the new pipeline at the end of the summer of 1952, few changes in the collection galleries or supply system have been made.

Litigation followed the installation of both phases of the water system. After the first phase of construction, several farmers in the San José-Solomonville area sued the water company. During the 1950s, a federal decree settled litigation initiated by the San Carlos Apache tribe. Water right adjudication is again before the court system (1992).

Impacts of the Water System

In the opinion of water department officials, most of the environmental changes that can be observed in Bonita Creek are the result of unrestricted grazing and periodic flooding. Since installation of the water system, the department has noted no land subsidence and has observed no decline in the vitality of the trees in the immediate area of the collection galleries or wells. The most significant environmental change that

occurred as a direct result of the system was the removal of numerous large trees from the area immediately adjacent to the collection gallery (Squier 1991).

During the 1951 construction phase, the water department built several temporary buildings to house workers. Other structures belonging to the water company include the pumping stations on top of the ridge on the west side of the canyon and one structure located next to the creek bed and known locally as the "City Yard."

The Water Department has assisted the Bureau of Land Management in the maintenance of a recreation area consisting of three sets of picnic tables in cleared areas on the creek banks. The recreation areas are locally known as the First, Second and Third Tables. The First Tables, in Spring Canyon below the mouth of Bonita Creek, were not replaced after vandalism occurred in the area. However, the Second and Third Tables are still popular recreation areas. They are located on stream benches that were formerly farmed by Angel Bianes.

Several long-term residents of Bonita Creek take issue with the water department's claim that the collection system did not have impacts on the creek's ecosystem. They note that no vehicular road had ever been constructed into the lower creek until the water system was built. The road had immediate negative effects on the stability of the creek banks and the permanence of fertile areas of "first class" loamy soils along the creek. Ramon Melendrez, who worked on the first phase of the water system, noted that the water company made an attempt to bury the pipeline straight up the creek bed, knocking down any trees, including fruit trees in the orchards in the "ancones," that obstructed the direct path of the pipeline. Workers also cleared the creek of brush. Melendrez noted that after road construction and the removal of trees and brush, serious erosion in the creek bed began to occur. Bonita Creek began to downcut severely after the road was constructed. Melendrez also noted that the Gila River had downcut to such a degree that the land near the mouth of Bonita Creek that was formerly at the same elevation as the Gila River is now perhaps 20 feet above the level of the river. He observed that this steep drop in elevation from Bonita Creek into the Gila River is bound to have affected the flow of the water through the Bonita drainage (Melendrez 1992).

VIII

CONCLUSION

SUMMARY OF ENVIRONMENTAL CHANGE

This section presents a summary of the information we have obtained about the environmental history of Bonita Creek. This report is a study of the process of environmental change on the Bonita Creek watershed and the role of human impacts in that change. The approximate two-century period targeted by the report is the period in which the most severe change and the greatest number of specific changes occurred. In order to discuss the process of change, it is necessary to describe Bonita Creek geography at the beginning of the period in question (ca. 1800). Since no detailed descriptions of the Bonita Creek Watershed were written during the nineteenth century, it is necessary to create a historical reconstruction of the watershed. In the years between 1826 and 1886, areas surrounding Bonita Creek in the Gila River Valley and on the San Carlos Reservation were described by many observers including James Ohio Pattie, Lieutenant Emory, John Russell Bartlett, several Forty-niners, members of the Wheeler survey party and early military personnel. These descriptions give valuable information and assist in the historical reconstruction of the Bonita Creek Watershed. However, the most useful tool for the reconstruction of the pre-Euroamerican geography is the process of deletion and augmentation of specific plant and animal species.

Historical reconstruction can be done for either plant or animal communities. The process is less complex for animal species and will not be described in detail here since it is similar to that used for plant communities. As outlined by Peter Warshall (Hadley, Warshall and Bufkin 1991:302), reconstruction of plant communities prior to intense impact requires the following eight-step process: (1) Determine exotic species added by Euroamericans. (2) Determine the increasers, or plants that have increased as a result of human imposed impacts; determine the resisters, or plants that have resisted human impacts; determine the evaders, or plants that could evade human impacts. (3) Review increasers, resisters, decreasers and evaders with their

herbivores and determine at which stage of the life cycle each became vulnerable to decrease or was stimulated to increase. (4) Review the climate to determine whether climatic changes would have naturally increased or decreased species' abundance. (5) Understand the frequency and intensity of fire effects on each species. (6) Reconstruct soil losses from human-induced erosion, "replacing" lost soil layers and the plants they contained. (7) Reconstruct the competition and co-evolution of various species that might "fine tune" the understanding of plant distribution. (8) In riparian communities, focus on the many influences on channel and stream bed changes. A similar process can be used to reconstruct former animal species, applying competition from domestic livestock, pressure from hunting and trapping, and removal of feed supplies as the major forces affecting populations.

To recreate the pre-Euroamerican Bonita Creek landscape, we must first delete all traces of Euroamerican physical impacts. In this landscape there are no roads, no masonry structures, no dams, no Water Company collection galleries. We delete European-style agriculture, almost all European livestock, and the vast majority of nonnative invader plant species. Historians postulate that in many areas of North America, European plants, animals and diseases arrived through Native American trading networks years before physical contact with Europeans occurred (Crosby 1972, 1986). Spanish explorers first marched across the Gila Valley in the sixteenth century. During the next two centuries, although no Spanish settlement was established, Spanish military expeditions and trading contacts were common occurrences (Officer 1987; Kessell 1976). By the 1820s, Gila Valley natives had become acquainted with Anglo-American trappers and explorers. We can assume that by the early nineteenth century some European animals and plants had made their way into Bonita Creek. Both livestock and seeds were intentionally imported by some native groups. Seeds were often accidentally imported in the manure or fleeces of livestock. By 1800 an occasional horse or cow had visited temporarily north of the Gila. By the first quarter of the nineteenth century, the Apache had begun to assemble breeding herds of horses and by 1830 were keeping a herd of 2,000 horses north of the Gila (Dobyns 1981). Before mid-century, the Apache were bringing cattle into the area north of the Gila on a regular basis (Emory 1848; Bartlett 1965; Green 1955). However, the vast majority of the cattle were slaughtered soon after their arrival (Goodwin 1942). In Bonita Creek's pre-contact landscape, a few species

of livestock-transported nonnative grasses may have taken hold. In contrast to the Sobaipuri and other Piman groups, there are no records of the Apache having incorporated European food crops intentionally into their agricultural system (Buskirk 1986), so it is unlikely that Apache farmers planted European crops on their Bonita Creek farms.

Historical reconstruction of the early nineteenth century landscape requires considerable augmentation of native plant and animal species. Prior to competition from invader and imported exotic species, native plant species were more abundant. Although none of the "original" native plant communities have disappeared entirely from Bonita Creek, during the early nineteenth century the concentration, density and numbers of native plants within the existing communities were much larger. Undergrowth along the Gila and on Bonita Creek was very dense, and beaver dams backed up many small ponds. On Bonita Creek sycamores, cottonwoods, ash and walnut were abundant in all stages of development. Brush was dense except in the few areas where Apache farmers cleared with fire. The creek bed and the banks were almost at the same level. Many of the benches along the creek were almost impenetrable with brush. On the higher levels of Turtle Mountain, juniper and pinyon were abundant. Some areas of the Gila were swampy, and malaria was a problem. It is possible that small stagnant pools remained in side channels on Bonita Creek. Throughout the general area, a larger incidence of fire (both lightning caused and intentionally set by the Apache) benefitted the proliferation of native grasses and prevented the expansion of succulents, cactus and small shrubs. In our reconstruction, we must therefore increase the amount and density of native grass cover, decrease the number and distribution of cactus and succulents, and diminish the amount of brush (or shrubs) outside of riparian areas.

In the early 1800s, there were more native animal species and a larger number of individuals within each species. Bighorn sheep, black bear and eagles inhabited the higher elevations of the Bonita Creek area. On the upper watershed, Ash Flat, carpeted with grama grasses, supported large herds of antelope and elk. Wolves and mountain lion fed on deer and on the Ash Flat herds. Grizzlies preferred the rich riparian habitat of the Gila bottomlands and frequented Bonita Creek, where they consumed wild grape and berries, as a passageway to higher elevations. Although beaver were washed out of Bonita Creek in periodic floods,

they quickly returned.

During the early nineteenth century, Bonita Creek was homeland to the Western Apache. Euroamericans later called this portion of the Gila River Valley the "Great Stealing Road of the Apache," because it was used so frequently as a route for raiding into northern Sonora. Apache rancherías were scattered along upper Bonita Creek (Goodwin 1942), near the confluence with the Gila, and possibly along lower Bonita Creek (Emory 1848). Small trails, suitable for foot travel or possibly horse travel, probably wound along both banks of the creek. The major human impacts came from Apache farms, small half-acre plots planted mainly with corn and squash, and occasional semi-cultivated plots of wild tobacco or devils claw (Buskirk 1986). Apache check dams, constructed of stone and brush to slow flood waters, probably dotted the side canyons above Bonita Creek. The Apache used fire to clear their farm plots, to open the understory for hunting, and to drive game. They built irrigation diversions with brush and sand (Buskirk 1986); they lived in wickiups made of willow, cottonwood and available shrubs; they gathered mescal, acorns, pinyon nuts, and a large variety of cactus fruits and wild seeds for supplemental food; and they hunted for deer, antelope, rabbits and pack rats. With the possible exception of their use of fire, they imposed a minimal impact upon their environment.

After the first quarter of the nineteenth century, three waves of Euroamerican impact began to alter this relatively undisturbed environment. Between 1826 and the 1840s, trappers almost extirpated the local beaver population. Excessive trapping drastically reduced the number of beaver dams and was bound to have altered the effects of flooding and the stability of river and creek banks. Travel through the area increased after 1849 when the Gila River became a passageway for a significant number of California-bound emigrants, most of whom depended on local game as a food source. Construction of the national wagon road in the 1850s further increased traffic and made the Gila River accessible to wheeled vehicles. During the late 1870s and early 1880s, the first permanent herds of breeding stock were imported into the area and began to proliferate rapidly. The trapping, the initiation of road construction, and the presence of thousands of head of livestock began to rapidly transform the environment.

Euroamerican settlement began in Bonita Creek during the 1880s. Although informants' direct

observations date back only to the 1920s, second-hand information passed on by members of the previous generation dates to the 1880s. The cumulative generalized description of the Bonita Creek watershed during the early years of non-Indian settlement has been gleaned from informants' discussions of the area when they first knew it. By the 1920s, Bonita Creek had reached its peak of development. It had more settlers and more farmland under cultivation than at any other time, and many of the large cattle companies still operated in the area. Bonita Creek presented an idyllic picture of isolated, peaceful, rural life. Scattered subsistence farms, some humble but all neatly kept, were located at approximate half-mile intervals along the creek banks. Orchards were interspersed between the farmsteads. Some of the orchards contained only a few trees but all of the available benches, even the smallest, were planted. In home construction, local native materials predominated; most buildings were made of adobe and stone. Tin roofs were the only noticeable imported building material, and even this imported material had only begun to replace the original mud and brush roofs. The creek banks were only slightly elevated above the creek bed, and head gates on irrigation ditches at the farms were almost at creek level. Domestic livestock grazed between the fenced farm areas. Underbrush was kept to a minimum by clearing and grazing. Beneath the towering sycamores and cottonwoods that lined the creek, the understory was open. On the few benches that had not been cultivated, "the bermuda grass was like a carpet" (Baker 1991). Trails, but no vehicular roads, went up and down the sides of the canyon and through the creek bed itself. The idyllic scene was largely undisturbed by modern motorized machinery.

After the 1920s both settlement and farming began a steady decline in Bonita Creek. Today the creek has no permanent residents, and no farming is practiced within the canyon. Although a road goes up the center of the canyon as far as the Safford Water Company's collection galleries, the canyon appears isolated. Since the initiation of Hispanic and Anglo settlement, a number of changes in the local environment have occurred. Many of the changes can be attributed to human impact, and most are negative in character. Former residents perceive the changes as negative; and many of them view the canyon as damaged. Most damage is in the form of loss of land mass, topsoil, plant species and animal species. According to informants, the vast majority of this resource loss has occurred in Bonita Creek since 1941. A partial list of

the changes informants have observed is contained below.

1) The most serious damage has been the loss of large amounts of top soil from the canyon, possibly as much as 50 percent. It is noteworthy that this loss reached significant proportions only after the construction of the road to the Safford Water Department's facilities along the creek.

2) Bonita Creek appears to have downcut considerably--6 to 12 feet--since the 1930s. To some extent, this is a result of downcutting of the Gila, which has been even more severe than the downcutting of Bonita Creek, and which has led to the lowering of Bonita Creek's "base level."

3) A number of species of exotic plants have been introduced to the canyon. Many, such as fruit and nut trees, are of limited distribution and can be expected to disappear with time. Of greater significance is the introduction and spread of undesirable foxtail grass, which former residents attribute to intentional distribution. The loss or diminution of other introduced species, mainly filaree, is regretted by former residents.

4) There appears to be a reduction in the number of sycamore trees in the canyon, possibly accompanied by a slow rate of regeneration in this species.

5) At least two large mammals--the grizzly bear and wolf--have been eliminated from the watershed and the surrounding region. These are relatively recent losses. Bison and pronghorn have also disappeared, though when this occurred is uncertain. Bighorn sheep disappeared and were reintroduced. Other species, notably black bear and mountain lion, are present in much smaller numbers.

6) Heavy grazing of the watershed with subsequent reduction of grass cover has contributed to the severity of flooding and, thus, to the loss of soil and to changes in the species composition of riparian areas.

(7) Non-native fishes have appeared in Bonita Creek near the Gila.

(8) Erosion, which first became noticeable during the early 1930s, has become severe in many

of the tributaries to Bonita Creek and in Bonita Creek itself.

(9) Deposits of debris from flooding events and gravel bars on the creek banks have increased considerably.

In attempting to determine the causes of the major changes in Bonita Creek, one group of land users could be singled out. The early cattle companies who overstocked the ranges to an extreme degree may be responsible for a large portion of the land degradation which subsequently occurred. This group of users was anxious to acquire as much of the available free federal resources as they possibly could. Federal land policy of the late nineteenth century, which allowed priority and use to establish formal ownership, inadvertently encouraged overuse and abuse of resources. Hence competitive overstocking became the common practice. The bottomland preference of cattle and the fact that several entire townships in the study area have no water sources other than Bonita Creek increased the direct impact of overstocking on the creek itself. A second major source of change was initiated by the Safford Water Company pipeline and collection galleries. Until the late 1930s, Bonita Creek had been uniquely free from mechanical disturbance. Few inhabited areas in Arizona were still without a bulldozed automobile road at that time. Many former residents state that bulldozing and tree removal for the construction of the water company road "changed everything" within the canyon (Baker 1991) and was the single most important cause of change.

CHRONOLOGICAL SUMMARY OF HUMAN IMPACTS

A decade-by-decade summary of major impacts is included here. Resource exploitation became intense by the 1890s with the increase of cattle on the open range and continued to be intense through the 1920s when Bonita Creek attained its maximum development in farming and settlement. Since that time resource exploitation has decreased.

1800s-1830s: Apache farmers inhabit the upper portion of the Bonita Creek watershed, practicing subsistence farming and hunting-and-gathering economy. They may import limited numbers of European livestock into the area on a temporary basis for slaughter. Increased raiding into northern Sonora leads to an increase in Spanish military expeditions into the Gila area.

1820s-1840s: Trappers arrive from New Mexico. During the two decades following 1826, beaver are almost extirpated in the Gila River watershed.

1840s: General Kearny's Army of the West marches down the Gila River during the Mexican War, second written observations of Bonita Creek. In 1849, several thousand Forty-niners en route to California pass by Bonita Creek.

1850s: Construction of the Federal Wagon Road from El Paso to Yuma allows wheeled vehicles into the Gila Valley near Bonita Creek.

1860s: Establishment of the first US military post (Fort Goodwin) in the Gila Valley. First mineral exploration by Anglo Americans in Gila Valley (troops with General Carleton's California volunteers). Possible arrival of first Hispanic settlers at Pueblo Viejo (Solomonville). Military pressure on the Apache disrupts the former subsistence patterns, including farming on Bonita Creek.

1870s: The San Carlos and White Mountain Apache Reservation established in 1873. Repeated escapes from reservation by Western Apache bands, Bonita Creek used as major escape route. Because of conflict with the US Army, Apaches probably discontinue farming on upper Bonita Creek Watershed at this time (if not in preceding decade). In 1873 Wheeler Survey of general area conducted. Importation of first herds of breeding cattle into the area. Establishment of towns of San José, Sanchez, Solomonville and Safford. Settlement by first Anglo-Americans. First mineral strikes in Clifton-Morenci area 1872-1873. First ranch established on Eagle Creek by George Stevens. Possible first temporary non-Indian settlement on Bonita Creek by cowboys working for large cattle companies.

1880s: In 1883 San Carlos boundary surveyed. Apache escapes from reservation through Bonita Creek continue until the 1886 Geronimo surrender and end of the Apache Wars. Expansion of mineral exploration at Clifton-Morenci. First homestead-type settlements established on Bonita Creek. In 1883 Chinese labor expelled from Clifton. By late 1880s possible Bonita Creek residents include: William Kimball, Toppy Johnson, members of the Earven family,

Chinese farmers, Mrs. Gay. Intermittent drought begins 1885. Olney, Prina, Cunningham cattle are in Bonita Creek. Turner West ranch established. Chiricahua Cattle Company, Double Circle, Bryce Mattice, Hat Ranch, and Turtle cattle companies all establish themselves within the Bonita Creek watershed. Railroads arrive in southern Arizona. By 1880s cutting of fuelwood for Clifton-Morenci mines extends to Bonita Creek. Hunting for food supply for army and miners increases.

1890s: Importation of first herds of Angora goats. Sanchez and Fajardo goat herds in Bonita Creek. Increase in trapping and predator control because of presence of goats. Increase in cattle numbers despite continued drought; 1892 considered to be worst year of drought. First formal leases on San Carlos Reservation issued to non-Indian cattle companies in 1892. Late 1890s is probable peak for livestock numbers in the area. Jack Farrell settles at confluence of Johnny Creek, imports cattle. Angel Bianes farms lower Bonita Creek terraces, transports produce by burro to stores in Clifton. José Baja farms in Bonita Creek. Toppy Johnson moves into stone cabin. Construction of toll road from Solomonville to Clifton. Major flood on Gila River in 1891, flood impact on Bonita Creek unrecorded. Railroads arrive in Gila Valley. In 1893 prospectors build an arrastra in Bonita Creek. First territorial game protection law passed in 1897.

1900-1920s: 1901 construction of Morenci Southern Railway. Demand for fuelwood for steam boilers at Clifton-Morenci decreases after 1900 although demand for domstic firewood for heating and cooking continues. After 1900 unwanted burros and mules turned loose in increasing numbers. In 1904 drought ends. Placer strike at mouth of Bonita Creek ca. 1910. Prohibition adopted 1910 in Graham County. Predatory Animal and Rodent Control agency organized in 1914, becomes active in Bonita Creek, increases trapping. As late as 1915-1918, grizzlies still present on San Carlos Reservation. Wolves still present in general area through the 1920s. First formal efforts to rid ranges of wild burros and horses during 1920s. Goats and cattle stocking rates decline slightly from 1890s peak although overstocking

continues. San Carlos Reservation boundary resurveyed in 1915, fences constructed on boundary line before 1924. Floods on Gila and throughout general area occur in 1902, 1905, 1906, 1915, 1916, specific impacts in Bonita Creek not destructive to land forms. Severe drought between late 1918 and 1921. Leasing system on non-reservation land becomes more formalized during period after 1918. After 1923, non-Indian cattle leases are gradually terminated on San Carlos Reservation. Improvements to Bonita Creek placer mines in 1928-1929. Bonita Creek continues to have approximately 30 acres under cultivation until the end of this period.

1930s: Severe drought 1933-1934. Depression has effect on Bonita Creek area. Sales of land and transfers of leases increase during early 1930s. Taylor Grazing Act enacted in 1934, formal leases required for use of public lands. Sharp reduction in cattle numbers. Most goat herds are removed. Removal of wild horse and burro herds. Last non-Indian cattle leases on San Carlos Reservation terminated, five bands of Lee sheep removed from reservation in 1936, Double Circle cattle removed in 1938. Old settlers, including Bianes, Chacon, Sanchez, and Peña, leave canyon. New settlers in canyon include Christensens, Georges, Jones, Phillips, Gossic and Bakers. First-phase Safford water system constructed in Bonita Creek in 1938-1939, includes wells, underground pipes and retardation dams. First automobile road goes up Bonita Canyon as far as collection galleries, sometimes possible to continue to reservation fence.

1940s: Two highly destructive floods in 1941 and 1944 destroy creek banks, remove farmed terraces, and wash away houses (Bianes-Chacon-Baker tufa stone house, Sam Earven and Art Lee houses). Smaller numbers of cattle graze in Bonita Creek. Most farms are abandoned after the 1944 flood. Absentee ownership becomes more common. Depopulation of the canyon begins after World War II.

1950s: Second phase of Safford Water company collection system begins in 1951. Improvements to pipe system, removal from stream bed. Continued decline in cattle numbers, farming and

settlement.

RESEARCH RESULTS

The Bureau of Land Management identified both general and specific objectives for the Bonita Creek Ethnoecology Study. The study has three general objectives: "a good ecological description of the Bonita Creek Watershed in early 19th century pre-Euroamerican times," identification of "changes that have occurred in ecological condition since approximately 1800," and identification of "the specific forces that caused the observed changes in ecological condition" (Bureau of Land Management 1990:Introduction). In addition, a number of specific study objectives were listed:

1) A description, for pre-Euroamerican times, of soil productivity in upland and riparian areas, vegetation communities in the upland and riparian areas, watershed condition and climatic regimes.

2) Identification of changes in and the causes of these changes for soil productivity in upland and riparian areas since the early 1800s, vegetation communities in upland and riparian areas since the early 1800s, watershed condition since the early 1800s, and climatic conditions since the early 1800s (changes only).

3) A discussion of site-specific human impacts on the uplands and riparian areas of the watershed since the early 1800s, human occupation of the watershed since the early 1800s, terrestrial and aquatic fauna found on the watershed, and faunal changes since the early 1800s.

4) A photographic record of the uplands, riparian areas and human impacts to the area as obtained from a historic photographic inventory.

Since no detailed accounts of the Bonita Creek Watershed were written during the pre-Euroamerican settlement period, the authors have presented the first general objective, the "ecological description" of the pre-settlement period, in the form of the historical reconstruction that begins this chapter. The second and third general objectives, identification of ecological change and the causes of ecological change, have been

presented in a more explicit form. Since much of Bonita Creek's environmental change has taken place during the time included in historical memory, specific impacts and the changes which resulted from them were presented in Chapters 5, 6 and 7. In some cases, identification of the forces that initiated ecological change has been speculative; in other cases, however, there are obvious direct connections between impacts and change. Those instances have been identified within the chapter narratives.

