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LAND MANAGEMENT

ARIZONA

Environmental Change in Aravaipa, 1870 - 1970
An Ethnoecological Survey

Diana Hadley
Peter Warshall
Don Bufkin

CULTURAL RESOURCE SERIES No. 7

1991

Cover photo: Aravaipa Gathering, c. 1918
(Neuel and Jane Weathersby)

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Environmental Change in Aravaipa, 1870 - 1970
An Ethnoecological Survey

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Cultural Resource Series

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EDITOR'S FORWARD

The preface to this document expresses the hope that this ethnoecological survey of Aravaipa " . . . will provide local managers with a greater time-depth and feeling for the ways in which humans and natural events have intertwined to shape Aravaipa's present condition and the appearance of Aravaipa's resources. Wise future management cannot be divorced from the cumulative impacts and decisions of the past. Future management can benefit from the knowledge, the admitted mistakes, and beneficial decisions made by former residents."

I cannot think of a clearer statement of the manner in which cultural resource information can be made relevant to our lives today. Archaeologists and historians are often asked to justify the usefulness of their efforts in relation to the realities of modern-day living. In response, we say that the lessons of the past can teach us how to live better in the present. By building on the successes of those who came before us, and avoiding mistakes that they have made, we can do a better job of managing our resources now and can plan more effectively for the future.

As a cultural resource program leader, I am delighted to see this kind of study being produced, using cultural resource information to help us manage other resources. It not only provides a service to our land managers and other resource specialists, but also strengthens the integration of the cultural resource program with the other resource programs in the Bureau of Land Management (BLM). This is very encouraging from my perspective, and Safford District personnel are to be commended for their initiative in sponsoring this effort, the first of its kind funded by the BLM.

As the purpose of this ethnoecological survey is to provide BLM's land managers with helpful information tools to better manage the resources for which they are responsible, the study is not an end in itself. Management implications derived from this study remain to be written to provide guidance for on-the-ground work. Once this is done, these "lessons of the past" can be translated into actions for the present.

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

FORWARD

To simply indicate that this report is the product of a Bureau of Land Management (BLM) contracted study does an injustice to its preparers. Hadley Associates, and in particular Diana Hadley, went "above and beyond the call of duty" with regard to the contract requirements. The result is a piece of work which I believe will very quickly become THE reference document that the Safford District of the Bureau of Land Management will rely upon for helping determine how best to manage the public lands in the Aravaipa area of southeastern Arizona. Diana, Peter and Don, this report stands as a tribute to your scholarship.

A great deal of appreciation is also due to several of my BLM co-workers in the Gila Resource Area of Safford District. Critical to the development of the Statement of Work that guided the contract were Al Bammann (Wildlife Biologist) and Bill Brandau (Range Conservationist). Al and Bill supplied much of the "meat and bones" to the contract Statement of Work. The study would not have been worth doing without their input. Andy Wigg (Park Ranger) also assisted in the development of the Statement of Work and identified several key informants. Meg Jensen (Gila Resource Area Manager) was an enthusiastic proponent of the study throughout the contract's lifespan. Beginning with its inception in 1988, Meg tirelessly and very adroitly "politicked" to acquire its necessary funding. She did this long after I had concluded that it would never be funded. You were right when you said, "Don't give up, Darrell!". Thanks, Meg.

In the Resources Division of the Safford District, Mike McQueen (Research Coordinator) is to be thanked for his valuable input regarding ecological concerns. Steve Knox (District Outdoor Recreation Planner), Gay Kinkade (District Archaeologist) and John Augsburger (District Wildlife Biologist) are to be thanked for their generous financial support of the contract from their respective programs. I would also like to extend a special thanks to Gay for providing additional cultural resource program monies with which to fund several contract extensions.

In the Arizona State Office, I would like to thank Jacque Summers (Contract Specialist) and Linda Johnson (Procurement Analyst) for their seemingly never-ending patience with this first-time Contracting Officer's Representative (you know what I mean, Jacque and Linda!). A person could not ask for better contract administration guidance and support.