Specific study objectives include descriptions of soil productivity, climate, vegetation communities, site-specific human impacts, and creation of a photographic inventory. Relevant data concerning soil productivity in the immediate Bonita Creek area, particularly for the early nineteenth century, do not exist. However, farmers agree that the alluvial loams in the Bonita Creek bottomlands were unusually productive. These "first rate" soils, described by both residents and surveyors, were formerly present in larger quantities. There is clear evidence (both visually and from informants' descriptions) of considerable erosion along the creek and in its tributaries as well as evidence of substantial topsoil loss. There is no evidence to suggest major shifts in the boundaries between plant communities, and no community types have been added or lost. There do, however, appear to have been changes in the composition of the riparian community. Data on change or stability in upland plant communities are limited. Although the upper watershed has been, and continues to be, grazed heavily, there is little evidence of downcutting. In contrast, the downcutting that has occurred on the lower watershed is severe. Data on the elimination and addition of species of plants or animals are discussed below. Discussion of site-specific human impacts is included in Chapters 4, 5 and 6 and in the accompanying maps. A number of historic photographs of the watershed were located, some of which provide useful ecological information. Finally, much has been learned about the history of occupation in the canyon over the last century, both in general and site-specific terms. It has been possible to identify, in some cases with certainty and in other cases only tentatively, a number effects of this occupation on the environment of Bonita Creek.

Ethnoecological research examines the way in which an ethnic group perceives and impacts the ecosystem inhabited by the group. Although the data for ethnoecological research in Bonita Creek are somewhat limited, it was possible to study the effects of human settlement on the environment. It was more

difficult to study variation in the perception of that environment. In Bonita Creek members of three ethnic groups, Apache, Hispanic and Anglo-American (and possibly a fourth group, Chinese) lived within a limited portion of the watershed and practiced several forms of subsistence economy for at least two centuries. Although no former Apache residents are still alive, considerable information is available about Apache subsistence activities in other areas similar to Bonita Creek. As described in Chapter 4, Apache ecological perceptions and practices were quite different from those of the subsequent inhabitants of the watershed. It is highly probable that the ecological adaptations followed by the Bonita Creek Apache residents were similar to those described by Goodwin (1942) and Buskirk (1986) in other similar areas inhabited by the Western Apache.

Both Hispanic and Anglo former settlers were available and willing to discuss their ecological perceptions and practices in Bonita Creek. Archival sources provided additional information for the early years of Euroamerican settlement. It is notable that there were few differences between the practices of Hispanic and Anglo residents of Bonita Creek. Hispanics account for a greater proportion of goat ranchers and practiced more "truck" farming for domestic markets in nearby towns. They appear to have been involved in more incidental economic activities, like fuelwood cutting and possibly moonshining. Anglo-American residents were able to acquire larger numbers of cattle and build up larger land holdings, perhaps because they had easier access to economic resources in the form of loans and governmental agency contacts. Aside from these distinctions, Hispanic and Anglo land use practices were very similar. Both groups attempted to maximize their economic returns by increasing herd size and by performing multiple economic activities (livestock raising, vegetable and fruit farming, plus acquiring some incidental income from fuelwood cutting or liquor manufacture). Former residents all have opinions concerning both the condition of Bonita Creek today and the reasons for its present condition. Although their opinions were not presented as a statement of land ethic, they contain elements of environmental analysis. Therefore, these opinions provide the historian with a useful tool for examining each ethnic group's perception of environmental change and the responsibility for that change.

In comparison to other dispersed rural settlements in southern Arizona, Bonita Creek was less

densely populated and was populated by a larger percentage of part-time and periodic residents. In addition, for 50 years the impact of several very large cattle corporations overwhelmed the impact of the sparse population of settlers. Since the corporate owners were largely absentee and have now been gone from the area for over 50 years, the ecological perceptions of the specific group that had the greatest impact on the area cannot be examined. This contrast to other rural settlements in the Southwest is important. Aravaipa Canyon, for example, was not heavily impacted by absentee cattle corporations. In addition, Aravaipa was continually inhabited by several multi-generational families for a period of over a century (Hadley, Warshall and Bufkin 1991), providing a unique continuity of historical memory. This distinction makes Aravaipa a somewhat richer area for ethnoecological research.

IMPLICATIONS FOR THE FUTURE

The Bonita Creek Watershed has been inhabited and used by humans over a period of several thousand years. Archaeological and ethnographic data suggest that Native American settlement in the canyon of Bonita Creek was episodic. Although prehistoric and Apache groups changed their environment, we hypothesize that the effects were both minor and temporary--as compared to the over-riding effects on the canyon's ecology of the floods that have swept down it at irregular intervals. That is, the ecology of the canyon appears to have been left in a state from which it could recover rapidly after each period of human impact.

From the perspective of the last 10,000 years, the twentieth century marks just one more episode of occupation in the canyon of Bonita Creek. Although human uses of Bonita Creek continue today, the episode of actual settlement by Hispanics and Anglos ended after less than a century, in part because the canyon lacked such amenities as schools, stores and electricity. It has been suggested that the puebloan occupation of the canyon ended, at least in part, for the same reason--that is, because of the canyon's isolation, relative to the standards of the day.

This latest period of use was apparently more intense than those that went before. That is, more people were probably involved, more acres were in cultivation, large numbers of livestock were imported into

the area, a greater variety of exotic and domesticated plants were introduced, and a more high-energy technology was brought to bear on the environment. It can be assumed that when the first Hispanic and Anglo settlers arrived in Bonita Canyon, they entered an environment only slightly impacted or changed by human occupation. The human alterations they might have observed would have included prehistoric cliff dwellings, cleared areas where Apache rancherías had been maintained, remnant fields from prehistoric and Apache farmsites, and trails incised by human use. Other human impacts would have been so subtle as to be hardly evident. The first Hispanic and Anglo settlers probably would not have noticed areas where agaves had been depleted by Apache mescal harvesting, or thickets of devils claw that had been casually cultivated by Apache farmers for basket making. The presence of temporary check dams for the retardation of flood waters in side creeks would similarly have left no imprint, although such check dams may have been responsible for such important impacts as the prevention of major erosion during the flood episodes that certainly occurred on a regular basis.

In general, environmental change along Bonita Creek has been more quantitative in nature than qualitative. As noted, though plant community distributions and relative compositions have undoubtedly shifted, no community types have been added or lost. Although the upper watershed has been, and continues to be, grazed heavily, there is little evidence of downcutting. From this limited perspective, the watershed is in "good" condition. Decades of intense grazing of the upper watershed around the turn of the century failed to cause large-scale erosion or to "destroy" the grassland of Ash Flat. This is fortunate, because it spared the entrenched watershed from the effects of major flows carrying a high sediment load. Most encouraging for the future condition of the canyon environment is the lack of large dams in the upper watershed--thus, the major floods that have had such a major impact on the canyon environment can be expected to continue. Also, many of the changes that have occurred were temporary in nature. For example, the signs of the clearing of land for agriculture and of the grazing of cattle on the floodplain of Bonita Creek can probably be erased with proper management. On the other hand, the loss of top soil constitutes a more permanent change in the environment of Bonita creek. It may require a major cycle of deposition to replace the sediments that have been lost.

Among the significant disturbances that are apparent today in lower Bonita Creek is the road that runs up the canyon, crossing from one terrace to another. If old routes are considered, there is hardly a terrace that is not crossed by this road. There is, in addition, a new road built into the canyon at the former Toppy Johnson ranch, which must be considered one of the major, undesirable, recent disturbances to the canyon.

The condition of the Bonita Creek Watershed should be considered in relation to that of other drainages in the region. In particular, Aravaipa and Eagle creeks have been subject to more mining, farming, and road building than Bonita Creek. Both drainages also have wider floodplains than Bonita Creek, making them more attractive to settlement. By comparison, the floodplain of Bonita Creek is too small and probably too erratic for the development of any significant agriculture, the land is too rugged and of limited value for livestock grazing, wildlife resources are too limited for significant long-term exploitation, and mineral resources are of limited value.

FUTURE STUDIES

The authors wish to suggest areas that require further study and that could not be adequately addressed within the scope of the present study. (1) Available dendroclimatic and dendrohydrological reconstructions of past conditions apply only indirectly to the Bonita Creek Watershed. There is, however, some potential for additional data from studies of the Gila watershed in general and Bonita Creek in particular that might be undertaken. Dendroclimatic and dendrohydrological studies in the Bonita Creek area would answer many of the questions concerning climate change in the area which this report has not been able to address. (2) Dendrochronological studies would also give indications of Bonita Creek's fire history. The questions concerning the incidence of natural lightning-caused fires and/or the incidence of fires started by Apaches on Ash Flat and on Turtle Mountain could be partly answered by dendrochronological research. Detailed examination of tree stumps on Turtle Mountain would give a fuller history of fuelwood cutting in that area and would answer many question concerning the invasion of junipers. The documentation of large juniper stumps cut during the last century, particularly at lower elevations, would give a clearer history of the

former distribution of juniper and might assist in settling the debate over juniper invasion or juniper reoccupation of former territory in Turtle Mountain and many other similar areas. (3) A full inventory of the archaeological resources in the Bonita Creek area should be undertaken. Planned excavations in Pueblo Devol may provide useful data on the environment that was available to the "cliff dwellers" of Bonita Creek. (4) An inventory of former goat corrals on Turtle Mountain would assist in differentiating between the impacts of goats and cattle. (5) A complete study of the hydrological resources of Bonita Creek would resolve the discrepancies between the two major understandings of the source of Bonita Creek's water.

Table 3. Time Table of Human Events Affecting Bonita Creek

1700	Settlement of Apaches in area north of Gila River.
1821	Mexican independence from Spain.
1826	James Ohio Pattie and party of trappers descend Gila River.
1846	Lieutenant Emory descends Gila River with General Kearny's Army of the West during the War with Mexico.
1848	Treaty of Guadalupe Hidalgo, US acquires territory north of Gila River from Mexico.
1854	Gadsden Purchase, US acquires territory south of Gila River from Mexico.
1859	Camp Grant on San Pedro established.
1864	Camp Goodwin on the Gila River established.
1869	Fort Apache established as an agency for White Mountain and Cibicue Apache.
1869	Publication of J. Ross Browne's Report on the Mineral Resources West of the Rocky Mountains.
1869	Establishment of Board of Indian Commissioners.
1870	War Department creates Department of Arizona and Southern California.
1871	April: Camp Grant Massacre occurs.
1871	June: General George Crook arrives in Arizona.
1872	San Carlos Reservation established for Southern Tonto and San Carlos Apache.
1872	George H. Stevens made agent at Camp Grant Reservation.
1872	Camp Verde Reservation established for Southern and Northern Tonto Apache.
1873	Aravaipa and Pinaleño bands resettled at San Carlos Reservation.
1873	Wheeler Survey party travels down Gila River, preliminary survey of Bonita Creek area.
1873	Charles Lesinsky trespasses on Apache reservation and begins political manipulation to have lands removed.
1873	First removal of San Carlos Reservation land (subsequent removals made during the years 1874, 1877, 1893, 1896, 1902).
1874	August: John Clum appointed agent at San Carlos.

1875	Concentration of Apache from Camp Verde at San Carlos.
1875	Concentration of Cibecue and White Mountain Apache at San Carlos.
1875	Introduction of first permanent herds of breeding cattle in Gila River Valley.
1876	Establishment of Fort Thomas.
1876	January: Distribution of 4,000 sheep at San Carlos.
1876	John Clum obtains return of Geronimo's band from Ojo Caliente Reservation.
1876	George H. Stevens and Francisca Stevens settle on Eagle Creek.
1876-86	Campaigns against Chiricahua Apache.
1877	Warm Springs Apache flee San Carlos Reservation.
1877	San Carlos Indians allowed passes to return to former planting grounds on Fort Apache Reservation.
1878	George H. Stevens license as trader at San Carlos revoked.
1881	Cibecue uprising.
1882	General George Crook reassigned to the Department of Arizona.
1882	Apache attack on Stevens sheep ranch.
1883	First survey of the southern boundary of White Mountain and San Carlos Apache Reservation (one reservation at the time); subsequent surveys in 1915-1916 and partial surveys in 1919 and 1934.
1883	Through the rationing system, 700 head breeding cattle distributed to San Carlos Indians.
1883	Colonel Joseph H. Hampson purchases the Stevens ranch and starts the Double Circle Ranch.
1885	May: Outbreak from San Carlos by Geronimo's band.
1886	End of formal hostilities between the Apache and US government.
1889	Chiricahua Cattle Company obtains first informal right to graze cattle on the San Carlos Reservation (lease continues until 1934).
1892	Killing of Albert Bellmeyer and William Gordonier of William Church's Turtle Cattle Company in Bellmeyer Saddle.
1895	First formal issuance of grazing leases to non-Indian ranchers.
1896	First formal homestead issued in Bonita Creek area to Elias Tidwell.
1899	US Army leaves duty at the San Carlos Reservation.

1900	Beginning of migration of White Mountain and Cibecue Apaches back to former homes.
1911	American Game Protective and Propagation Association established.
1914	Predatory Animal and Rodent Control division of Biological Survey established.
1923	Arizona Game Protective Association established.
1927	Farmland on Gila River and near old San Carlos River condemned for construction of Coolidge Dam.
1929	Completion of Coolidge Dam.
1934	Indian Reorganization Act of 1934.
1934	Termination of all non-Indian cattle grazing leases on San Carlos Reservation.
1936	January 17: San Carlos Apache Tribe adopts a Constitution and Bylaws.
1938	Last non-Indian cattle leave the San Carlos Reservation.
1938	June 23: San Carlos Tribal Council adopts ordinance establishing nine voluntary livestock associations.
1938	Safford Water Company collection galleries and system installed in Bonita Creek.
1942	Eleven livestock associations present on the reservation.
1951	Second phase of construction Safford Water Company collection galleries in Bonita Creek.
1954	Constitution and by-laws of San Carlos Indian Tribe adopted.

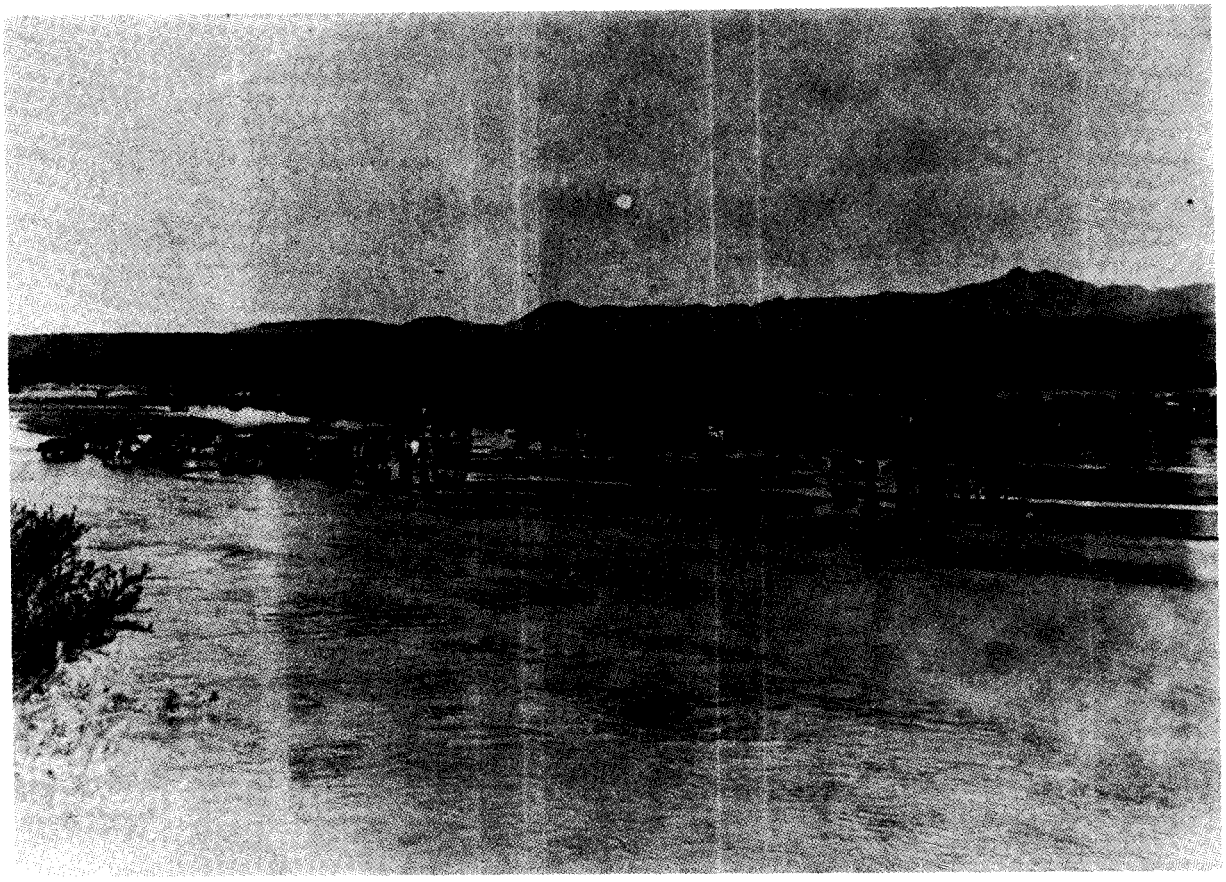


Photo 1. Chiricahua Cattle Co., herd crossing the Gila River, 1909, photo by Dane Coolidge (Arizona Historical Society)

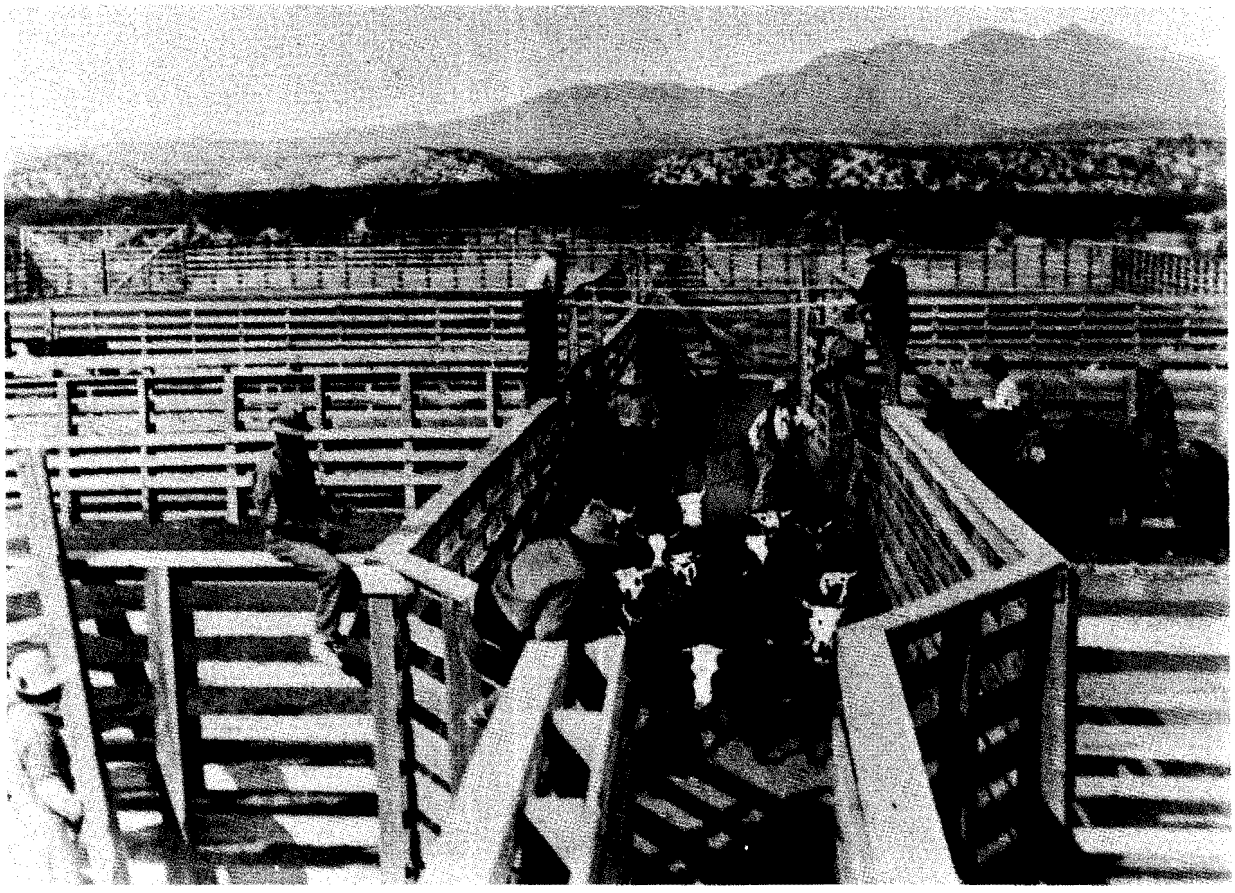


Photo 2. Cattle corrals and loading pens, San Carlos Apache Reservation, 1911, photo by Dane Coolidge (Arizona Historical Society).

Photo 3. Chiricahua Cattle Co., pack horses, San Carlos Apache Reservation, 1911, (Arizona Historical Society).

Photo 4. Chiricahua Cattle Co., branding on the San Carlos Apache Reservation, 1911, photo by Dane Coolidge (Arizona Historical Society).

Photo 5. Chiricahua Cattle Co., branding on San Carlos Apache Reservation, 1911, photo by Dane Coolidge, (Arizona Historical Society).

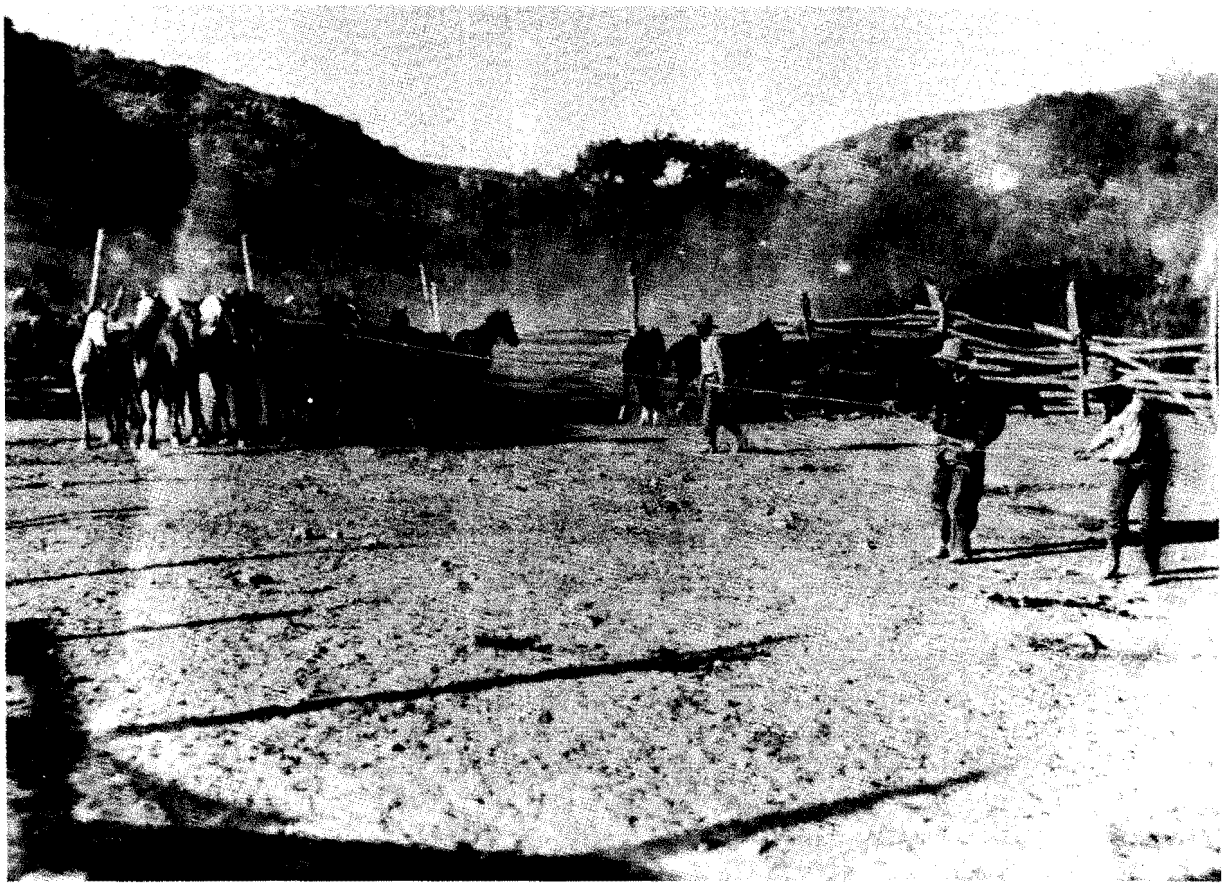


Photo 6. Chiricahua Cattle Co., horse herd in corral, San Carlos Apache Reservation, 1911, photo by Dane Coolidge (Arizona Historical Society).

Photo 7. Chiricahua Cattle Co., Dad Hardiman, Hal Young, and ?, San Carlos Apache Reservation, 1911, photo by Dane Coolidge (Arizona Historical Society).

Photo 8. Chiricahua Cattle Co., Freman and ?, San Carlos Apache Reservation, 1911, photo Dane Coolidge (Arizona Historical Society).

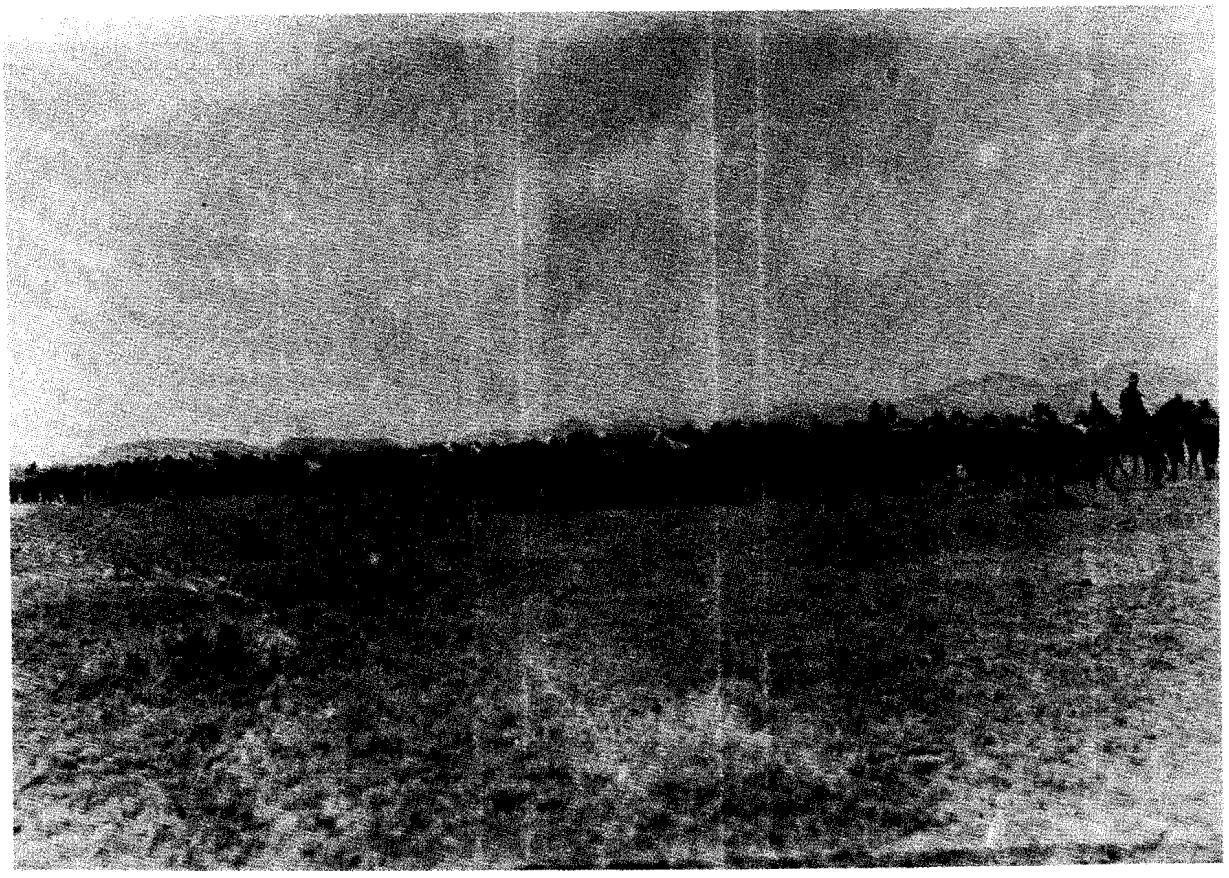


Photo 9. Chiricahua Cattle Co., horse herd, Blue River, San Carlos Apache Reservation, 1911, photo by Dane Coolidge (Arizona Historical Society).

Photo 10. Chiricahua Cattle Co., rope corral, San Carlos Apache Reservation, 1911, photo by Dane Coolidge (Arizona Historical Society).

Photo 11. Chiricahua Cattle Co., horse herd in Gila River (note lack of down cutting) 1911, photo by Dane Coolidge (Arizona Historical Society).

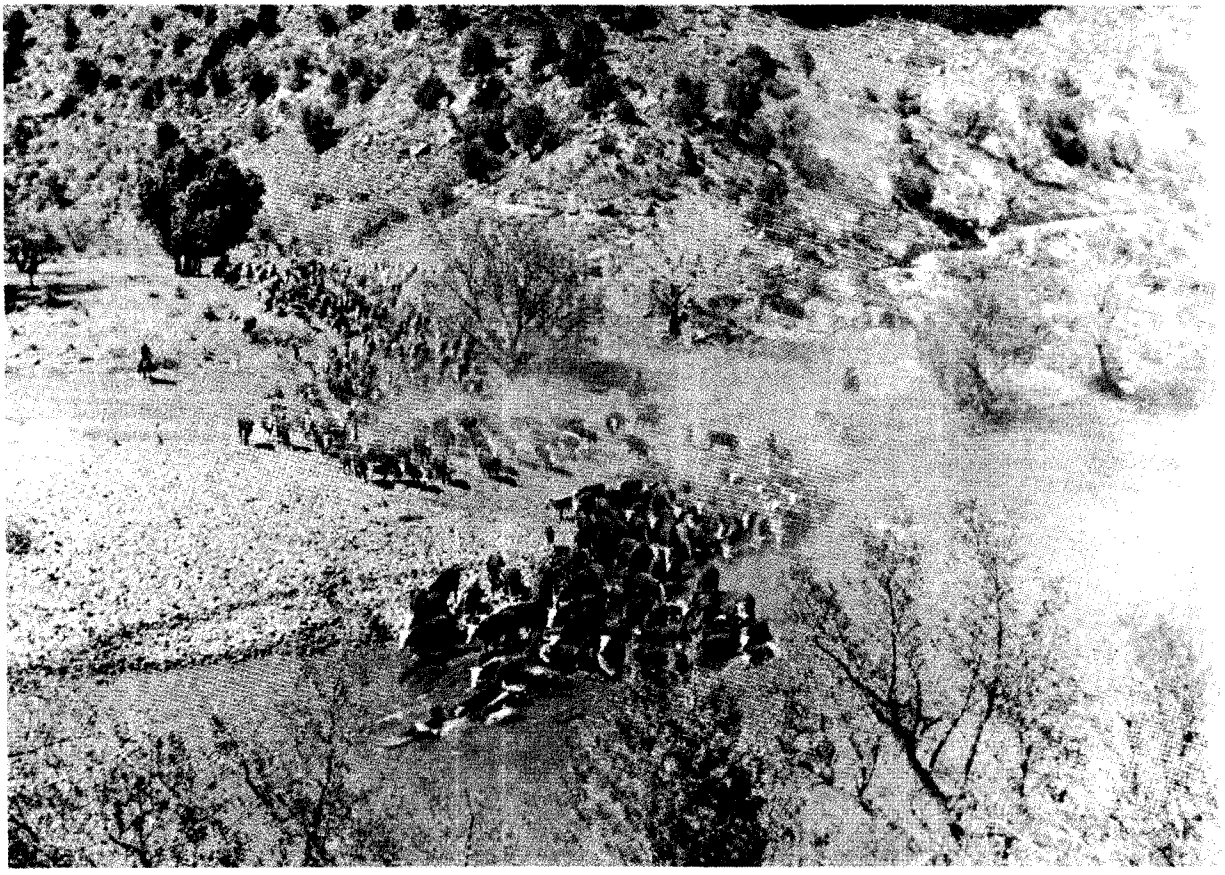


Photo 12. Watering the herd in the Gila River, n.d. (Arizona Historical Society).

Photo 13. Bonita Creek, looking north, 1960s (courtesy Kennedy Curtis).

Photo 14. "Colored" George's cabin in Johnny Creek, constructed 1933-34, photographed 1960 (courtesy Kennedy Curtis).

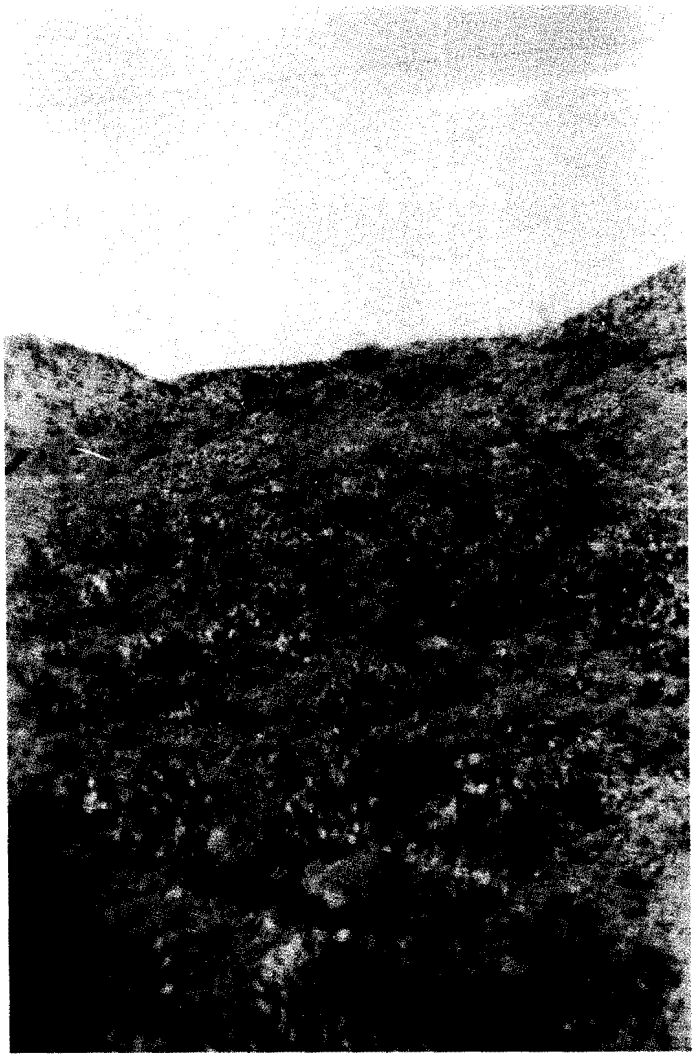


Photo 15. North facing slope near West Ranch, 1960s (courtesy Kennedy Curtis).

Photo 16. The West Ranch, ca. 1960 (courtesy Kennedy Curtis).

Photo 17. Wash by West Ranch home, ca. 1960.

Photo 18. Original buildings, West Ranch (courtesy Kennedy Curtis).

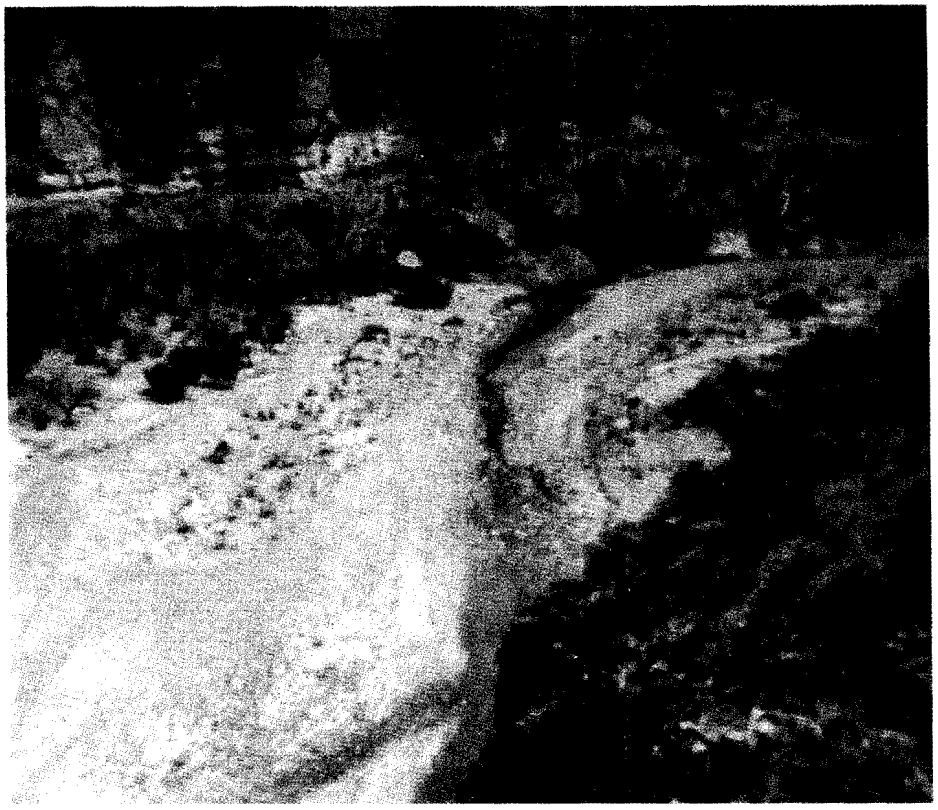


Photo 19. Bonita Creek, "The Narrows," ca. 1960 (courtesy Kennedy Curtis).

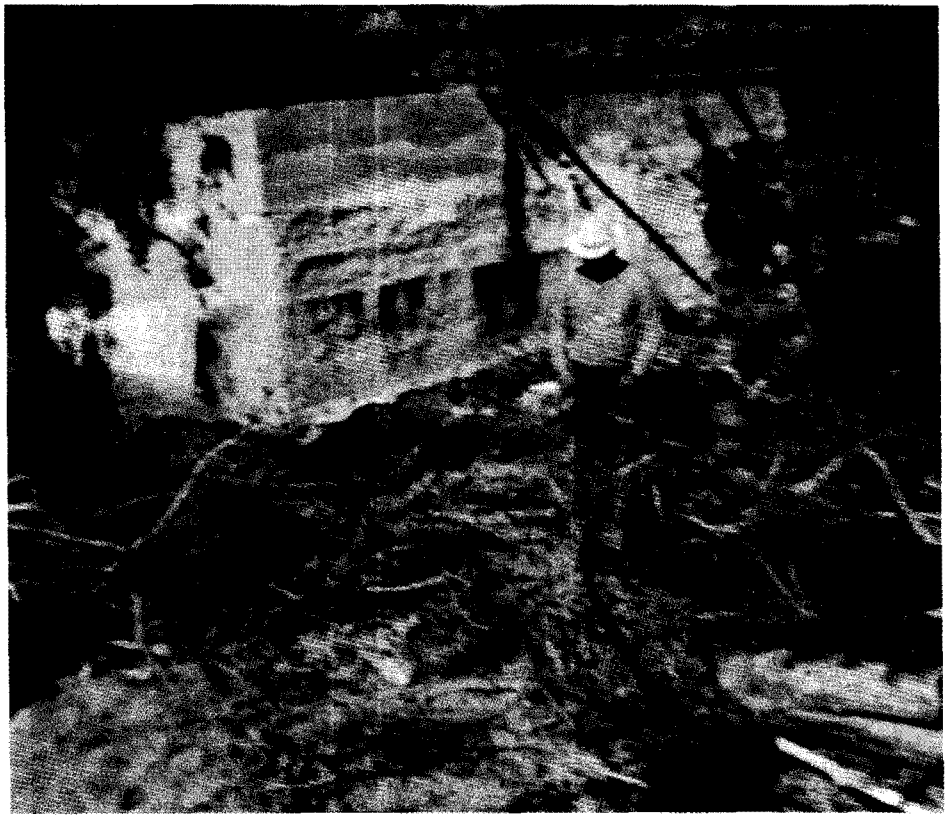


Photo 20. Aftermath of flood in Bonita Creek, 1967 (courtesy Kennedy Curtis).

Photo 21. Aftermath of flood in Bonita Creek, 1967 (courtesy Kennedy Curtis).

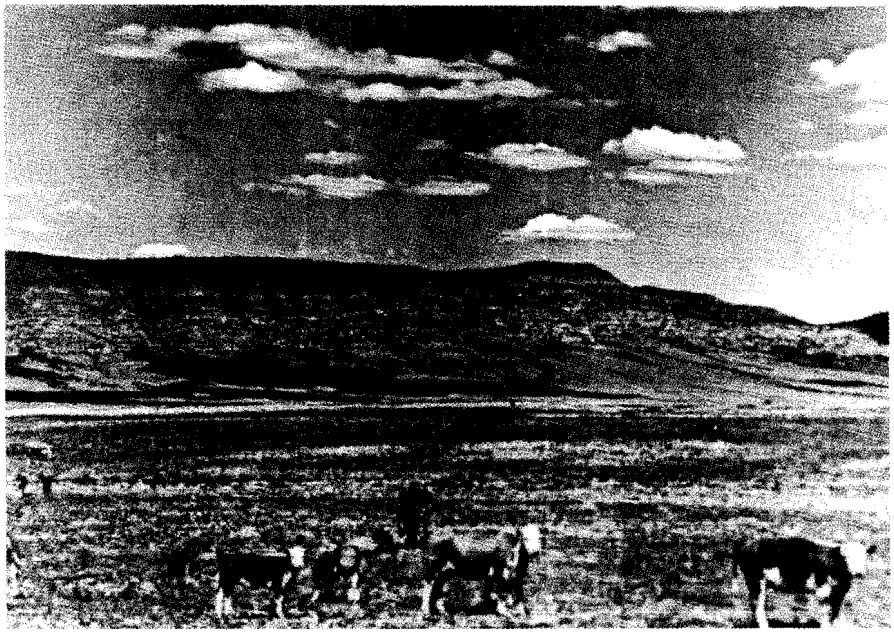


Photo 22. Cattle on Ash Flat, early 1940s (courtesy John Lasley).

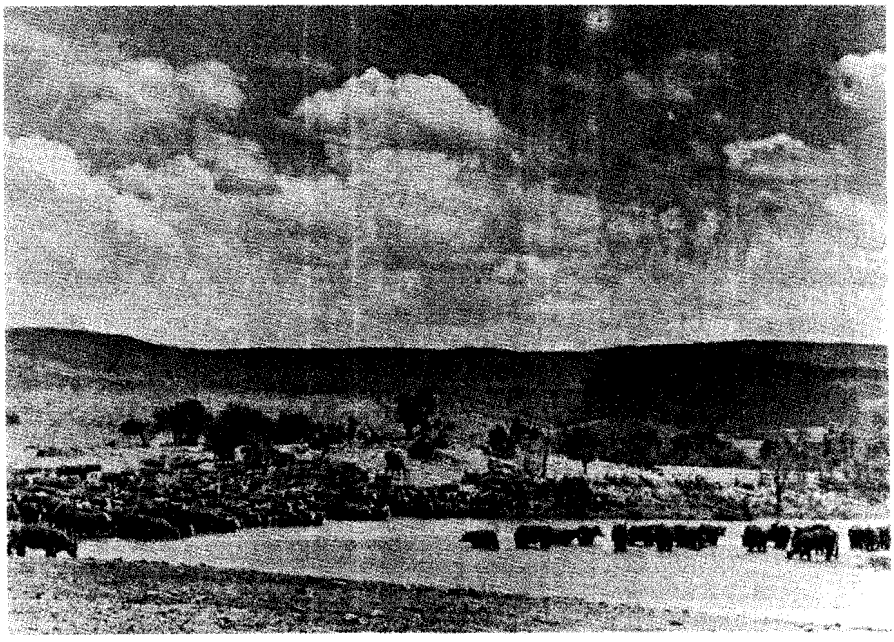


Photo 23. Cattle near tank on Ash Flat, early 1940s (courtesy John Lasley).

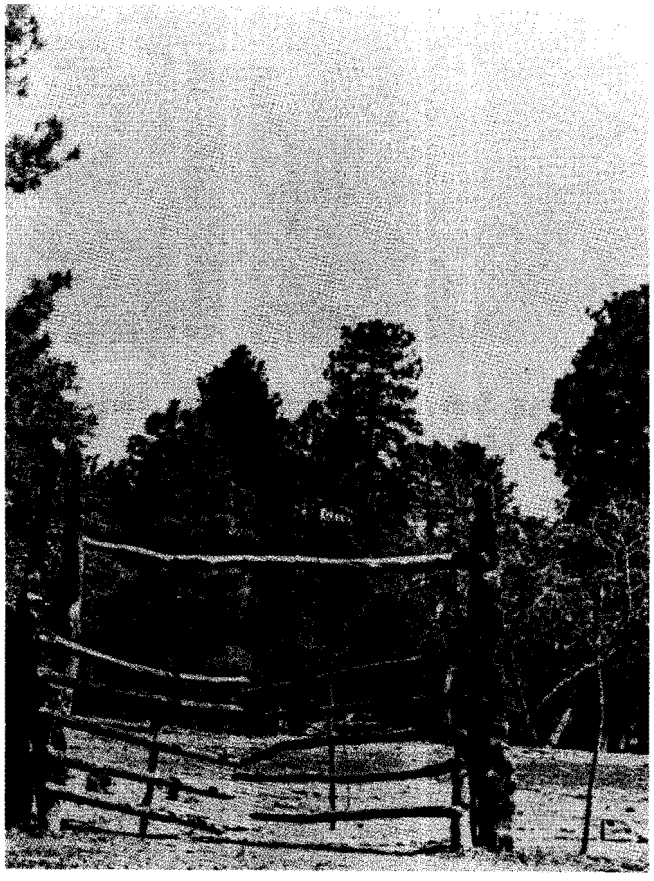


Photo 24. Wild cattle trap on Slaughter Mountain Unit, early 1940s (courtesy John Lasley).

Photo 25. Apache cowboys, San Carlos Reservation, early 1940s (courtesy John Lasley).

Photo 26. House at Turner West Ranch, John West in door (courtesy Velma West).