Darrell Sanders
Gila Resource Area Archaeologist
Safford District, Bureau of Land Management
June 1991

PREFACE

The Bureau of Land Management sponsored this report on the history of ecological change in Aravaipa Canyon and adjacent lands in order to gain a better understanding of alterations in the study area's natural environment and of the reasons for which it came to be in its present condition. The report attempts to record a century of land change and resource use along with the decisions and thought processes of the individuals and agencies which shaped Aravaipa's landscape. Before the initiation of this study, as old-timers from "the Aravaipa" passed away and documents were lost or discarded, the history of formative natural events (floods and freezes), the stories of individual family land use and residents' changing attitudes, the history of influential outsiders and government agencies were slowly disappearing. Fortunately, this report has preserved some of this valuable information.

The report includes information on five separate aspects of land change. First, it gives a chronological history of landscape and species changes which have resulted from human occupation and settlement. Second, it offers a chronological history of landscape and species changes which resulted from natural causes, a task which centered on interpretation of the area's scanty weather data, a comparison of local data with more complete records from nearby locations, and a comparison between records and local recollections. Third, the report offers a chronological history of social and economic development in the Aravaipa area. This focuses on the mineral, soil, water, floral and faunal wealth of the study area, its discovery, abundance, availability, and allocation to trade or home use. Since the ability to make a living and the ability to use natural resources cannot be unraveled, the report also describes Aravaipa's in-migrations and out-migrations, population patterns and community structure. Fourth, the report attempts to assess the degree to which outside influences affected the social and economic lives and the production and consumption strategies of Aravaipa's resource users. Since Aravaipa settlers functioned as part of a larger political economy, this report is also a chronology of the impact of external capital, new technologies, political events on the state and national level, and the imposition of and reaction to a variety of governmental and agency regulations.

Finally, the report discusses the world view and land ethic of Aravaipa residents. Throughout Aravaipa's history, residents were forced to make choices which reconciled their values with the harsh necessities of life. What one group considered edible food, another group abhorred. What one group considered reasonable and humane trapping, hunting or predator control, another group thought unreasonable and cruel. A moderate stocking rate for one rancher appeared too low or too high to another. The desire to record these changes in values required the cooperation of informants and led to the use of the method called ethnoecology. For the purposes of this report, ethnoecology has supplied the major tool for investigating perceptions of the environment and decisions about natural resources. The report attempts to place the informants' values and recollections within a broader framework of environmental change indicated by field observations and more academic evaluations.

The century covered by this report begins with the first Euroamerican settlement in Aravaipa. Prior to that time, several distinct groups of Amerindians enjoyed Aravaipa's rugged beauty and abundant resources, occupying the area in substantial numbers for almost a millennium. Beginning in the 1870s, the waters of the creek, the numerous springs, the lush grass, the mineral resources, and the ease and beauty of life in Aravaipa, attracted settlers from Mexico as well as Anglo-American farmers, ranchers and miners. At its demographic peak during the early twentieth century, almost 1,000 people were scattered throughout the Aravaipa area, and it supported two prosperous farm villages on the east and west ends of the canyon, several hundred acres of irrigated farmland, five well-developed mining camps, a number of large ranches, and dozens of homesteads, goat camps, and mining prospects. During Aravaipa's boom years, livestock ranged over the entire study area.

Today, the mining towns of the Aravaipa are ghost towns, the Angora goats have been gone for half a century; the prosperous farm village on the canyon's east end has only two permanent resident families; former roads into the tablelands have become impassable; and many ranches are operated by absentee owners. Scattered throughout the study area, paralleling Amerindian ruins, are the visible remains of former Euroamerican settlement: abandoned homes, corrals, barns, mines, line camps, goat pens, fences, trails, and water developments. To the ecologist, the Aravaipa remains beautiful, although the landscape includes exotic plants, invading fish and non-native birds, ghosts of extinct mammals, eroded arroyos, restructured creek and tableland plant communities, and widened and deepened creekbeds. The nature and quality of human impacts on Aravaipa's environment is the central issue of this study. It is a discussion of whether particular human transformations in Aravaipa have been desirable or undesirable.

In summary, it is hoped that this history will provide local managers with a greater time-depth and feeling for the ways in which humans and natural events have intertwined to shape Aravaipa's present appearance and the condition of Aravaipa's resources. Wise future management cannot be divorced from the cumulative impacts and decisions of the past. Future management can benefit from the knowledge, the admitted mistakes, and beneficial decisions made by former residents.