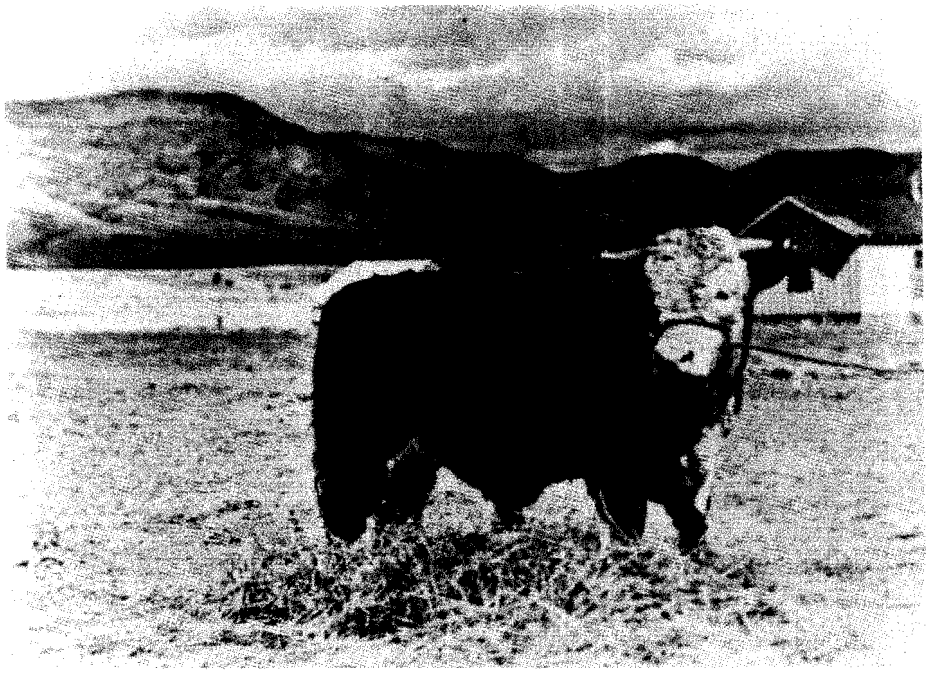


Photo 27. Prize winning registered bull, Ash Flat headquarters in background, early 1940s (courtesy John Lasley).

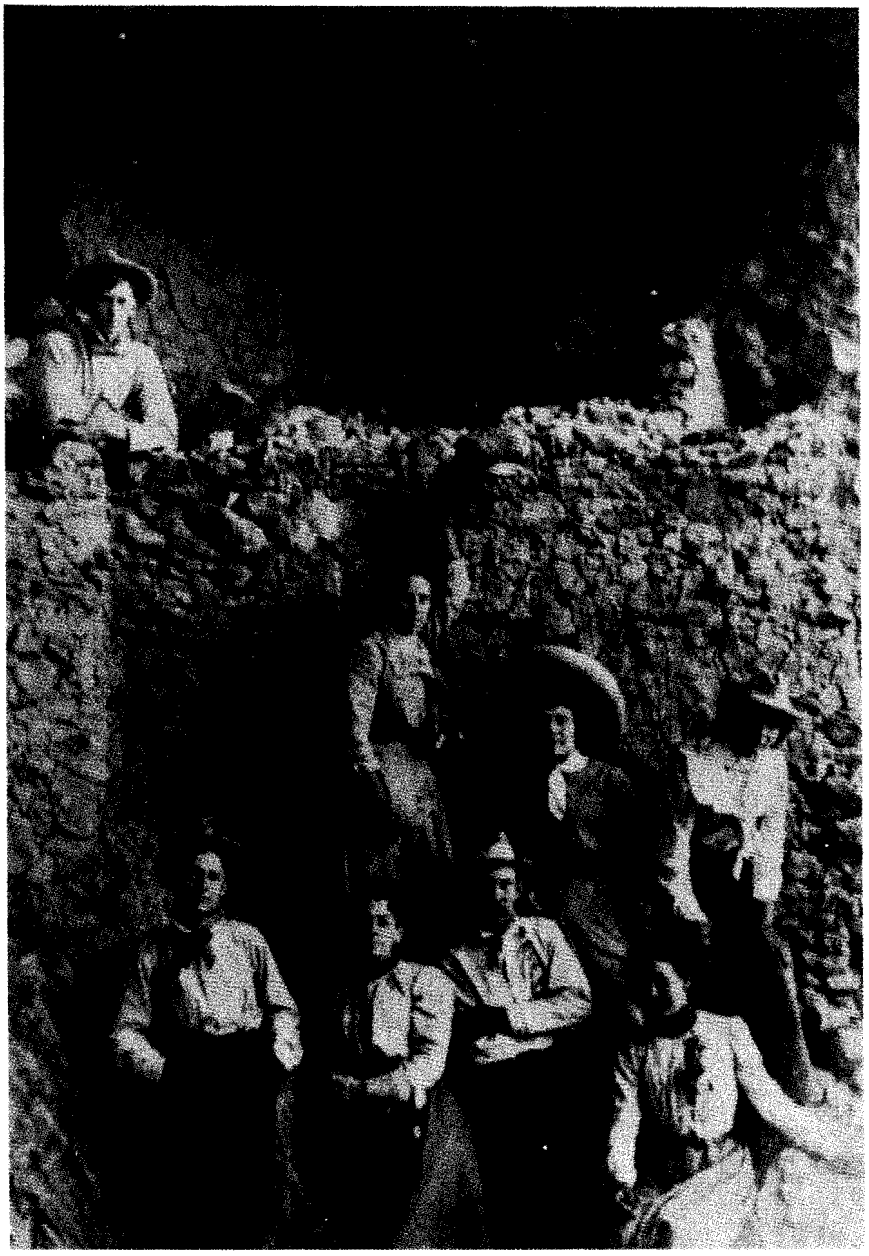


Photo 28. Early Safford residents at an outing at "Pueblo Deval" ruins along Bonita Creek. The names of many prominent residents of Graham County can still be seen on the ruin along with much graffiti dating from the nineteenth century.

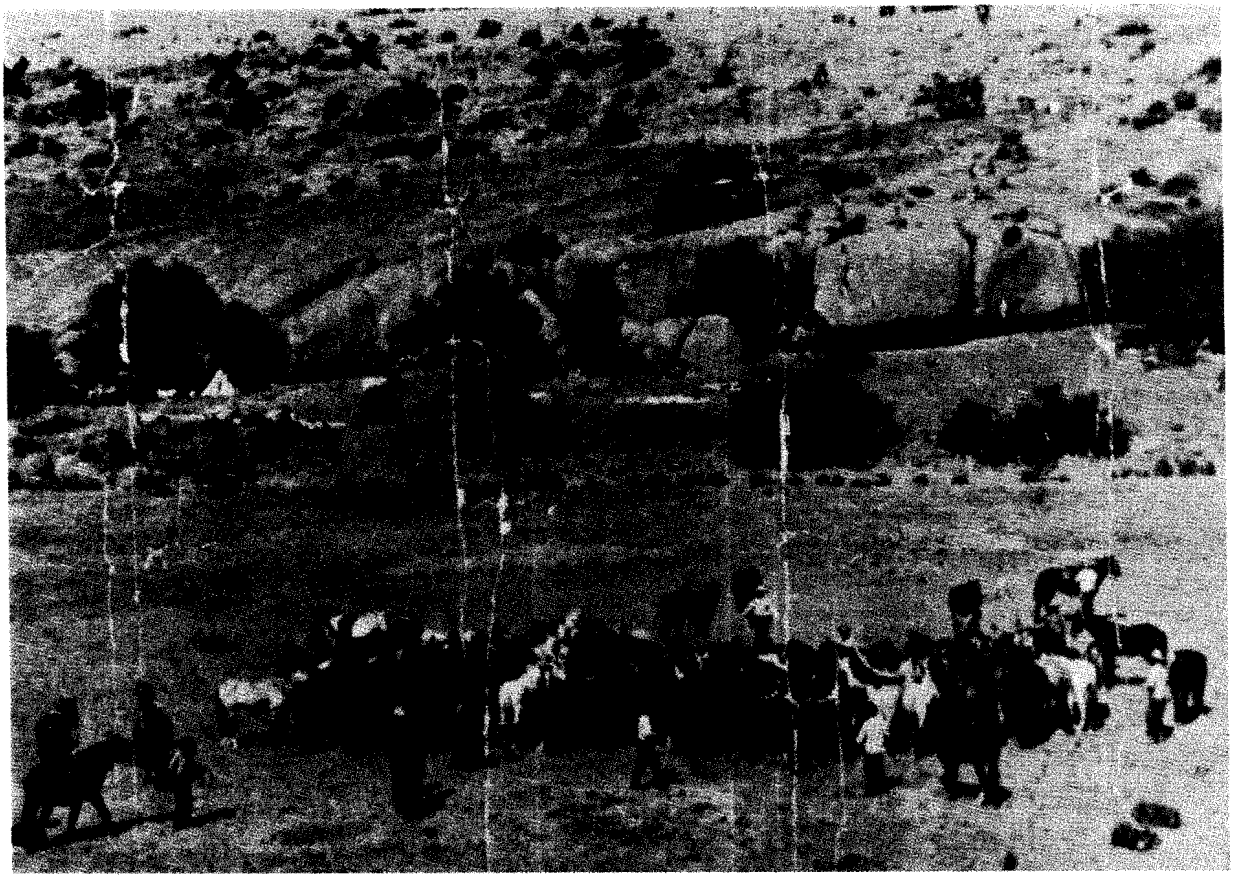


Photo 29. Chiricahua Cattle Company gathering horse herd on San Carlos Reservation in the Slaughter Mountain Unit. Xs at top left mark site where three cowboys were killed by Apaches, 1890s (courtesy Graham County Historical Society).

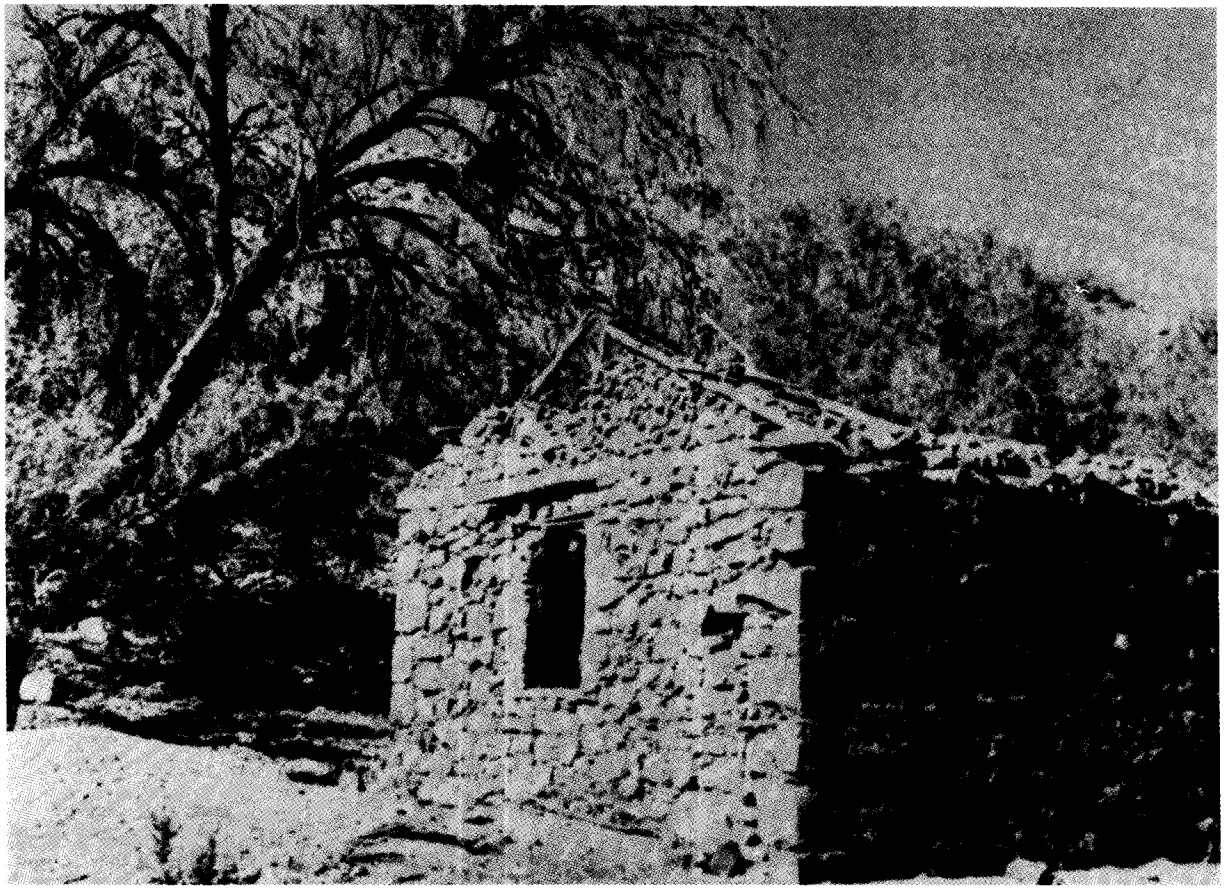


Photo 30. Serna stone cabin at mouth of Bonita Creek prior to restoration (courtesy Graham County Historical Society).

Photo 31. Cottonwoods in Bonita Creek (courtesy Graham County Historical Society).

Photo 32. Mouth of Bonita Creek and view of Gila River, 1919 (photo by Frank Olmstead for the Gila River Flood Control Survey).

Photo 33. Stone house at Toppy Johnson ranch. The man standing in light colored hat is Toppy Johnson. Horseman is Henry West, son of Turner West, 1930s (courtesy of Velma West).

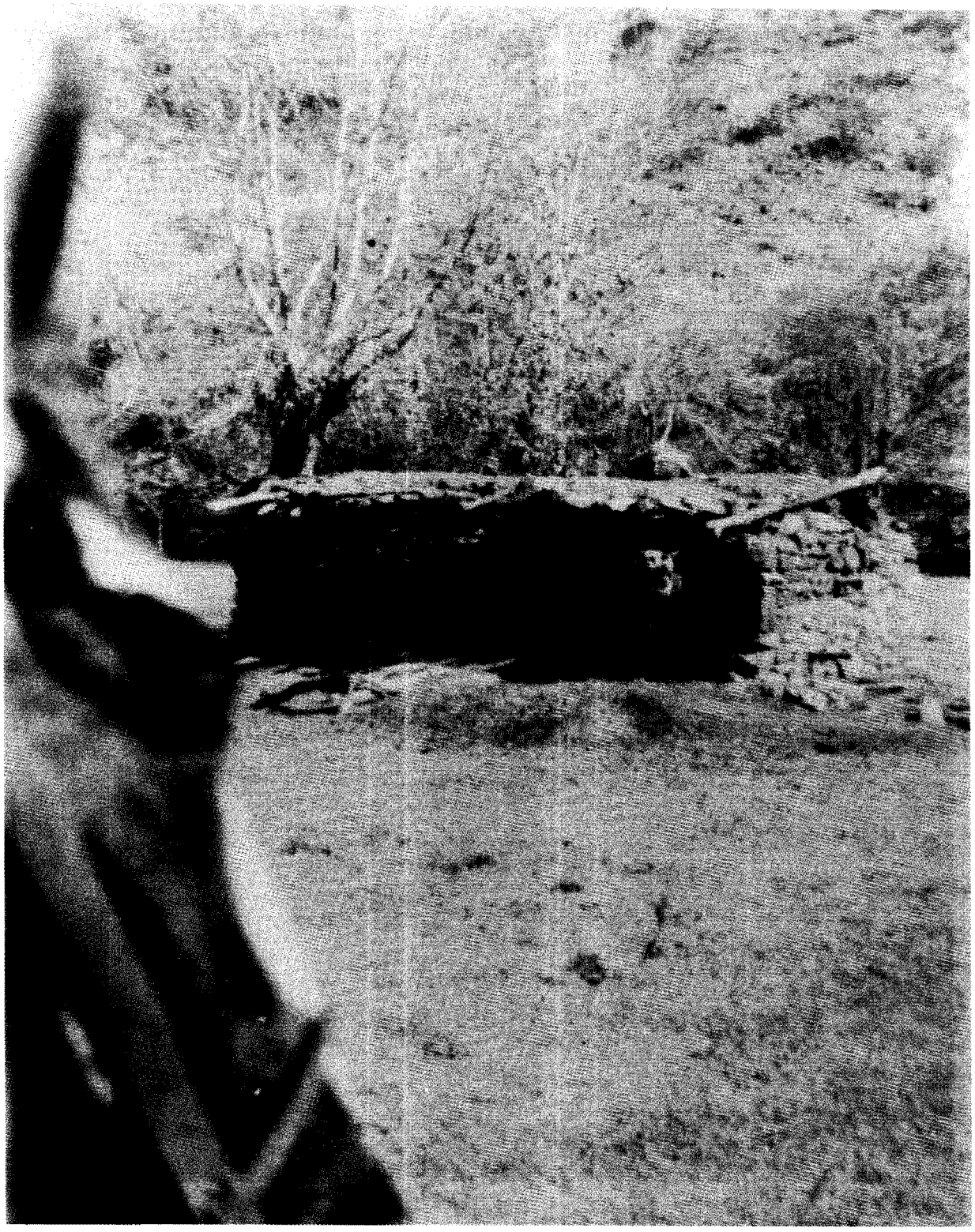


Photo 34. Outbuilding at Toppy Johnson ranch, 1930s (courtesy of Velma West).

Photo 35. Allen Turner West, seated, and Henry West, standing, 1930s (courtesy Velma West).

Photo 36. Corral at West ranch with the original barns, 1930s (courtesy Velma West).

Photo 37. Confluence of Bonita Creek and Gila River during the 1940s (courtesy Jesse H. Baker).

Photo 38. Baker home at Bianes-Chacon homesite during the 1930s (courtesy Jesse H. Baker).

Photo 39. Original tufa stone house, probably constructed by Angel Bianes at Bianes-Chacon-Baker homesite during the 1930s; house was destroyed by flooding during 1940s (courtesy Jesse H. Baker).

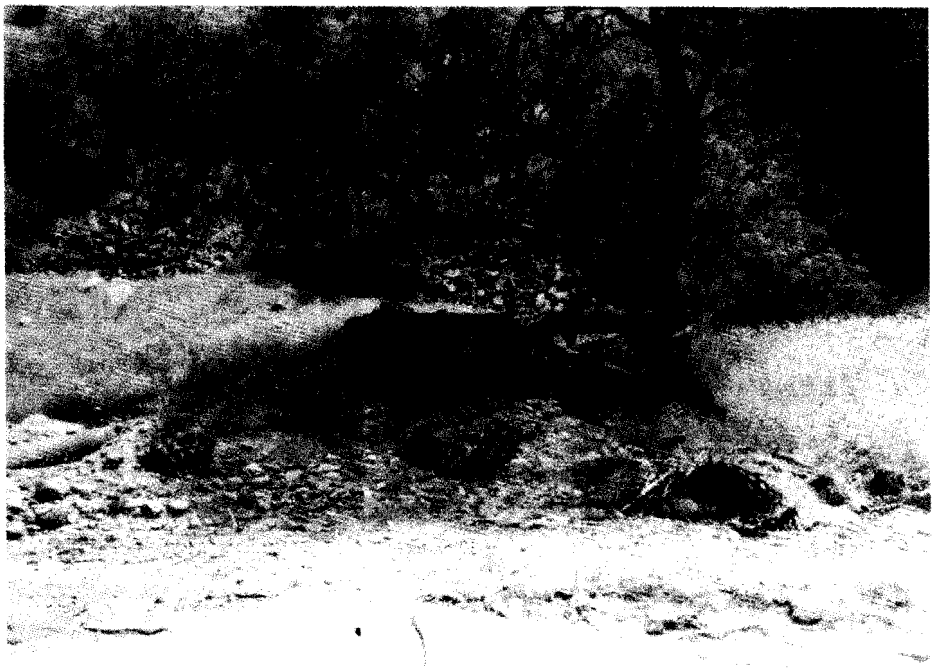


Photo 40. Remains of first retention dams installed by Safford Water Company during first phase of construction in 1938 (photo by Diana Hadley 1992).

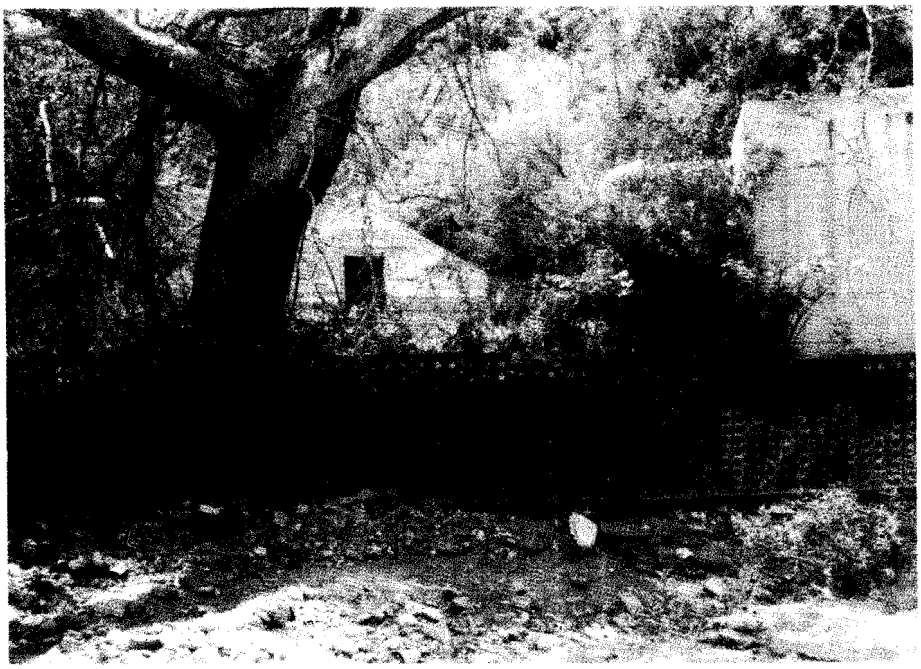


Photo 41. Portions of 1938 Safford Water Company retention dam being used as fencing (photo by Diana Hadley 1992).

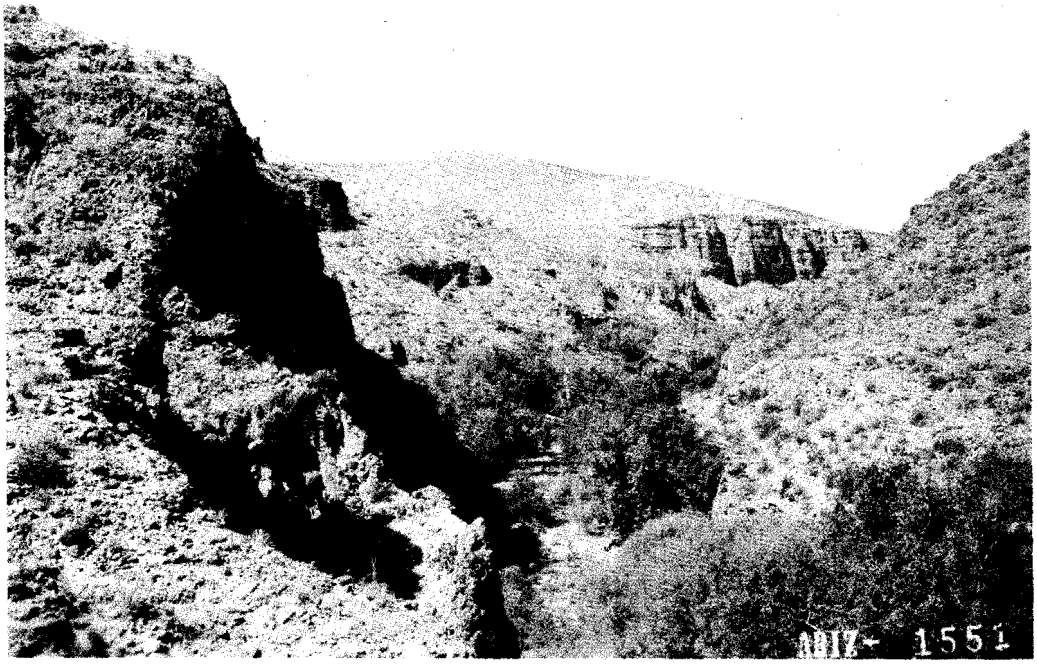


Photo 42. "Dam Site #25. Looking upstream." October 3, 1935 (ARIZ-1551; photo in possession of BLM).