LOCATION OF THE STUDY

The study takes place in a small 450 square mile section of southern Arizona that is bisected by Aravaipa Creek and Canyon (Maps 1 and 2). At its center is the first Wilderness Area managed by the Bureau of Land Management, considered by many the jewel of the BLM's Gila Resource Area. The study area includes those sections of Graham and Pinal Counties which surround Aravaipa Creek, and roughly encompasses the territory inhabited by the Aravaipa band of the Apache (Tsé jiné clan). The area is not geographically of one piece, but includes portions of three seperate watersheds connected more by the movement of residents than by geography. At the center of the primary study area is the creek which provided a corridor for residents of the east and west ends of Aravaipa Canyon until automobiles became the preferred mode of transportation. The creek was the economic focus of livestock raising and farming, connecting residents through the use of its water, and as an intermittent passageway. Yet the rough canyon through which the creek passed, particularly the Aravaipa box, also separated residents and prevented easy communication.

A larger secondary study area surrounds the primary study area. To the north, the secondary study area includes the San Carlos Mineral Strip, land which moved back and forth between Apache and non-Indian tenure. On the west end of Aravaipa Canyon the San Carlos trail provides access to the San Carlos Reservation by horse or by foot. To the south, the Copper Creek mining complex, reached from Aravaipa by various horse trails and four-wheel drive roads over the tablelands, is part of the secondary study area.

METHODOLOGY, ORAL HISTORY AND ETHNOECOLOGY

This report employed oral history interviews, standard documentary research, and field observations to generate a chronological history of land use and human-induced land change in Aravaipa. As I began to collect and review documents, I came to appreciate the richness of Aravaipa's history. I also realized that some information could not be retrieved from the historical record. For instance, while general trends in game species could be partially reconstructed, the history of smaller, non-game species will remain anecdotal. While exact dates of local floods and summer droughts were recalled, the exact years of invasion of exotic plants and some non-native animals went unrecorded. Similarly, while general trends in mining can be documented, details on the time-span of operations and quantities of production remain scanty.

Field observations confirmed the importance of Aravaipa as a unique and richly varied ecological area. Although it was impossible to survey each of the fifty tributary watersheds contained in the 450 square mile study area, those surveyed revealed such diversity, in both human and ecological history, that only the most general observations could be made. The fieldwork demonstrated the importance of having informants accompany the researcher to describe unique historical events, which otherwise might have remained mysterious even to the best ecologists. It made clear that many approaches (tree rings, water quality sampling, soil and land survey) are all useful in understanding how a piece of landscape arrived at its present condition.

A portion of the methodology for this report relied on interviews and dialogue with over forty Aravaipa residents and former residents concerning their recollections and perceptions of environmental change. I directed interviews toward generating both a chronology of events and a description of attitudes and feelings. The interviews included an informal questionnaire compiled by the Bureau of Land Management. Questions addressed the availability of resources, personal environmental ethics, evaluation of human-induced and natural environmental change, the degree to which cultural tradition (Amerindian, Mexican-American, Anglo-American) influenced resource use, and informants' perceptions of unintentioned results of well-meant actions.

The use of oral history interviews presents a few obvious pitfalls which the interviewer has attempted to avoid. Dangers of the method include the failure of the informant's memory, the selective process in recollection, a tendency to idealize the past, the inclination to allow self-interest to shape facts, and the possibility that the interviewer may influence the informant's response. In doing the research for this study, whenever possible I attempted to cross-check interviews with those of other informants, and to substantiate oral information with both written documents and physical evidence. I attempted to avoid secondhand information; however, in many cases I found that the recollections of first-generation Aravaipa residents had been passed down to their children and provided useful knowledge. As would be expected, an enormous variation existed in the informants' willingness and ability to recall the past. In obvious ways, memory reflected personal experience and interests, and frequently was specific to certain subjects or activities. Women, for example, proved to be excellent informants on family history and community life, while men were generally better informed on economic activities like mining or ranching.

These interviews have been a great pleasure to me, and, I hope, to the informants as well. At the start of the study, it was anticipated that approximately eight informants would be interviewed. However, the people of Aravaipa proved to be such an extraordinarily long-lived, vital, interesting and articulate group that the number escalated to five times the original plan. Unfortunately, this present study is not a history of the people of Aravaipa, whose rich and exciting lives certainly deserve another report or book. Time limitations dictated that no family histories would be included in this report. Perhaps, the work in this study can be combined and enriched in the future into a history of some of Aravaipa's major families.

Ethnoecology combines the word roots for "ethnos," "oikos[eco]," and "logos." "Ethnos" means a people, nation or band of people living together. "Oikos" is the Greek word for "household" or "dwelling place." "Logos" is most often used in words related to discourse, discussion, logical arguments, and is even etymologically connected to gossip. Philosophically, "logos" describes the regulatory or moving principles in things (the "ology"). In short, ethnoecology can be described as the study of people, living in place, about their dwelling place. Concern for place means both the household economy and the ecology-- both from the root "oikos." As any researcher sitting around a friendly cup of coffee discovers, ethnoecology becomes a dialogue concerning the perception of ecological change during one's life, in this case the Aravaipa area. What caused the mountain lions to descend to lower elevations? Why did certain families leave the canyon? Who and what was responsible for the changes in Aravaipa Creek? How much wood is needed to run a moonshiner's still? Why is filaree disappearing? The ethnoecological method is not a new technique. It uses standard documentary research, field observations, along with oral interviews. But it is a new focus, attempting to unite nature with human management of natural resources, household economics with dwelling place, and ethnic beliefs and perceptions with environmental history.

ORGANIZATION OF THE REPORT

Since this report is a history of human activities, it is organized by economic sectors, not resources. In other words, it is arranged by ranching, mining, goat herding, farming, trapping and hunting, rather then mineral, plant, or animal resources. The tables, maps, and photos for each chapter can be found at the end of the chapter. The scientific names of plants and animals are listed in Appendix I. For a background on the natural setting of Aravaipa, read Chapter I. Chapter II provides a summary of pre-Euroamerican activities as recorded by archaeologists and the earliest Spanish explorers and the history of Aravaipa up to the 1870s. Chapters III through X describe what has been learned of each economic sector of Aravaipa's history with a short summary of environmental impacts at the end of the chapter. Chapter XI addresses general changes in environmental ethics. Chapter XII summarizes events by decade, introduces a methodology for historical reconstruction of Aravaipa's plantlife, discusses what events may have led to irreversible change, and summarizes how environmental values have affected each major natural resource. The report ends with suggestions for future studies that would enhance our knowledge of the past and augment our ability to restore and rehabilitate Aravaipa's ecology.

This study, by its very nature, must be full of mistakes. A surprisingly large amount of material exists for a small rural area which had only a few thousand residents over the last century. Listening to hours of tapes in both Spanish and English has undoubtedly led to some misconceptions and incorrect information. Informants for the study are the only ones who can correct the mistakes. The researchers would greatly appreciate any corrections or comments. They can be contacted in Tucson or through the Safford Office of the Bureau of Land Management.

ACKNOWLEDGMENTS

To produce the chronological history of human impacts in Aravaipa, the documentary search has taken the researcher to the Arizona State Archive, the Arizona Historical Society in Tucson, the Arizona Historical Foundation in Phoenix, Special Collections at the University of Arizona Library, the Arizona Room of Hayden Library at Arizona State University, the Graham County Historical Museum, the Graham County and Pinal County Recorders Offices and title companies in both counties, the record files of the Bureau of Land Management in Phoenix and Safford, the Bureau of Indian Affairs, the real estate office of the San Carlos Tribe, the Desert Laboratory at Tumamoc Hill in Tucson, the Office of Arid Land Studies at the University of Arizona, Documentary Relations of the Southwest at the Arizona State Museum, the Arizona Department of Water Resources in both Phoenix and Tucson, the Arizona Bureau of Geology and Mineral Technology, the Arizona Livestock Sanitary Board, the Arizona Game and Fish Department, the division of Animal Damage Control, the offices of Nature Conservancy and the Whittell Trust. We have obtained materials and photographs from the Huntington Library, the Bancroft Library, and the Southwest Museum in California, and the special collections department of the library at Northern Arizona University. We are grateful for the cooperation and assistance of all of these institutions.