Photo 43. "Bonita Creek Dam Site #25. Man standing at heel of dam." October 3, 1935 (ARIZ-1554; photo by O'Neil, in possession of BLM).

Photo 44. "Bonita Creek Dam Site #25. Panorama showing dam site. View 1 of 2-view panorama." October 3, 1935 (ARIZ-1555; photo by O'Neil, in possession of BLM).

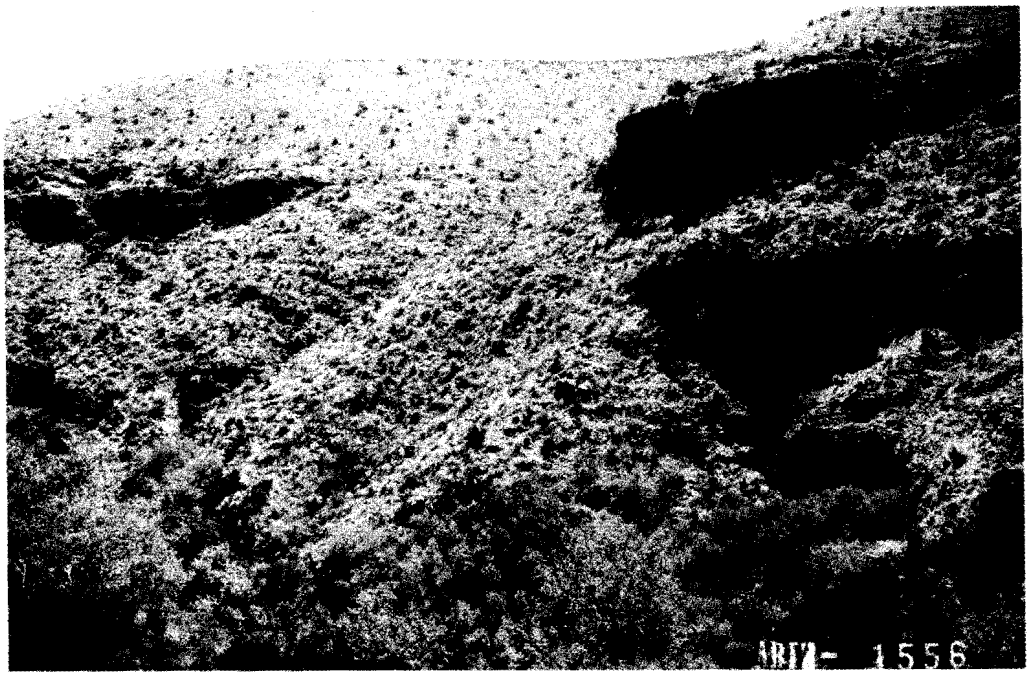


Photo 45. "Bonita Creek Dam Site #25. Panorama showing dam site. View 2 of 2-view panorama." October 3, 1935 (ARIZ-1556; photo by O'Neil, in possession of BLM).

Photo 46. "Bonita Creek Dam Site #25. Gravel in creek bed above dam site; also showing a view of reservoir." October 3, 1935 (ARIZ-1557; photo by O'Neal, in possession of BLM).

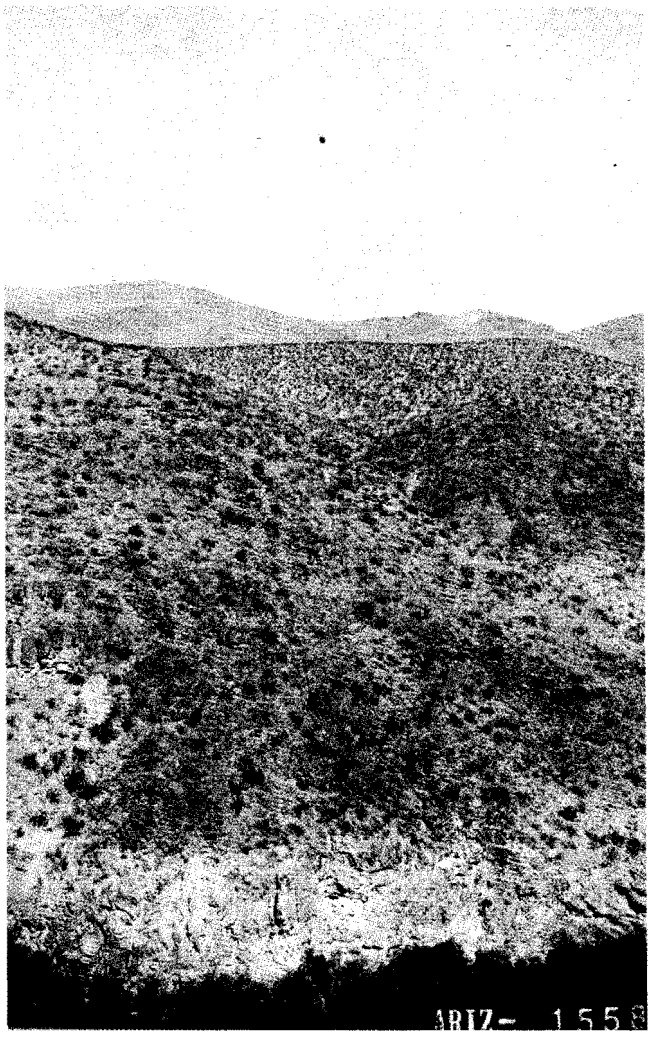


Photo 47. "Bonita Creek Dam Site #25. No. 1 of a 5-view panorama." View into canyon from above, October 3, 1935 (ARIZ-1558; photo by O'Neal, in possession of BLM).

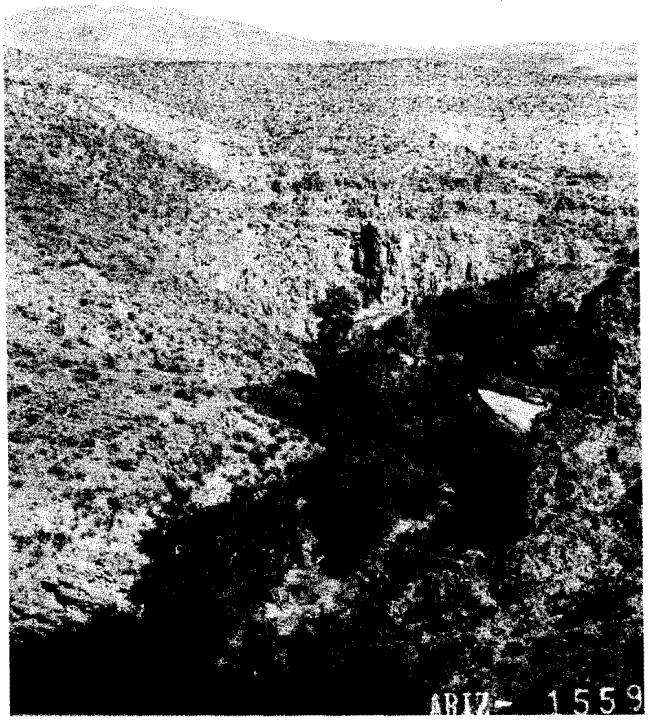


Photo 48. "Bonita Creek Dam Site #25. No. 2 of a 5-view panorama." View into canyon from above, October 3, 1935 (ARIZ-1559; photo by O'Neal, in possession of BLM).

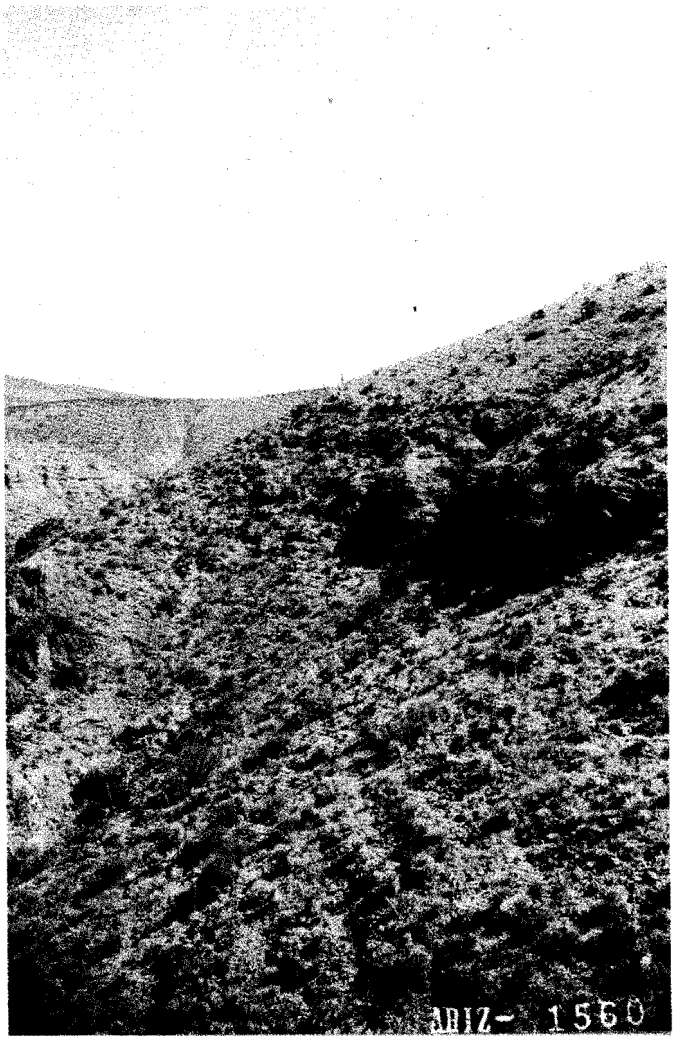


Photo 49. "Bonita Creek Dam Site #25. No. 3 of a 5-view panorama." View into canyon from above, October 3, 1935 (ARIZ-1560; photo by O'Neal, in possession of BLM).

Photo 50. "Bonita Creek Dam Site #25. No. 4 of a 5-view panorama." View into canyon from above, October 3, 1935 (ARIZ-1561; photo by O'Neal, in possession of BLM).

Photo 51. "Bonita Creek Dam Site #25. No. 5 of a 5-view panorama." View into canyon from above, October 3, 1935 (ARIZ-1562; photo by O'Neal, in possession of BLM).

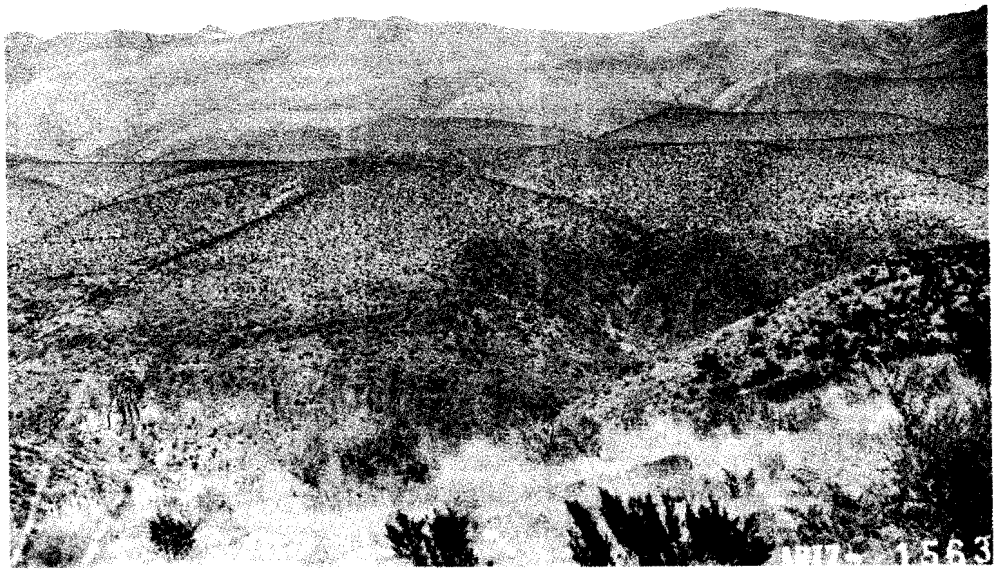


Photo 52. "Bonita Creek Dam Site #25. No. 1 of a 3-view panorama." View across canyon from above, October 3, 1935 (ARIZ-1563; photo by O'Neal, in possession of BLM).

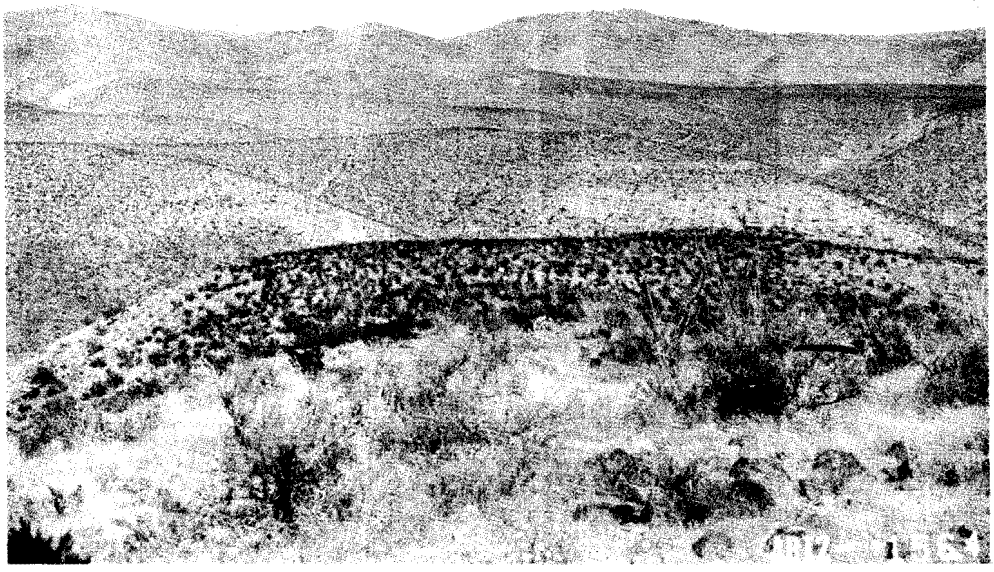


Photo 53. "Bonita Creek Dam Site #25. No. 2 of a 3-view panorama." View across canyon from above, October 3, 1935 (ARIZ-1564; photo by O'Neal, in possession of BLM).

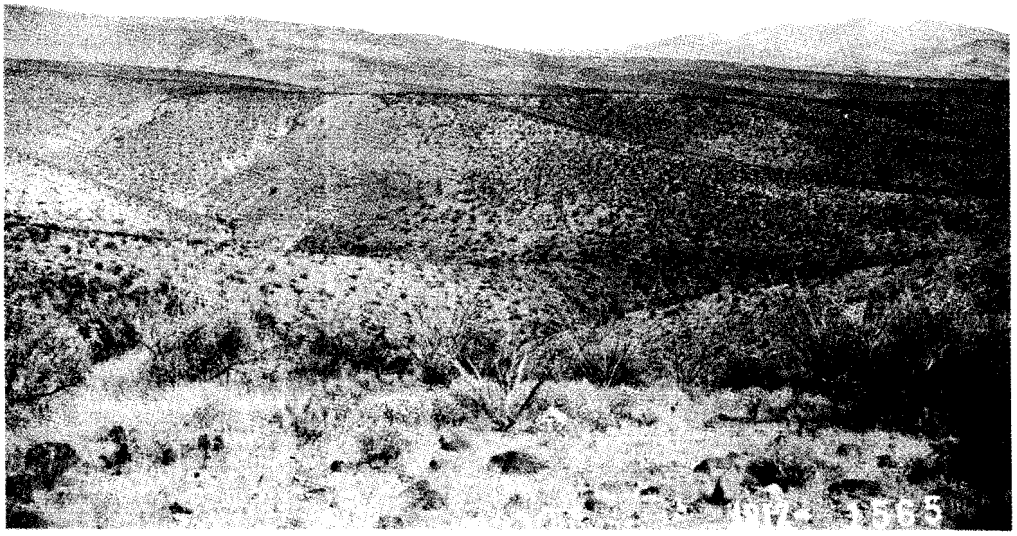


Photo 54. "Bonita Creek Dam Site #25. No. 3 of a 3-view panorama." View across canyon from above, October 3, 1935 (ARIZ-1565; photo by O'Neal, in possession of BLM).

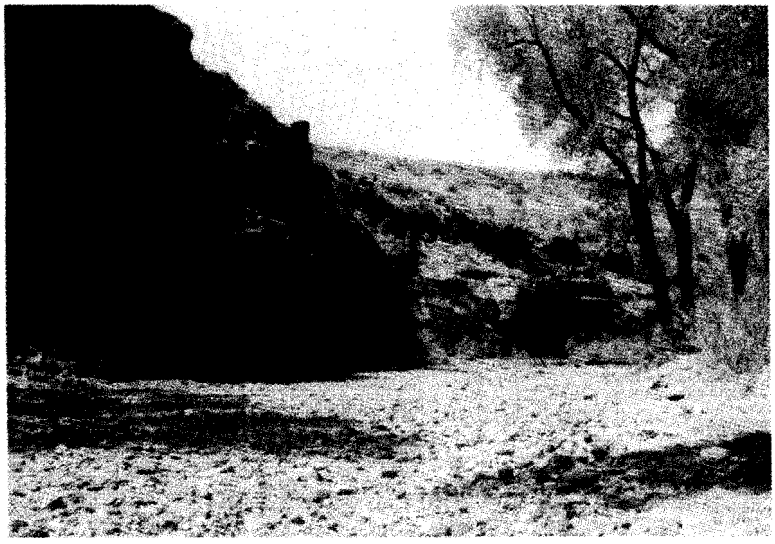


Photo 55. "Bonita Creek Picnic Area." October 1976 (Photo in possession of BLM).

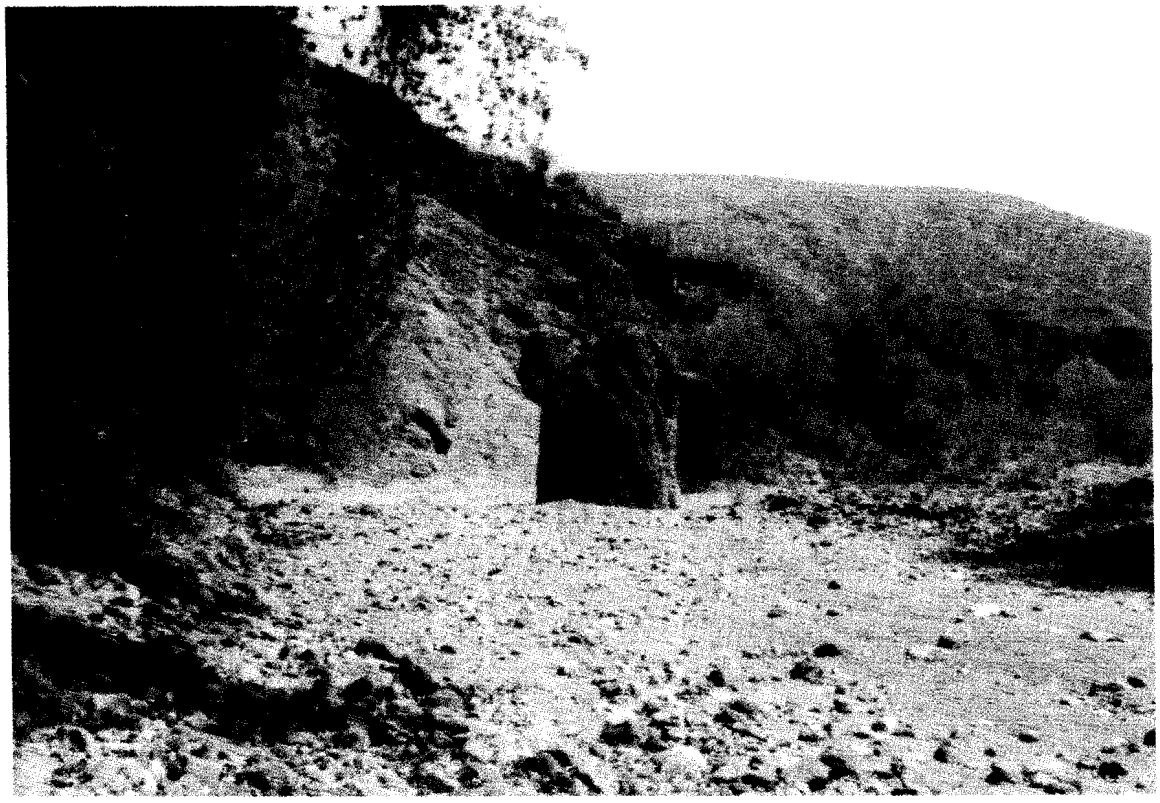


Photo 56. "Bonita Creek Picnic Area." October 1976 (Photo in possession of BLM).

BIBLIOGRAPHY

Aday, Larold
1991 Unrecorded Interview, San Carlos, Ariz. Notes on file with Diana Hadley.

Adams, E. Charles
1979 Cold Air Drainage and Length of Growing Season in the Hopi Mesas Area. *The Kiva* 44(4):285-296.

1983 The Architectural Analogue to Hopi Social Organization and Room Use, and Implications for Prehistoric Northern Southwestern Culture. *American Antiquity* 48(1):44-61.

Allen. J. A.
1895 *On A Collection of Mammals from Arizona and Mexico, Made by Mr. W. W. Price, with Field Notes by the Collector.* American Museum of Natural History, Bulletin 7. New York.

Anyon, Roger, Patricia A. Gilman and Steven A. LeBlanc
1981 A Reevaluation of the Mogollon-Mimbres Archaeological Sequence. *The Kiva* 46(4): 209-225.

Arizona Bureau of Mines
1969 *Mineral and Water Resources of Arizona.* The Arizona Bureau of Mines Bulletin 180. University of Arizona, Tucson.

Baker, Jesse H.
1991 Tape Recorded Interview, Safford, Ariz. On file with Bureau of Land Management, Safford, Ariz.

Bammann, Al
1992 Bureau of Land Management, Safford, Ariz. Personal Communication.

Barr, F. Remington
1940a A Chronicle of Early Operations of the Principal Original Companies: The Arizona Copper Company, Ltd. and the Detroit Copper Mining Company of Arizona. Unpublished ms., Ryder Ridgeway Collection, Department of Archives and Manuscripts, Arizona State University Library, Tempe.

1940b Integrated Results of Sixty Years Operation of Phelps Dodge - Morenci Branch. Unpublished ms., Ryder Ridgeway Collection, Department of Archives and Manuscripts, Arizona State University Library, Tempe.

Bartlett, John R.
1965 *Personal Narrative of Explorations and Incidents in Texas, New Mexico, California, Sonora and Chihuahua, Connected with the United States and Mexican Boundary Commission During the Years 1859, 1851, 1852, 1853.* Reprint 1854 ed. The Rio Grande Press, Inc., Chicago.

Basso, Keith H. (editor)
1971 *Western Apache Raiding and Warfare: From the Notes of Grenville Goodwin*. University of Arizona Press, Tucson.

1983 Western Apache. In *Southwest*, edited by Alfonso Ortiz, pp. 462-488. Handbook of North American Indians, Vol. 10. Smithsonian Institution, Washington.

Bateman, Richard
1986 *James Pattie's West, The Dream and the Reality*. University of Oklahoma Press, Norman.

Bieber, Ralph (editor)
1938 *Southern Trails to California*. Arthur H. Clark, Glendale.

Bingham, Sam
1991 The Restoration of Eagle Creek. Unpublished ms. for *Orion Magazine*.

Bronitsky, Gordon, and James D. Merritt
1986 *The Archaeology of Southeast Arizona: A Class I Cultural Resource Inventory*. Cultural Resource Series Monograph 2. Bureau of Land Management, Phoenix.

Brown, David E.
1982 Biotic Communities of the American Southwest - United States and Mexico. *Desert Plants* 4(1-4).

1985 *The Grizzly in the Southwest, Documentary of an Extinction*. University of Oklahoma Press, Norman.

Brown, David E., and Charles H. Lowe
1980 *Biotic Communities of the Southwest*. USDA Forest Service General Technical Report RM-78. Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colo.

Brown, Jeffrey L.
1974 Pueblo Viejo Salado Sites and Their Relationship to Western Pueblo Culture. *The Artifact* 12(2):1-53.

Browne, J. Ross
1950 *A Tour through Arizona or Adventures in the Apache Country, 1864*. Arizona Silhouettes, Tucson.

Bureau of Land Management
1990 Bonita Creek Watershed Ethnoecology Study, Safford District, Arizona. Solicitation No. AZ950-RFPO-05. Bureau of Land Management, Arizona State Office, Phoenix.

Burkham, D. E.
1970 *Precipitation, Streamflow, and Major Floods at Selected Sites in the Gila River Drainage Basin Above Coolidge Dam, Arizona*. Geological Survey Professional Paper 655-B. Government Printing Office, Washington.

Buskirk, Winifred
1986 *The Western Apache, Living on the Land Before 1950*. University of Oklahoma Press, Norman.

Cantou, Pierre
1991 Unrecorded Interview, Bureau of Indian Affairs, Phoenix. Notes on file with Diana Hadley.

Castetter, Edward F., Willis H. Bell, and Alvin R. Grove
1938 *The Early Utilization and the Distribution of Agave in the American Southwest.* Ethnobiological Studies in the American Southwest VI. The University of New Mexico Bulletin 335. University of New Mexico Press, Albuquerque.

Christensen, Vic
1992 Tape Recorded Interview, Phoenix. On file with Bureau of Land Management, Safford, Ariz.

Claridge, Lois
1991 Unrecorded Interview. Notes on file with Diana Hadley.

Clum, Woodworth
1936 *Apache Agent, the Story of John P. Clum.* Houghton Mifflin, Boston.

Clum, John P.
1929 The San Carlos Apache Police. *New Mexico Historical Review* 4(3)203-19.

1931 The Truth About the Apaches, told in the Annual Reports by John P. Clum, United States Indian Agent for the Apache Indians at San Carlos, Arizona.

Colquhoun, James
1924 *The History of the Clifton-Morenci Mining District.* John Murray, London.

Cozzens, S. W.
1875 *The Marvelous Country; or Three Years in Arizona and New Mexico.* Sampson Low, Marston, Low and Searle, London.

Cremony, John C.
1868 *Life among the Apaches.* A Roman, San Francisco.

Crosby, Alfred W.
1972 *The Columbian Exchange.* Cambridge University Press, Cambridge.

1986 *Ecological Imperialism, The Biological Expansion of Europe*, 700-1900. Cambridge University Press, Cambridge.

Cruse, Thomas
1941 *Apache Days and After.* Caxton Printers, Caldwell, Id.

Curtis, Kennedy
1991-1992 Tape Recorded Interview, Safford, Ariz. On file with Bureau of Land Management, Safford, Ariz.

Daringer, Clyde
1991 Tape Recorded Interview, Safford, Ariz. On file with Bureau of Land Management Safford, Ariz.

Davis, Britton
1929 *The Truth About Geronimo*. Yale University Press, New Haven.

Davis, Goode P.
1982 *Man and Wildlife in Arizona*. Arizona Game and Fish Department, Phoenix.

Dean, Jeffrey S.
1969 *Chronological Analysis of Tsegi Phase Sites in Northeastern Arizona*. Papers of the Laboratory of Tree-Ring Research No. 3. The University of Arizona Press, Tucson.

Dean, Jeffrey S., and William J. Robinson
1977 *Dendroclimatic Variability in the American Southwest: A.D. 680 to 1970*. Report to the National Park Service. Laboratory of Tree-Ring Research, University of Arizona, Tucson.

Debo, Angie
1976 *Geronimo, the Man, His Time, His Place*. University of Oklahoma Press, Norman.

Department of the Interior
1945 San Carlos Indian Reservation, Arizona. Map. Department of the Interior, Office of Indian Affairs.

DeWall, Alfred A.
1981 *Soil Survey of Gila-Duncan Area, Arizona, Parts of Graham and Greenlee Counties*. U.S.D.A. Soil Conservation Service, U.S.D.I. Bureau of Land Management, and Arizona Agricultural Experiment Station.

Dobyns, Henry F.
1981 *From Fire to Flood, Historic Human Destruction of Sonoran Desert Riverine Oasis*. Ballena Press, Socorro, N.M.

Donaldson, Bruce R., and John R. Welch
1991 Western Apache Dwellings and Their Archaeological Correlates. Western Apache Archaeology Project, Contribution 1. In *Mogollon V*, edited by Patrick Beckett. COAS, Las Cruces.

Doyel, David E.
1984 From Foraging to Farming: An Overview of the Preclassic in the Tucson Basin. *The Kiva* 49(3-4):147-165.

Earven, Cowboy
1991, 1992 Tape Recorded Interview, Safford, Ariz. On file with Bureau of Land Management, Safford, Ariz.

Earven, James
1992 Tape Recorded Interview, Safford, Ariz. On file with Bureau of Land Management, Safford, Ariz.

Eccleston, Robert
1950 *Overland to California on the Southwestern Trail, 1849*. Edited by George P. Hammond and Edward H. Howes. University of California Press, Berkeley and Los Angeles.

Eddy, Frank W., and Maurice E. Cooley
1983 *Cultural and Environmental History of Cienega Valley, Southeastern Arizona*. Anthropological Papers of the University of Arizona No. 43. University of Arizona Press, Tucson.

Ellsworth, George S.
1987 *Samuel Claridge, Pioneering the Outposts of Zion*. Privately published, Logan, Utah.

Emory, William H.
1848 *Notes of A Military Reconnaissance, from Fort Leavenworth, in Missouri, to San Diego, in California*. 30th Congress, 1st Sess., House Ex. Doc. No. 41. Wendell and Van Benthuysen, Washington.

Etter, Patricia A.
1991 The 1849 Diary of Stanislaus Lasselle. Edited by Patricia A. Etter. *The Overland Journal* 9(2):3-33.

Euler, R. Thomas, and Michael H. Bartlett
1989 *A Class III Archaeological Survey of the Sanchez Copper Project Area, Graham County, Arizona*. Submitted to Bureau of Land Management, Safford. SWCA, Inc. Environmental Consultants, Tucson.

Fanta, John
1991 Unrecorded Interview, San Carlos, Ariz. Notes on file with Diana Hadley.

Fish, Suzanne K.
1989 From the Avra Valley to the Picacho Mountains: A Comparative Assessment of Hohokam Subsistence based on the Pollen Record. In *Hohokam Archaeology along Phase B of the Tucson Aqueduct, Central Arizona Project*, Vol.1, Part 1, *Syntheses and Interpretations*, edited by Jon S. Czaplicki and John C. Ravesloot, pp. 239-252. Arizona State Museum Archaeological Series No. 178. University of Arizona, Tucson.

Flannery, Kent V.
1976 Empirical Determination of Site Catchments in Oaxaca and Tehuacan. In *The Early Mesoamerican Village*, edited by Kent V. Flannery, pp. 103-117. Academic Press, New York.

Fong, Lawrence M.
1980 Sojourners and Settlers. In "The Chinese Experience in Arizona and Northern Mexico." *Journal of Arizona History* 21(3):1-30.

Fratt, Lee
1991 Ground Stone in Arizona. In *Making and Using Stone Artifacts: A Context for Evaluating Lithic Sites in Arizona*, by Mark C. Slaughter, Lee Fratt, Kirk Anderson, and Richard V. N. Ahlstrom, pp. 16-25. SWCA Archaeological Report No. 91-8. SWCA, Inc., Environmental Consultants, Tucson.

Garcia, Ernie
1991 Unrecorded Interview, Safford, Ariz. Notes on file with Author, Diana Hadley.

George, Margaret A. "Suzy"
1991 Tape Recorded Interview, Duncan, Ariz. On file with Bureau of Land Management, Safford, Ariz.

Getty, Harry T.

1958 Development of the San Carlos Apache Cattle Industry. *The Kiva* 23(3):1-4.

1963 *The San Carlos Indian Cattle Industry*. Anthropological Papers of the University of Arizona No. 7. University of Arizona Press, Tucson.

1964 Changes in Land Use among the Western Apache. In *Indian and Spanish American Adjustments to Arid and Semiarid Environments*, edited by Clark S. Knowlton. The Committee on Desert and Arid Zone Research, Contribution 7.

Gifford, James C.

1980 *Archaeological Explorations in Caves of the Point of Pines Region, Arizona*. Anthropological Papers of the University of Arizona No. 36. The University of Arizona Press, Tucson.

Gilbert, G. K.

1873 *Report on the Geology of Portions of New Mexico and Arizona*. Survey of Lands West of the Mississippi River, Part V. US Corps of Topographical Engineers.

Gillespie, William B.

1989 Faunal Remains from Four Sites along the Tucson Aqueduct: Prehistoric Exploitation of Jack Rabbits and Other Vertebrates in the Avra Valley. In *Hohokam Archaeology along Phase B of the Tucson Aqueduct, Central Arizona Project,* Vol. 1, Part 1, *Syntheses and Interpretations*, edited by Jon S. Czaplicki and John C. Ravesloot, pp. 171-237. Arizona State Museum Archaeological Series No. 178. University of Arizona, Tucson.

Goodwin, Grenville

1937 *Report on the San Carlos Indian Reservation*. United States Department of the Interior, Office of Indian Affairs, File 8962, 1943, San Carlos, 042. Washington.

1942 *The Social Organization of the Western Apache*. University of Chicago Press, Chicago.

Graham County Historical Society

1973 *Salute to the Kearny Command, October 27, 1846 - October 27, 1973*. Souvenir Edition, Graham County Historical Society, October 27, 1973.

Graybill, Donald A.

1989 The Reconstruction of Prehistoric Salt River Streamflow. In *The 1982-1984 Excavations at Las Colinas*, Vol. 5, *Environment and Subsistence*, pp. 25-38. Arizona State Museum Archaeological Series No. 162. University of Arizona, Tucson.

Graybill, Donald A., and Fred L. Nials

1989 Aspects of Climate, Streamflow, and Geomorphology Affecting Irrigation Systems in The Salt River Valley. In *The 1982-1984 Excavations at Las Colinas*, Vol. 5, *Environment and Subsistence*, pp. 5-23. Arizona State Museum Archaeological Series No. 162. University of Arizona, Tucson.

Green, Robert B.

1955 *On the Arkansas Route to California in 1849, The Journal of Robert B. Green of Lewisburg, Pennsylvania*, edited by J. Orin Oliphant. Bucknell University Press, Lewisburg, Penn.

Griffin, P. Bion, Mark P. Leone, and Keith H. Basso
1971 Western Apache Ecology: From Horticulture to Agriculture. In *Apachean Culture History and Ethnology*, edited by Keith H. Basso and Morris E. Opler, pp. 7-27. Anthropological Papers of the University of Arizona No. 21. University of Arizona Press, Tucson.

Hack, John T.
1942 *The Changing Physical Environment of the Hopi Indians of Arizona*. Papers of the Peabody Museum of American Archaeology and Ethnology, Vol. 35, No. 1. Cambridge.

Hadley, Diana, Peter Warshall, and Don Bufkin
1991 *Environmental Change in Aravaipa, 1870-1970: An Ethnoecological Survey*. Cultural Resources Series, Number 7. Bureau of Land Management, Phoenix.

Harris, Benjamin Butler
1984 *The Gila Trail, The Texas Argonauts and the California Gold Rush*, edited by Richard H. Dillon. University of Oklahoma Press, Norman.

Hastings, James R., and Raymond H. Turner
1965 *The Changing Mile*. The University of Arizona Press, Tucson.

Haynes, C. Vance, Jr.
1981 Geochronology and Paleoenvironments of the Murray Springs Clovis Site, Arizona. *National Geographic Society Research Reports* 13:243-251. Washington.

Heindl, L. A., and R. A. McCullough
1961 *Geology and the Availability of Water in the Lower Bonita Creek Area, Graham County, Arizona*. Geological Survey Water-Supply Paper 1589. Government Printing Office, Washington.

Henrie, Manetta
1960 Descendants of John Doyle Lee, 1912-1877. Provo, Utah.

Huckell, Bruce B.
1984 The Paleo-Indian and Archaic Occupation of the Tucson Basin: An Overview. *The Kiva* 49(3-4):133-145.

Hunter, William C.
1987 *Changes in Riparian Vegetation and Subsequent Changes in Avifauna in a Cattle-Excluded Portion of Lower Bonita Creek, Graham County, Arizona*. Submitted to the Bureau of Land Management, Safford District. Center for Environmental Studies, Arizona State University, Tempe.

Irion, Mrs. Robert
1877 Diary of a Trip from the Huerfano Valley, Colorado to the Silver King Mine, Arizona Territory. Ms., Huntington Library, San Marino, Calif.

Jackson, W. Turrentine
1942 *Wagon Roads West: A Study of Federal Road Surveys and Construction in the Trans-Mississippi West, 1846-1869*. University of California Press, Berkeley.

Johnson, Alfred E., and William W. Wasley
1966 Archaeological Excavations near Bylas, Arizona. *The Kiva* 31(4):205-253.

Kessell, John L.
1976 *Friars, Soldiers, and Reformers, Hispanic Arizona and the Sonora Mission Frontier, 1767-86.* University of Arizona Press, Tucson.

LaFleche, Flora Sanchez
1992 Tape Recorded Interview. On file with Bureau of Land Management, Safford, Ariz.

Lasley, John F.
1988 Ma-Koshe-Non-Ton. Unpublished Ms., Columbia, Mo.

Lee, Emma
1986 Letter to Larry Shifflet. 1/14/1986. Personal collection of Larry Shiflet.

Lee, Ted
1991 Tape Recorded Interview, Safford, Ariz. On file with Bureau of Land Management, Safford, Ariz.

Lines, Ruskin
1991 Tape Recorded Interview, Safford, Ariz. On file with Bureau of Land Management, Safford, Ariz.

Lowe, Oscar
1873 *Report upon Mineralogical, Agricultural, and Chemical Conditions Observed in Portions of Colorado, New Mexico, and Arizona*. Survey of Lands West of the Mississippi River, Part VI. US Army Corps of Engineers. Government Printing Office, Washington. 1875.

Mallery, J.C. and J.W. Ward
1876 New Map of the Territory of Arizona, Southern California and Parts of
1877 Nevada, Utah, and Sonora. Britton, Rey, and Co., San Francisco.

Marion, J. H.
1965 *Notes of Travel through the Territory of Arizona, an Account of the Trip by George Stoneman in the Autumn of 1870*, edited by D. M. Powell. University of Arizona Press, Tucson.

Martin, R. J., and W. A. Mattice (editors)
1930 *Climatic Summary of the United States*. US Department of Agriculture and Weather Bureau.

Mattice, Warner and Jane
1991 Tape Recorded Interview, Pima, Ariz. On file with Bureau of Land Management, Safford, Ariz.

McCray, Ernest R.
1941 The San Carlos Apache is a Modern Cattleman. *American Cattle Producer* 23:5-8.

Melendrez, Ramon, and Marcaria Bianes
1991 Tape Recorded Interview, Buena Vista, Ariz. On file with Bureau of Land Management, Safford, Ariz.

Melendrez, Ramon and Reg
1992 Tape Recorded Interview, Bonita Creek, Ariz. On file with Bureau of Land Management, Safford, Ariz.

Minckley, W. L., M. R. Sommerfield, and others
1979 *Resource Inventory for the Gila River Complex, Eastern Arizona.* Submitted to Bureau of Land Management, Safford, Ariz. Arizona State University, Tempe.

Minnis, Paul E.
1981 *Economic and Organizational Responses to Food Stress by Nonstratified Societies: An Example from Prehistoric New Mexico.* Unpublished Ph.D. Dissertation, Department of Anthropology, University of Michigan, Ann Arbor.

Minnis, Paul E., and Stephen E. Plog
1976 A Study of the Site Specific Distribution of *Agave Parryi* in East Central Arizona. *The Kiva* 41(3-4):299-308.

Mount Graham Profiles
1989 *Ryder Ridgway Collection*, Vol. 2. The Graham County Historical Society, Safford, Ariz.

Myrick, David F.
1980 *Railroads of Arizona*, Vol. 2. Howell North Books, San Diego.

Nelson, Ben A., and Steven A. LeBlanc
1986 *Short-Term Sedentism in the American Southwest: The Mimbres Valley Salado.* Maxwell Museum of Anthropology and University of New Mexico Press, Albuquerque.

Nials, Fred L., David A. Gregory, and Donald A. Graybill
1989 Salt River Streamflow and Hohokam Irrigation Systems. In *The 1982-1984 Excavations at Las Colinas*, Vol 5, *Environment and Subsistence*, pp. 59-76. Arizona State Museum Archaeological Series No. 162. University of Arizona, Tucson.

Officer, James
1987 *Hispanic Arizona, 1536-1856.* University of Arizona Press, Tucson.

Ogle, Ralph H.
1940 *Federal Control of the Western Apaches, 1848-1886.* University of New Mexico Press, Albuquerque.

Olmstead, Frank H.
1919 *A Report on Flood Control of the Gila River in Graham County, Arizona.* 65th Cong., 3rd Sess., Senate Doc. 436. Government Printing Office, Washington.

Opler, Morris E. (editor)
1973 *Grenville Goodwin among the Western Apache, Letters from the Field.* University of Arizona Press, Tucson.

Parker, Brigadier General James
1929 *The Old Army, Memories.* Dorrance and Co., Philadelphia.

Pattie, James O.
1988 *Personal Narrative of James Ohio Pattie.* Edited by Richard Batman. Mountain Press Publishing, Missoula.

Quaife Milo M. (editor)
1930 *The Personal Narrative of James Ohio Pattie of Kentucky.* Lakeside Press, Chicago.

Quinn, Frank
1991-1992 Unrecorded Interview, Safford, Ariz. Notes on file with Diana Hadley.

Ramenofsky, Elizabeth L.
1984 *From Charcoal to Banking, The I.E. Solomons of Arizona*. Westernlore Press, Tucson.

Reynolds, Stephen J.
1988 *Geologic Map of Arizona*. Map 26. Arizona Geological Survey, [Phoenix].

Richins, Clark
1991 Unrecorded Interview, San Carlos, Ariz. Notes on file with Diana Hadley.

Ridgeway, William R.
1969 Sanchez Name Spices Graham County History. *The Journal of Graham County History* 5(1).

Ringgold, Jennie P.
1952 *Frontier Days in the Southwest*. The Naylor Co., San Antonio.

Robert, Henry M.
1869 Military Map of Arizona. Engineers Office, Military Division of the Pacific, San Francisco.

Rogers, Garry F., Harold E. Malde, and Raymond M. Turner
1984 *Bibliography of Repeat Photography for Evaluating Landscape Change*. University of Utah Press, Salt Lake City.

Rucks, Mike
1981 Riparian Inventory-Bonita Creek. Bureau of Land Management, Safford, Ariz.

Russell, Frank
n.d. San Carlos Indian Reservation, Arizona, An Industrial Survey. San Carlos Apache Tribe, San Carlos, Arizona.

1908 The Pima Indians. In *Twenty-Sixth Annual Report of the Bureau of American Ethnology, 1904-1905*, pp. 3-389. Washington.

Rustling, James F.
1874 *Across America: Or, The Great West and Pacific Coast*. Sheldon & Co., New York.

Sayles, E. B.
1983 *The Cochise Cultural Sequence in Southeastern Arizona*. Anthropological Papers of the University of Arizona No. 43. University of Arizona Press, Tucson.

Sayles, E. B., and Ernest Antevs
1941 *The Cochise Culture*. Medallion Papers No. 29. Gila Pueblo, Globe, Ariz.

Schmidt, Martin F. (editor)
1960 *General George Crook: His Autobiography*. University of Oklahoma Press, Norman.

Sellers, W. D., and R. H. Hill
1974 *Arizona Climate*. University of Arizona Press, Tucson.

Seymour, Gregory R., and Alice M. Sinkovec
1992 *Of Bulls, Bears, and Fireflies: Historic Bonita Creek, An Archaeological Perspective, Graham County, Arizona.* Submitted to Bureau of Land Management, Safford, Ariz.

Shiflet, Larry
n.d. *Bellmeyer Saddle*. Ms. for Graham County Historical Society, Safford, Ariz.

n.d. *The Bonita Tragedy, A Horrible Example of Inhumanity*. Unpublished Ms., in possession of author.

Shiflet, Larry
1991 Unrecorded Interview, Bonita Creek, Ariz. Notes on file with Author, Diana Hadley.

Silvey, W., R. K. Sorenson, and J. N. Rinne
n.d. *Compendium of the Drainage Systems in Arizona -- A Computer Compatible Digital Identification of Perennial Lotic Waters*. Unpublished report, Arizona Game and Fish Department.

Slaughter, Mark C.
1991 Flaked Stone in Arizona. In *Making and Using Stone Artifacts: A Context for Evaluating Lithic Sites in Arizona*, by Mark C. Slaughter, Lee Fratt, Kirk Anderson, and Richard V. N. Ahlstrom, pp. 4-15. SWCA Archaeological Report No. 91-8. SWCA, Inc., Environmental Consultants, Tucson.

Slavens, Brig. Gen T.H., Ret.
n.d. San Carlos, Arizona, in the Eighties.

Smith, H. V.
1945 *The Climate of Arizona.* University of Arizona Experiment Station Bulletin 197. Tucson.

Smith, Dwight L.
1991 The Wheeler Survey in New Mexico and Arizona: Samuel E. Tillman's Tour of Duty in 1873. *New Mexico Historical Review* 66(3):303-326.

Soil Conservation Service
1938 *Range Management Plan for the San Carlos Apache Reservation*. Soil Conservation Service.

Sparks, William
1926 *The Apache Kid, a Bear Fight and Other True Stories of the Old West*. Skelton Publishing, Los Angeles.

Squier, Mike
1991 Unrecorded Interview. Safford, Ariz. Water Department. Notes on file with Diana Hadley.

Stevens, Harold O.
1991 Tape Recorded Interview, Safford, Ariz. On file with Bureau of Land Management, Safford, Ariz.

Stevens, Sara
1992 Unrecorded Telephone Interview, Globe, Ariz. Notes on file with Diana Hadley.

Stoddard, Selma Lee
1992 Tape Recorded Interview, Safford, Ariz. On file with Safford Bureau of Land Management Office, Safford, Ariz.

SWCA, Inc.
1985 *Wildlife and Fishery Studies, Upper Gila Water Supply Project*, Part 2, *Fisheries*. Submitted to Bureau of Reclamation, Boulder City, Nevada. SWCA, Inc., Flagstaff.

Szuter, Christine R., and Frank E. Bayham
1989 Sedentism and Animal Procurement among the Desert Horticulturalists of the North American Southwest. In *Farmers and Hunters: The Implications of Sedentism*, edited by Susan Kent, pp. 80-95. Cambridge University Press, Cambridge.

Thrapp, Dan L.
1967 *The Conquest of Apachería*. University of Oklahoma Press, Norman.

1972 *General Crook and the Sierra Madre Adventure*. University of Oklahoma Press, Norman.

1974 *Victorio and the Mimbres Apaches*. University of Oklahoma Press, Norman.

Trott, J. James, and Michael Taylor
1990 Pueblo Devel: Documentation Report. On File, Bureau of Land Management Site Files, Safford. National Park Service, Southwest Cultural Resources Center, Santa Fe.

Turner, Raymond M.
1974 *Quantitative and Historical Evidence of Vegetation Changes along the Upper Gila River, Arizona. Geological Survey Professional Paper 655-H*. United States Government Printing Office, Washington.

United States Engineer Office
1875 *Geographical and Geological Explorations and Surveys West of the 100th Meridian*.

Wagonner, J. J.
1952 *History of the Cattle Industry in Southern Arizona, 1540-1940*. University of Arizona Social Science Bulletin 20. Tucson.

Wasley, William W.
1962 A Ceremonial Cave on Bonita Creek, Arizona. *American Antiquity* 27(3):380-394.

Waters, Michael R.
1989 The Influence of Late Quaternary Landscape Processes on Hohokam Settlement Patterning in Southern Arizona. In *Hohokam Archaeology along Phase B of the Tucson Aqueduct, Central Arizona Project*, Vol. 1, Part 1, *Syntheses and Interpretations*, edited by Jon S. Czaplicki and John C. Ravesloot, pp. 79-130. Arizona State Museum Archaeological Series No. 178. University of Arizona, Tucson.

Waters, Michael R., and Anne I. Woosley
1990 The Geoarchaeology and Preceramic Prehistory of the Willcox Basin, SE Arizona. *Journal of Field Archaeology* 17(2):163-175.

Weech, Hiram
n.d. *Our Pioneer Parents, Autobiography of Hiram Weech*. Lee Printing Company, Hollywood, Calif.

West, Velma
1992 Tape Recorded Interview. On file with Bureau of Land Management, Safford, Ariz.

Wheat, Joe Ben
1955 *Mogollon Culture Prior to A.D. 1000*. American Anthropological Association Memoir 82. Menasha.

White, Charles B.
n.d. *An Outline of San Carlos Apache Culture*. Department of Health, Education, and Welfare, Public Health Service, Division of Indian Health, Indian Health Area Office, Phoenix.

Willey, Gordon R., and Philip Phillips
1958 *Method and Theory in American Archaeology*. The University of Chicago Press, Chicago.

Wills, W. H.
1988 *Early Prehistoric Agriculture in the American Southwest*. School of American Research Press, Santa Fe.

Wilson, Trelva, and Phyllis Hancock
1952 *Out of the Years*. Murray and Gee, Culver City, Calif.

Winn, Fred
1926 The West Fork of the Gila River. *Science* 64(1644):16-17.

Woosley, Anne I.
1980 Agricultural Diversity in the Prehistoric Southwest. *The Kiva* 45(4):317-335.

Worcester, Donald
1979 *The Apaches: Eagles of the Southwest*. University of Oklahoma Press, Norman.

SOURCES

NEWSPAPERS

The following abbreviations are used in referring to newspapers in the text.

AB	The Arizona Bulletin, Solomonville, Ariz.
AC	The Arizona Citizen, Tucson, Ariz.
ADS	The Arizona Daily Star, Tucson, Ariz.
CC	The Clifton Clarion, Clifton, Ariz.
CE	The Copper Era, Clifton-Morenci, Ariz.
FE	The Florence Enterprise, Florence, Ariz.
GCB	The Graham County Bulletin, Safford, Ariz.
GG	The Graham Guardian, Safford, Ariz.
GCG	The Graham County Guardian, Safford, Ariz.
MSB	The Miami Silver Belt, Miami, Ariz.

INTERVIEWS

Larold Aday
Jesse Henry Baker
Pierre M. Cantou
Vic Christensen
Lois Claridge
Kennedy Curtis
Clyde Daringer
Cowboy Earven
James Earven
John Fanta
Ernie Garcia
Margaret A. "Suzi" George
Flora Sanchez LaFleche
Ted Lee
Ruskin Lines
Warner and Jane Mattice
Marcaria Bianes Melendrez
Ramon Melendrez
Reg Melendrez
Frank Quinn
Clark Richins
Larry Shiflet
Mike Squier
Harold O. Stevens
Sarah Stevens
Selma Lee Stoddard
Mike Squier
Velma West

APPENDIX 1

SETTLERS

SETTLERS

Table A.1. Homestead Entries in the Bonita Creek Area.

Location	Name	Acreage	Date
T4S, R27E Sec. 33	Robert A. Moore	48.46	06/17/1936
T4S, R27E Sec. 34	Julius Christiansen	586.33	09/09/1838
T4S, R26E	No Private Patents		
T5S, R26E Sec. 26	Phelps Dodge Corp. (ME)	219,054.00	07/28/1964
T5S, R26E Sec. 35	San Juan Mining Co. (ME)	96.89	04/21/1922
T5S, R27E Sec. 3	City of Safford (R&PP)	20.24	10/21/1963
T5S, R27E Sec. 4	Robert A. Moore	428.45	06/17/1936
T5S, R27E Sec. 10	John E. Farrell	160.00	02/17/1925
T5S, R27E Sec. 11	City of Safford	120.00	06/05/1958
T5S, R27E Sec. 14	Andrew Lee Talley	640.00	04/04/1933
T5S, R27E Sec. 23	Andrew Lee Talley	640.00	04/04/1933
T5S, R27E Sec. 31	Kennicott Copper Corp.	305.73	08/22/1972
T5S, R27E Sec. 31	Kennicott Copper Corp.	40.25	02/07/1964
T5S, R28E Sec. 31	Kennicott Copper Corp.	20.24	10/21/1963
T6S, R28E Sec. 5	City of Safford	160.00	11/09/1950
T6S, R28E Sec. 5	City of Safford		
T6S, R28E Sec. 6	City of Safford	20.24	10/21/1963
T6S, R28E Sec. 9	City of Safford	22.50	10/22/1970
T6S, R28E Sec. 21	City of Safford		
T6S, R28E Sec. 29	Ramon Melendrez	5.00	03/06/1972
T6S, R28E Sec. 31	Elias Tidwell	157.02	01/19/1898
T6S, R28E Sec. 31	James W. Earven	187.24	05/19/1916

Table A.2. Census, Voting Precinct No. 11, Bonita Creek. 1910.

First Entry	Second Entry	Other
Hicks, Moroni (farmer)	Lucinda (wife)	(5 children)
Gomez, Eucebio	Refugio (wife)	
Farrell, John A. (ranchman)	Luella A. (wife)	
Benevides, Bernabe (lodger) (ranchman)		
Benevides, Joaquin (lodger) (ranchman)		
Bianes, Jose' (lodger)(ranchman)		
Wamsley, Townsend (gardener)	Annie (wife)	
Johnson, Presley (farmer)		
Ernandez, Erasido (lodger)(laborer)		
Pedea, Juan (ranchman)		
Earven, James (goat herder)	Beulah (wife)	Mydge (age 14), Elizabeth (age 12), Winnie (age 9), Samuel (age 7), Robert (age 12)
Traylor, Minnie (16)(sis-in-law)	John (21)(bro-in-law)	
Booker, [illegible](cowboy)		
Hoffman, John (cowboy)		
West, Turner (rancher)	Maram E. (wife)	Elizabeth (age 15), Wesley (age 13), Clayborne (age 11), Henry (age 8), Ruby (age 5), Karl (age 2)

APPENDIX II

MISCELLANEOUS CLIMATE AND WEATHER DATA

FLOOD SEQUENCE ON THE GILA RIVER AND/OR BONITA CREEK

Two distinct types of storms affect the seasonal precipitation in the Gila River Valley: summer storms, mainly of the local convective type (called "thunderstorms") and storms that occur during the spring and winter that are of the convergence or frontal type and are more generalized and widespread (Burkham 1970:B4). Periodic catastrophic floods have occurred in both the Gila River and on Bonita Creek; frequently they occur on both watercourses at the same time, although during the summer, it is possible that a major flood that affects Bonita Creek was initiated by a local storm that originated in the White Mountains. Causes of area-wide floods include: (1) widespread heavy rainfall of long duration, (2) warm weather after significant snow accumulation, or (3) widespread heavy rainfall or snow. Flash floods, exclusive to Bonita Creek, were most likely initiated by heavy localized thunderstorm activity. Only widely reported floods that disturbed a major portion of the Gila watershed and presumably would have affected Bonita Creek are mentioned here. In addition to the floods, there was an earthquake in 1887.

1833 Flood Gila (Olmstead 1919: 9; Russell 1908: 38).

1862 Flood Gila (Alta California 2/17/1862).

1867 Flood Gila (Leslie's Magazine 6/29/1867).

1868 Flood Gila (Russell 1908: 53).

1874 Flood Gila (Citizen 1/31/1874).

1884 Flood Gila, San Carlos, and San Francisco.

1887 Flood Gila and portions of the upper watershed (Florence Enterprise 9/17/1887).

1890 Flood Gila (Miami Silver Belt 2/21/1891).

1891 Flood Upper Gila, Feb. 22, Washed out pre-historic irrigations systems (Olmsted 1919:65; Citizen 2/28/1891).

1895 Flood, Gila, Sept.27-Oct.4, Solomon flooded by San Simon River (Burkam 1970:B21).

1896 Flood, Gila, Oct. 9-16, 3 days continual rain. Solomon flooded by San Simon.

1905 Flood in entire Gila watershed, 2 floods following 3 consecutive days rain each Dec. 1904 and Jan. 13, 1905, 3rd flood on Nov. 28 following 2 heavy rains in late Nov. Channel of Gila had been widened and deepened by previous 2 1905 floods (Olmsted 1919:65).

1906 Flood San Francisco, Dec. 3, following 2 severe storms, most severe on the San Francisco (Burkham 1970:B24).

1910-1911 Flood San Carlos River, Gila River Apache farmlands washed out.

1914-1915 Flood Gila, Dec. 20, 1914 and Jan. 30, 1915, local high intensity rains (Burkham 1970:B25).

1916 Flood entire Gila, including Bonita and Eagle Creeks, Jan. 18-20 and 29, warm rainfall on heavy snow build-up (Burkham 1970:B25).

1916 Flood, Gila, Oct 14-15. rainfall over entire Gila River basin Oct 8-15.

1941 Flood throughout entire Gila watershed, less severe downstream at head of Gila Valley (Smith 1945:18-19), severe in Bonita Creek.

1944 Flood throughout entire Gila watershed, very severe in Bonita Creek.

1965 Flood, Gila, Dec.21-24 and Dec. 30-31, warm rain caused snow melting.

1979 Flood.

1983 Flood.

1991-1992 Flood.

CLIMATIC SUMMARY, SOUTHERN ARIZONA

Precipitation in southern Arizona: Monthly, annual, and average amounts (in inches and hundredths)

DUNCAN, GREENLEE COUNTY.—Elevation, 3,643 feet

Year	January	February	March	April	May	June	July	August	September	October	November	December	Annual
1889	-----	-----	-----	-----	-----	-----	1.40	1.02	1.27	0.20	0.23	0.75	-----
1901	-----	-----	-----	-----	-----	T	2.30	.80	3.90	2.20	.50	.10	-----
1902	0.40	0.40	0.71	0.00	0.36	0.00	T	2.48	.46	.10	.75	1.62	7.34
1903	.04	.10	1.07	T	.35	1.08	.61	4.06	2.62	.00	.00	-----	-----
1904	T	.00	.25	.00	.55	.25	-----	1.50	T	2.53	.10	1.83	-----
1905	2.10	3.72	3.36	1.74	T	.16	1.25	.90	1.66	.70	2.90	1.25	19.74
1906	.11	1.59	.35	.13	T	T	2.50	2.16	.04	T	-----	3.33	-----
1907	-----	-----	.06	.17	-----	-----	-----	-----	-----	-----	-----	-----	-----
Average	.53	1.16	.97	.34	.25	.26	1.34	1.85	1.42	.82	.75	1.48	11.17

FORT GRANT, GRAHAM COUNTY.—Elevation, 4,833 feet

Year	January	February	March	April	May	June	July	August	September	October	November	December	Annual
1873	0.00	0.10	1.00	0.00	0.50	1.40	1.70	5.20	2.50	0.46	3.38	1.75	17.99
1874	1.58	2.87	2.45	.58	.07	.00	2.70	2.01	.00	1.47	.30	3.78	17.81
1875	2.48	1.44	1.95	1.52	.00	.50	7.02	1.08	4.59	.01	.20	.12	20.91
1876	.26	.24	.44	T	-----	.65	5.27	7.41	1.99	2.86	1.00	-----	-----
1877	.17	1.50	.30	.42	.66	.00	.94	2.94	.83	.71	.02	2.20	10.69
1878	.23	.50	.37	.18	.00	.32	6.44	4.93	.20	.00	1.90	1.39	16.46
1879	1.38	.47	.85	.07	.00	.08	2.59	1.12	2.18	1.83	.87	1.38	12.82
1880	.60	.48	.85	.08	.00	1.32	5.63	3.73	1.01	.47	.00	1.57	15.74
1881	.05	.33	.89	.84	.26	T	5.53	5.47	3.84	1.02	.08	.65	18.96
1882	.86	1.26	1.84	.07	.81	1.47	2.02	4.73	.80	.00	.79	.17	14.82
1883	1.21	1.40	1.27	.03	1.16	1.26	2.90	3.07	.42	1.21	.11	1.44	15.48
1884	1.12	4.62	3.87	.47	.81	1.20	.67	2.41	.98	3.06	.53	6.93	25.67
1885	.31	1.02	1.40	.04	.25	.73	.93	1.58	.81	.03	1.30	.31	9.21
1886	2.46	1.29	.53	.30	.04	-----	-----	3.40	3.49	.57	.10	.09	-----
1887	.11	2.58	T	.36	.16	.85	9.00	6.20	4.20	.37	.28	.21	24.32
1888	.12	.44	.83	.50	.18	.02	4.27	.52	.78	1.19	3.67	1.68	14.20
1889	1.99	1.28	1.04	.13	T	1.06	3.57	1.35	.69	.94	.16	1.11	13.32
1890	1.58	.46	.40	.92	.01	.20	3.24	4.54	1.36	1.62	.34	2.01	16.74
1891	.82	3.78	.28	.00	1.40	.10	1.19	2.25	1.21	.00	.00	1.18	12.21
1892	.96	1.59	1.66	.64	.35	.00	.86	1.00	.11	.46	.12	.15	7.90
1893	.56	.59	1.26	.00	.58	.00	4.24	2.00	3.87	T	.40	.35	13.85
1894	.38	3.43	.66	.13	.37	.00	2.55	1.98	.14	1.10	.00	2.79	13.53
1895	1.65	.37	.02	.07	.30	.14	1.09	4.02	1.69	1.21	2.05	.61	13.22
1896	.29	.50	.34	.00	.00	.90	1.88	2.68	2.91	4.89	.46	.24	15.09
1897	4.09	T	.27	.00	.04	.09	2.05	1.91	4.75	.33	.00	.34	13.87
1898	2.23	T	.53	1.60	.00	.37	2.65	4.41	.67	.00	.50	1.30	14.26
1899	.74	.35	.25	.05	.00	.46	3.21	.52	.69	.30	.70	.17	7.44
1900	.31	.53	.58	.48	T	T	.50	2.24	4.30	.16	2.37	T	11.47
1901	2.05	.50	.80	T	T	.00	4.37	1.32	1.20	1.64	.62	T	12.40
1902	.20	.40	.15	T	.30	T	.90	3.40	1.25	.90	.20	2.00	9.70
1903	T	.09	2.05	T	.50	.69	.12	3.10	1.60	.00	.00	.40	8.55
1904	.51	.31	.14	.00	.40	.61	1.35	.62	.65	.31	.02	.16	5.08
1905	.36	2.34	.99	1.21	.00	.17	.13	2.07	-----	-----	-----	-----	-----
1906	-----	-----	.22	.20	T	.00	2.05	3.40	.30	.00	.70	3.62	-----
1907	4.48	.70	.27	.50	.53	.00	3.27	3.59	.55	1.48	2.04	.00	17.41

SAN CARLOS RESERVOIR, GILA COUNTY.—Elevation, 2,532 feet

Year	January	February	March	April	May	June	July	August	September	October	November	December	Annual
1881	-----	-----	-----	-----	-----	0.00	4.13	5.93	1.94	0.93	0.06	0.52	-----
1882	1.24	0.93	0.55	0.00	0.71	1.09	1.98	6.05	.58	.00	1.58	.66	15.37
1883	1.60	2.07	.71	.00	.53	.00	2.48	1.11	.11	1.13	.00	2.47	12.21
1884	1.00	3.83	3.97	.84	.32	.49	.37	1.24	.83	1.49	.55	5.48	20.41
1885	.05	1.39	1.28	.03	.22	.47	1.25	1.22	.34	.34	.70	.90	8.19
1886	2.88	1.29	.82	.14	.00	.00	.03	3.49	.87	.46	.46	.00	10.44
1887	T	1.12	.00	.23	.06	.31	2.49	1.56	.88	.06	-----	1.45	-----
1888	.52	1.03	1.93	.00	.10	.00	2.10	.40	.63	1.73	1.76	2.84	13.04
1889	1.62	1.33	2.16	.25	.00	T	1.83	.87	2.05	.60	.40	2.30	13.40
1890	2.11	1.66	1.03	1.31	.00	T	2.29	3.41	.77	1.32	2.15	2.57	18.62
1891	.96	5.55	.51	.00	1.04	.06	.57	1.00	.76	.00	.00	1.44	11.88
1892	1.80	3.51	1.22	1.03	.08	.00	1.30	1.90	.00	.65	.34	.22	12.05
1893	0.50	.55	2.96	0.00	0.67	0.00	0.80	3.78	2.56	0.00	0.34	0.37	12.53
1894	.63	1.37	1.14	.11	.31	.00	.81	2.06	.09	1.05	.00	2.58	10.15
1895	2.16	.45	.18	.00	.04	.05	.32	2.30	1.94	3.01	3.42	.45	14.41
1896	.43	.04	.50	T	.00	T	3.78	.88	2.67	4.56	.67	.35	13.88
1897	2.77	.71	.77	.00	.30	.03	.66	1.20	.52	.35	.00	.59	7.90
1898	1.88	.00	.00	.60	.00	.20	2.65	1.41	.00	.00	.25	.80	7.79
1899	1.80	.00	.05	.00	.00	.90	1.65	.35	.62	.35	.30	.15	6.17
1900	.15	.40	.85	.87	T	.00	.32	-----	-----	-----	2.86	.00	-----
1901	2.05	2.74	.78	.11	.37	.00	3.24	1.46	1.93	.95	.20	.00	13.83
1902	.80	.20	.23	.00	.60	T	-----	-----	-----	-----	-----	-----	-----
1903	-----	-----	-----	-----	-----	.46	1.09	1.32	2.44	.00	.00	.20	-----
1904	.25	.43	.16	T	.35	T	1.31	2.36	.21	.14	.00	1.44	6.65
1905	3.46	5.03	3.30	3.34	.08	.25	.53	2.56	1.85	.01	4.04	.98	25.43
1906	.88	.79	2.33	.63	.12	.00	2.01	5.04	.20	.12	.75	3.92	16.79
1907	2.00	.24	1.07	.70	1.58	.06	.56	9.80	T	3.60	.63	.04	20.28
1908	.84	3.55	.73	.57	.12	.19	2.94	-----	.55	.30	.31	3.01	-----
1909	1.55	1.64	2.23	T	.00	.00	1.23	1.95	1.04	.00	.18	.88	10.70
1910	1.06	.06	.43	.09	T	.07	-----	1.92	T	.95	1.82	.41	-----
1911	2.42	1.38	1.47	.35	.00	.49	2.99	-----	-----	2.32	-----	-----	-----
1913	.91	3.31	.20	.34	.00	-----	1.32	-----	-----	-----	1.26	1.47	-----
1914	.65	1.30	.40	.22	.15	.43	-----	-----	-----	3.20	1.37	-----	-----
1915	2.60	2.30	.51	2.03	.40	.70	2.44	1.75	1.15	.06	.83	1.80	16.57
1916	5.40	1.11	2.10	.18	T	.00	1.43	-----	-----	-----	-----	-----	-----
1917	-----	1.26	.04	.30	1.45	.00	3.29	1.73	-----	-----	-----	-----	-----
1918	-----	.90	.61	.00	.00	.25	-----	1.59	.21	.23	-----	2.61	-----
1919	-----	.40	-----	.18	-----	.11	-----	-----	-----	-----	-----	-----	-----
1921	.16	.25	.06	.10	.01	.00	5.56	1.62	.18	.56	.28	.67	9.45
1922	*1.46	2.20	.99	1.20	.20	.04	1.35	.80	.16	.29	.75	.75	10.19
1923	.26	.73	.67	.07	.75	.00	2.70	1.97	.15	.12	1.83	2.90	12.15
1924	.00	T	1.84	.09	.15	.00	.27	T	.15	.27	.02	1.25	4.04
1925	.00	.27	1.30	.19	.00	.94	4.70	.45	1.73	.85	.77	.85	12.23
1926	.69	.65	2.62	1.87	.25	.05	2.08	*.64	1.53	T	*.06	2.72	13.16
1927	.13	2.18	1.18	.75	.05	.84	.91	.16	2.19	.00	.22	1.89	10.50
1928	.18	-----	.05	T	.00	.00	.55	4.12	-----	-----	-----	-----	-----
1930	*2.23	.32	3.12	.36	1.01	.30	*3.95	1.94	1.01	.24	2.87	.39	17.74
Average	1.29	1.37	1.12	.42	.27	.19	1.87	2.14	.92	.81	.87	1.36	12.63

Record from 1913 to 1916, inclusive, for Rice (altitude 2,540 feet), 12 miles north of San Carlos.

Data on selected sites in southern Arizona, from Martin and Mattice (1930:26-11, 18, 19).

CLIMATOLOGICAL SUMMARY FOR EAGLE CREEK

MEANS FOR PERIOD 1941 - 1970 EXTREMES FOR PERIOD 1931 - 1972

LATITUDE: 33° 24'
LONGITUDE: 109° 29'
ELEV. (FT.): 5100

Month	Temperature (°F) Means: Daily maximum	Daily minimum	Monthly	Extremes: Record highest	Year	Record lowest	Year	Mean degree days**	Precipitation Totals (Inches): Mean	Greatest daily	Year	Snow, Sleet, Hail: Mean	Maximum monthly	Year	Estimated mean relative humidity (percent): 0600 MST	1800 MST	Mean number of days: precip. .10 inch or more	Temperatures: Max. 90° and above	32° and below	Min. 32° and below	0° and below	Month
(A)									30	38		28	37				27					(A)
JAN									1.29	1.65	1965	2.0	22.0	1937			3					JAN
FEB									0.86	1.58	1936	1.0	10.5	1956			3					FEB
MAR									1.06	1.30	1954	0.3	4.0	1962			3					MAR
APR									0.46	1.08	1951	T	T	1953*			2					APR
MAY									0.20	0.55	1957	0.0	T	1935			1					MAY
JUN									0.51	1.57	1940	T	T	1954			2					JUN
JUL									2.86	2.10	1958	T	T	1949			8					JUL
AUG									3.19	1.98	1965	T	T	1954			8					AUG
SEP									1.58	2.83	1933	T	T	1950			4					SEP
OCT									1.09	2.25	1972	0.0	0.0				2					OCT
NOV									0.75	1.99	1931	0.6	16.5	1931			2					NOV
DEC									1.53	1.35	1946	2.7	41.0	1967			4					DEC
YEAR									15.38	2.83	SEP 1933	6.6	41.0	DEC 1967			42					YEAR

TOTAL PRECIPITATION (INCHES) FOR EAGLE CREEK

YEAR	JAN	FEB	MAR	APRIL	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	ANNUAL	YEAR
1931	0.97	3.41	1.60	1.57	0.35	1.59	3.38	2.92	3.09	1.10	3.42	1.19	25.39	1931
1932	1.00	2.26	0.38	0.36	0.11	T	4.45	3.98	8.63	1.04	0.00	1.67	15.88	1932
1933	0.88	1.88	0.00	0.94	0.26	0.92	3.01	1.96	4.28	1.14	1.89	0.40	17.56	1933
1934	0.19	0.72	0.23	0.20	0.27	0.21	3.76	6.36	1.67	T	1.18	1.28	16.07	1934
1935	1.93	2.02	0.75	0.71	0.86	0.12	1.11		2.00	0.08	2.72			1935
1936	0.84	3.41		0.42	0.55	1.10	2.55	2.30	1.64	0.30	1.15	1.55		1936
1937	3.10	0.86	1.27	0.00	0.30	0.46	1.45	2.15	2.17	1.15	0.12	1.21	14.24	1937
1938	0.38	1.56	2.10	0.11	0.13	2.68	2.20	2.64	1.84	T	0.15	1.59	15.38	1938
1939	1.85	0.65	0.79	0.57	0.02	0.20	1.51	2.31	2.16	1.83	1.49	0.70	14.08	1939
1940	0.75	3.02	0.31	0.26	0.94	3.03	1.90	3.89	3.21	0.32	2.29	3.60	23.52	1940
1941	2.05	1.61	2.67	2.01	0.81	0.06	4.01	4.61	3.05	0.19	1.20	2.26	24.53	1941
1942	0.47	1.19	0.25	0.43	0.00	0.00	1.80	4.18	2.84	0.43	0.00	1.97	13.56	1942
1943	1.47	0.34	1.85	T	0.48	0.65	1.21	4.95	2.32	0.47	T	0.70	14.44	1943
1944	0.52	0.70	0.56	0.17	0.45	0.05	1.54	4.04	5.90	0.12	2.25	0.65	16.95	1944
1945	0.96	0.05	1.60	0.10	T	T	0.86	1.11	1.05	1.18	0.02	1.37	8.22	1945
1946	1.96	0.18	0.32	0.35	0.12	0.18	3.36	2.72	0.64	0.76	0.45	1.35	12.39	1946
1947		0.85	0.04	0.00	T	0.78	0.15	2.85	1.16	0.08	0.76			1947
1948	0.59	1.65	1.15	0.00	T	T	0.81	1.62	0.80	1.28	T	2.91	10.73	1948
1949	3.42	0.15	0.60	0.66	0.03	0.75	3.77	1.68	1.06	0.67	0.22	1.39	14.40	1949
1950		0.72	0.28	0.00	0.00	0.30	3.33	0.83	1.00	0.05	T	T		1950
1951	1.05	0.78	1.14	1.85	0.11	0.00	2.44	2.94	0.42	2.29		2.34		1951
1952	2.85	0.44	1.52	1.30	0.03	0.97	2.22	3.39	0.29E	0.00	1.65	0.71	15.37	1952
1953	0.05	0.41	2.29	0.81	0.40	0.35	2.46	0.52	0.04	0.17	0.27	0.04	7.81	1953
1954	1.02	0.45	3.25	0.00	0.30	2.80	2.40	4.55	2.30	1.25	0.00	0.20	18.52	1954
1955	3.65	0.53	0.12	0.07	0.26	0.93	4.32	5.06	0.16	0.34	0.25	1.20	16.89	1955
1956	1.10	1.26	0.00	0.32	0.05	0.33	3.72	1.28	T	0.72	0.00	0.23	9.01	1956
1957	3.12	1.48	1.10	0.36	0.94	1.06	4.00	4.25	0.00	2.70	1.33	0.40	20.74	1957
1958	0.43	2.79	3.47	1.45	0.22	1.09	3.33	3.37	5.40	2.13	0.63	T	24.31	1958
1959	T	0.94	0.00	0.30	0.00	0.53	7.31	5.80	0.02	2.26	2.63	2.86	22.65	1959
1960	1.63	0.59	0.35	0.00	0.40	0.00	0.56	2.32	1.17	3.26	0.24	0.96	11.68	1960
1961	1.02	0.18	1.39	0.09	0.00	0.16	2.27	2.22	2.04	2.86E	1.95E	4.10	18.28	1961
1962	0.96	0.55	0.57	0.06	0.00	0.94	2.53	1.03	3.39	2.68	1.81	2.36	16.88	1962
1963	1.87	1.94	0.81	0.30	0.00	0.00	3.37	5.09	1.52	2.79	0.70	0.06	18.45	1963
1964	0.33	0.08	0.65	0.51	0.06	0.28	3.65	3.32	2.41E	0.29	0.71	0.94	13.23	1964
1965	2.21	1.47	1.03	0.93	0.00	0.68	3.89	3.19	0.25	0.48	1.33	7.18	22.64	1965
1966	0.59	1.00	0.06	0.06	T	0.91	3.61	4.06	2.41	0.05	0.80	1.61	15.16	1966
1967	0.25	0.64	0.48	0.57	0.28E	0.97	3.45	5.85	1.58	0.52	0.68	2.97	18.24	1967
1968	0.78	1.51	1.23	0.57	0.00	0.22	2.57	3.42	0.42	0.20	1.16	2.20	14.28	1968
1969	1.32	0.37	0.51	0.07	1.01	0.02	2.81	3.74	1.81	1.10	1.45	0.90	15.11	1969
1970	0.18	0.87	2.48	0.55	0.00	0.22	3.97	1.61	1.81	1.65	0.05	0.38	13.77	1970
1971	0.19	0.69	0.14	0.34E	0.01	0.00	0.50	4.11	2.78	4.35	0.68	1.54	15.38	1971
1972	0.00	0.00	0.02	0.00	0.09	1.37	2.18	3.59	1.88	7.02	0.65	2.24	19.04	1972

From Sellers and Hill (1974:197).

CLIMATOLOGICAL SUMMARY FOR SAFFORD

MEANS FOR PERIOD 1941 - 1970 EXTREMES FOR PERIOD 1931 - 1972

LATITUDE: 32° 50'
LONGITUDE: 109° 43'
ELEV. (FT.): 2900

Month	Temperature (°F) Means: Daily maximum	Daily minimum	Monthly	Extremes: Record highest	Year	Record lowest	Year	Mean degree days**	Precipitation Totals (Inches): Mean	Greatest daily	Year	Snow, Sleet, Hail: Mean	Maximum monthly	Year	Estimated mean relative humidity (percent): 0600 MST	1800 MST	Mean number of days: precip. .10 inch or more	Temperatures Max.: 90° and above	32° and below	Min.: 32° and below	0° and below	Month
(A)	30	29	30	42		41		16	30	41		29	40				29	22	22	22	22	(A)
JAN	60.1	29.7	44.9	82	1971	9	1964	603	0.69	0.82	1935	0.6	6.0	1946	52	44	3	0	+	21	0	JAN
FEB	65.8	32.6	49.2	87	1957	9	1964	446	0.41	1.24	1931	0.2	6.0	1939	51	41	2	0	0	14	0	FEB
MAR	70.3	37.4	54.2	92	1972	19	1966*	324	0.59	1.15	1943	0.1	3.0	1964	47	38	2	+	0	7	0	MAR
APR	80.7	44.8	62.8	100	1943	25	1936	111	0.24	0.63	1964	0.0	0.0		39	28	1	4	0	1	0	APR
MAY	89.4	52.6	71.0	110	1951	31	1950	20	0.08	0.44	1941	0.0	0.0		32	23	1	17	0	+	0	MAY
JUN	98.4	61.6	80.0	116	1971*	43	1932	0	0.21	1.50	1940	0.0	0.0		33	23	1	28	0	0	0	JUN
JUL	99.7	70.2	85.0	114	1936	54	1944	0	1.90	2.05	1934	0.0	0.0		49	32	5	30	0	0	0	JUL
AUG	96.7	67.8	82.3	109	1944*	49	1953	0	1.44	1.67	1971	0.0	0.0		64	41	5	29	0	0	0	AUG
SEP	93.1	61.1	77.1	108	1950*	40	1934	1	1.12	2.33	1944	0.0	0.0		60	35	3	24	0	0	0	SEP
OCT	83.3	48.7	66.0	99	1950	24	1965	55	0.61	1.81	1937	0.0	0.0		48	36	2	7	0	+	0	OCT
NOV	70.2	36.2	53.2	89	1933	17	1938	328	0.35	0.72	1961	T	0.2	1958	46	40	2	0	0	8	0	NOV
DEC	61.4	30.1	45.8	79	1933	11	1934	560	0.79	2.02	1965	0.4	11.0	1967	53	48	3	0	0	21	0	DEC
YEAR	80.8	47.7	64.3	116	JUN 1971*	9	FEB 1964*	2448	8.43	2.33	SEP 1944	1.3	11.0	DEC 1967	48	36	30	139	+	72	0	YEAR

CLIMATE OF SAFFORD, ARIZONA

Safford is located on the Gila River and at the northern extremity of the San Simon Valley which runs south-southeastward from Safford to the extreme southeastern corner of the state. Its elevation is about 2900 feet. The foothills of the Pinaleno or Graham Mountains begin about five miles southwest of the town, the maximum elevation (Mt. Graham, 10713 feet) in this massive range being reached about thirteen airline miles from Safford. The Gila Mountains to the north and northwest of Safford contain maximum elevations between 5000 and 6000 feet. Farther to the north lie the high-elevation plateaus of the San Carlos and Fort Apache Indian Reservations. The White Mountains, about 75 miles north of Safford, are located north of these reservations and reach elevations in excess of 11000 feet.

Towering Mt. Graham and its companion peaks in the Pinaleno Mountains to the southwest of Safford have marked effects on the local climate. The most important of these is the reduction in winter precipitation. Most of southern Arizona has a primary precipitation maximum in the summer and a secondary maximum during the winter. The summer maximum is due largely to thunderstorm rainfall during July, August, and September, associated with warm, moist air moving northwestward over the state from the Gulf of Mexico; Safford receives its share of this type of precipitation. Winter precipitation, however, results from storms that enter the state from the Pacific Ocean via southern California. The moisture-bearing winds associated with these storms usually blow over the state from the west or southwest quandrants, so that the Pinaleno Mountains form a massive natural barrier which intercepts some of this moisture before it reaches Safford; a major part of it falls as rain or snow on the windward side and along the summit of these mountains.

Winter storms also bring occasional strong winds to this area, but such winds are usually of comparatively short duration.

The diurnal temperature range(difference between the high and low temperature on a given day) is usually large, averaging about 31 degrees in the winter and reaching a maximum of about 37 degrees in May and June. Afternoon temperatures during the winter normally reach the sixties, but temperatures in the eighties are not unknown. Afternoon temperatures during summer months are consistently in the high nineties, but low relative humidity usually accompanies these temperatures and helps to moderate the heat.

Below freezing nighttime temperatures are rare at Safford from April through October, the town having a growing season averaging about 200 days in length.

From Sellers and Hill (1974:422).

AVERAGE MONTHLY TEMPERATURES (F) FOR SAFFORD

YEAR	JAN	FEB	MAR	APRIL	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	ANNUAL	YEAR
1931	42.2	49.8	53.8	62.8	70.4	78.4	83.2	81.2	77.6	66.6	51.2	42.1	63.3	1931
1932	39.2	48.0	50.3	57.4	67.4	78.3	84.8	82.4	75.2	62.6	52.5	42.2	61.7	1932
1933	41.0	43.8	55.4	58.0	66.2	80.1	86.6	81.8	78.6	66.6	52.6	45.8	63.1	1933
1934	44.0*	53.4	54.1	65.7	75.7	78.4	84.8	80.0	73.7	64.9	52.5*	47.8	64.6	1934
1935	47.0*	50.4	53.2	61.6	65.0	78.4	84.0	81.4	73.9*	64.0	49.7*	45.5*	62.8	1935
1936	43.4	46.8	55.2	63.6	72.2	83.7	86.8	84.0	74.2	62.4	51.2*	44.1	64.0	1936
1937	37.4	47.6	53.0*	62.5*	72.8	79.1*	82.6*	82.7*		66.0	53.8	46.8		1937
1938	46.1	50.1	54.5	62.7	70.1	80.5	83.0	82.2	77.7	66.8	47.6	46.7	64.0	1938
1939	44.2	41.2	56.2	65.0	72.4	81.2	84.8	82.7	77.1	63.2	54.5	48.8	64.3	1939
1940	45.2	49.2	57.3	62.6	72.8	81.3	85.5	81.4	76.6	65.3	50.8	49.2	64.8	1940
1941	46.8	52.3	54.0	57.4	70.0	77.6	83.9	81.4	75.4	64.1	54.2	47.1	63.7	1941
1942	47.2	46.0	52.2	61.6	69.8	78.2	85.7	82.0	75.4	63.6	55.4	46.4	63.6	1942
1943	46.0	53.6	56.4	66.2	72.0	80.4	84.4	81.4	75.9	63.4	52.3	44.6	64.7	1943
1944	43.2	47.8	52.2	59.0	70.4	78.5	83.0	83.2	75.8	67.2	51.0	44.6	63.0	1944
1945	44.7	49.4	51.3	60.2	70.0	76.4	85.2	83.2	76.4	66.4	51.3	42.7	61.1	1945
1946	41.4	47.4	55.6	66.7	69.3	82.0	85.0	81.6	78.0	62.0	50.0	47.6	63.9	1946
1947	40.4	52.0	55.8	61.7	74.6	79.8	87.8	82.8	78.9	65.8	48.9	42.4	64.2	1947
1948	43.2	46.8	50.4	65.2	71.1	81.0	85.2	82.9	77.6	65.3	45.7	43.9	63.2	1948
1949	39.7	46.4	53.2	63.4	71.0	80.1	84.5	81.7	79.9					1949
1950	44.3	52.5	56.0	65.9	69.5	79.2	83.3	81.4	75.3	72.3	56.1	48.8	65.4	1950
1951	44.2	48.6	54.4*	63.2	71.7	78.6	88.8	82.8*	78.9	68.0	51.7	45.5	64.7	1951
1952	46.5	47.2	50.5	63.4	74.3	81.9	86.0	84.2*	79.8	69.5	51.7	44.3	64.9	1952
1953	47.4	47.7	57.0	63.4	67.0	83.0	87.2	82.2	77.3	65.5	55.4	42.2	64.6	1953
1954	46.5	54.0	55.0	67.0	72.9	79.2	85.8	79.8	78.4	68.8*	55.7*	46.8	65.8	1954
1955	43.1	44.0	55.6	61.4	69.3*	78.5*	82.9	82.5	77.2	68.6	53.6	49.0	63.8	1955
1956	49.2	44.9	56.1	61.7	73.2	84.5	83.6	81.2	79.6	67.0	50.0	45.6	64.7	1956
1957	48.7	57.4	56.1	62.2	67.7	82.1	85.4	82.1	75.8	64.3	49.8	46.7	64.9	1957
1958	45.0	52.1	50.3	60.3	75.6	83.4	84.7	84.1	77.3	67.2	53.7	48.9	65.2	1958
1959	48.0	48.2	54.4	65.8	70.4	82.9	85.1	81.0	76.2	66.4	52.7	48.1*	64.9	1959
1960	43.0*	44.4	57.7	63.2	70.0	81.4	85.0	83.9	79.7	65.5	55.5	45.2	64.5	1960
1961	46.4	49.9	55.3	62.3	70.7	82.3	85.1	81.6	74.3	63.5	50.0			1961
1962	43.6*	52.3	50.6	67.6	70.4	78.0	83.2	83.5	78.5	66.5	57.2	48.8*	65.0	1962
1963	42.5	52.9	55.0*	61.5	73.6	77.2	85.2	80.6	78.9	69.1*	54.7	44.7	64.7	1963
1964	40.0	42.1	51.3*	61.6*	70.7	78.7	85.1	81.1*	74.9	68.1	50.9*	46.5*	62.6	1964
1965	47.4*	47.4	52.5	62.1	66.3*	75.6	84.0	82.9	75.7	65.8	57.7	47.8	63.9	1965
1966	43.0	44.2	55.6*	64.2	73.5	79.9	85.8*	82.7	76.6	65.0	57.6	46.5	64.6	1966
1967	44.7	51.6	60.3*	60.9	68.5*	77.5	84.6	81.6	76.5*	66.6	56.8*	43.4*	64.4	1967
1968	46.1*	54.1	55.3*	60.9*	69.9	80.7	82.3	78.6	74.8	66.0	54.0*	43.5	63.9	1968
1969	50.1	48.9	51.4	64.9	71.9	79.3	85.7	85.7	78.3	64.4	53.5	47.8*	65.2	1969
1970	44.4	50.2	53.4	58.6	72.2	82.2	86.2*	84.2*	75.9*	60.8	54.3*	47.7*	64.2	1970
1971	46.0	49.7	56.2	61.7	70.9*	82.2	85.7*	81.2*	76.9	62.4*	52.9	43.2*	64.1	1971
1972	45.1*	49.1	61.4	61.8	69.9	78.6	85.8	82.3	76.4*	65.8	49.8	43.9	64.2	1972

TOTAL PRECIPITATION (INCHES) FOR SAFFORD

YEAR	JAN	FEB	MAR	APRIL	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	ANNUAL	YEAR
1931	0.42	3.38	0.51	0.86	0.63	0.19	1.38	2.80	2.18	1.92	1.75	0.42	16.44	1931
1932	0.53	1.57	0.31	0.33	T	T	1.54	1.99	0.15	0.34	0.80	1.16	7.92	1932
1933	0.72	0.87	0.00	0.52	0.00	0.73	0.75	0.68	1.57	0.43	0.50	0.00	6.77	1933
1934	0.02	0.08	0.20	0.07	0.04	0.03	4.20	2.41	0.43	0.10	0.96	1.52	10.46	1934
1935	1.17	1.45	0.67	0.08	0.34	0.07	0.30	3.66	0.68	0.00	1.25	1.03	10.70	1935
1936	1.00	0.97	0.35	0.00	0.15	0.34	2.56	1.77	2.56	0.35	1.09	0.62	11.76	1936
1937	0.67	0.55	0.91	0.00	0.51	0.45	1.76	2.00	1.28	1.96	T	2.17	12.26	1937
1938	0.46	0.46	0.70	0.11	0.00	0.69	0.57	0.84	0.80	T	0.08	0.32	5.03	1938
1939	0.54	1.21	0.47	0.72	0.02	T	0.41	2.19	1.70	1.06	1.07	0.49	9.88	1939
1940	0.72	1.54	0.18	0.25	0.51	1.70	0.69	1.94	1.47	0.11	2.03	2.10	13.24	1940
1941	1.41	0.91	1.01	0.74	0.57	0.00	1.86	1.25	3.08	0.21	0.69	1.48	13.21	1941
1942	0.18	0.54	0.16	0.33	0.00	0.09	0.73	1.55	0.92	0.20	0.00	0.39	5.09	1942
1943	0.88	0.10	1.51	0.00	0.05	0.73	1.09	1.45	1.25	0.29	0.00	0.91	8.26	1943
1944	0.34	0.14	0.58	0.08	0.15	T	2.08	0.89	4.38	1.06	0.78	0.42	10.82	1944
1945	0.93	0.05	0.95	T	0.00	0.00	2.39	1.73	0.00	0.59	0.10	0.35	6.99	1945
1946	1.88	0.00	0.09	0.02	0.00	0.15	2.16	1.31	1.31	0.28	0.66	0.27	8.13	1946
1947	0.13	0.10	0.00	0.00	0.03	T	0.67	1.03	0.70	0.66	0.31	0.19	3.82	1947
1948	0.07	1.29	0.33	0.00	0.00	0.10	0.48	1.17	0.33	0.42	0.19	1.13	5.57	1948
1949	1.79	0.18	0.10	1.08	0.00	0.10	2.91	0.89	1.30	0.08	0.19	0.80	9.42	1949
1950	0.35	0.40	0.10	0.00	0.00	0.35	1.67	0.00	0.54	0.33	0.00	0.00	3.44	1950
1951	0.71	0.59	1.23	1.07	0.01	0.00	1.34	2.93	0.35	1.28	0.19	0.61	10.39	1951
1952	0.47	0.28	0.98	1.02	T	1.17	1.36	1.35	0.19	0.00	0.79	0.48	8.09	1952
1953	0.10	0.15	1.22	0.24	0.26	0.15	1.95	0.33	0.00	0.03	0.20	0.17	4.81	1953
1954	0.41	0.36	2.23	T	0.17	T	2.57	2.33	0.63	0.02	0.00	0.10	8.82	1954
1955	1.33	0.09	0.03	0.02	0.02	0.39	1.39	0.83	0.00	0.20	0.00	0.29	6.59	1955
1956	0.52	0.59	0.00	0.14	0.02	0.33	1.12	0.40	0.00	0.26	0.00	0.29	3.77	1956
1957	1.40	0.39	0.92	0.08	0.17	0.28	3.23	1.45	0.00	1.77	0.21	0.38	10.28	1957
1958	0.14	1.58	2.02	0.84	0.05	0.94	2.24	0.91	2.02	0.36	0.45	0.02	12.09	1958
1959	0.31	0.18	0.03	0.06	0.00	T	1.92	3.01	0.01	1.35	0.32	0.77E	7.63	1959
1960	1.36	0.57	0.09	0.00	0.30	0.00	1.67	0.33	0.15	1.65	0.02	0.91	7.65	1960
1961	0.38	0.00	0.03	0.00	0.00	0.14	2.19	1.74	1.47	1.69	2.09	1.19	11.52	1961
1962	1.04	0.02	0.57	0.00	0.00	0.32	2.91	0.04	3.76	1.61	0.61	0.49	11.37	1962
1963	0.26	1.28	0.57	0.08	0.00	0.10	1.55	3.14	0.55	0.57	0.39	0.02	8.41	1963
1964	0.05	0.30	0.41	0.67	0.00	0.04	1.00	0.94	1.97	0.17	0.54	1.02	6.84	1964
1965	1.68	0.47	0.14	0.17	0.03	0.74	3.87	1.85	1.70	0.90	0.52	6.24	17.41	1965
1966	0.64	0.97	0.20	0.00	0.00	0.00	1.40	1.62	2.32	0.05	0.00	0.00	7.20	1966
1967	0.20E	0.00	0.06	0.20	0.20	0.03	1.74	3.96	0.87	0.46	0.12	2.84E	10.54	1967
1968	0.49	0.42	0.73	0.12	0.00	0.12	2.45	2.39	0.14	0.16	0.40	0.81	8.22	1968
1969	0.34	0.17	0.27	0.01	0.23	0.00	1.70	1.32	1.75	0.76	0.68	1.19	8.42	1969
1970	0.00	0.56	0.93	0.10	0.00	0.29	1.52	0.60	2.05	1.43	0.00	0.06	7.54	1970
1971	T	0.12	0.00	0.15	0.00	0.33	1.51	2.48	1.03	1.57	0.31	1.07	8.24	1971
1972	0.00	0.00	0.05	0.00	0.05	0.45	1.35	2.33	0.74	1.00	0.43	0.30	8.70	1972

From Sellers and Hill (1974:423).