The researcher wishes to thank the many informants whose recollections have created this history of Aravaipa. Former residents of Aravaipa have generously and enthusiastically shared their most personal reminiscences with me, allowed me to copy family photographs, and have poured over maps and documents with me. I had not anticipated the graciousness of my reception into the personal past lives of so many people. It soon became apparent to me that the people of Aravaipa relished and treasured their years in the canyon, recalled them almost uniformly as the best years of their lives. My thanks to all of you who have

received me into your homes, spent hours with my tape recorder and notebooks, fed me delicious meals, given me a place to bed down for the night, lent me books and documents, allowed me to copy your treasured old photographs, and accepted me as your friend. I never anticipated such a generous reception or such enthusiastic support, and have never had a "job" which has been such a thorough pleasure.

My informants on Aravaipa's east end have included Victoria Salazar Tapia and her granddaughter Norma Tapia Luepke, Lola Salazar Acevedo, Teresa Acevedo, Bill and Dorothy Salazar, Rosalia Salazar Whelan, Tex Salazar, Rosalie Campos Hendrickson, Margaret Duffy Haby, Claude McNair and Henrietta Moraga McNair, Terry McNair Burgess, Charlie Prude, José Sanchez, Durward Sanford and Georgia McNair Sanford, Clay and Alice Turnbull, Angelina Moraga Valenzuela and Mike Valenzuela, Ramon Valenzuela, Lyle Sanchez, Maria Leon Luna, Irene Hancock Kennedy, Jay and Jenny Schnell, Keith Smith, Neuel J. and Jane Weathersby, Juan and Simona Ayala Rubal, Charlie and Luisa Whelan, Joseph Wootan, Alma Brown Wootan, Lola Rex, Wilfred Claridge, Eleanor Claridge, Hugh Claridge, Warner Mattice, Mildred Bleak Cosper, Martin Buzan, Martin Ramírez, Ben Avery, Paul Brooks, Jimmy Vindiola, Nicho Vindiola and many others. At San Carlos, I have been generously assisted by Lonnie Bullis, Reece Bullis, Mae Dewey, Marlo Cassadore, Ola Cassadore Davis, Veronica Belvado, Della Steele, Lucille Shortner, Rosalie Pechule, and Wallace Johnson. On the west end, my informants have included Fred Wood, Cliff and Georgia Wood, Jep and Peggy White, Fred Upshaw and Gussie White Upshaw, Shorty Neal, Joyce Mercer, Virgil Mercer, Joe Flieger, Babe Brown Roberson, Louie Barassi, and Sam Baker. It has been a great privilege to me to have had the opportunity to explore your exciting and interesting lives.

Many other people have assisted with access to information and with finding the correct informants for particular subjects. We wish to thank John and Norma Luepke, Conrad Bahre, Tom Collazo, Dave Brown, Barry Spicer, W. L. Minckley, Peter Warren, Ray Turner, Julio Betancourt, Tony Burgess, Tad Nichols, Doug Koppinger, Gene Wright, Peter Sundt, Joe Tabor, Bob Scarborough, Susan Leuebermann, Greg Schoon, Janice Luepke and Pat Spoerl for suggestions, photographs, guidance, loaned documents, and general information. Hugh Claridge, Jep White, Jenny Schnell, and Tom Waddell guided me over bumpy roads to places I never would have found without them. Dr. Charles Polzer, the patient director of

Documentary Relations of the Southwest allowed me time and equipment for the completion of the report. Dr. Thomas Sheridan, Fritz Jandrey, Paul Hirt, Richard Felger, Robert Lenon and Betsy Sandlein corrected the manuscript, Boleyn Baylor provided editorial assistance, and I have had excellent research assistance from Nancy Pontius, Naomi Barnes, and Kelly Reed.

I would particularly like to thank the project contract officer, Darrell Sanders of the Bureau of Land Management in Safford for his thoughtful guidance. Many former Aravaipa residents have expressed their enthusiasm and interest in the project, and commend the Bureau of Land Management for sponsoring this study. Many of the researchers' colleagues in the fields of biology, anthropology, history and agriculture have congratulated the Bureau of Land Management for producing an historical land use study. Darrell Sanders conceived of the project, and coordinated and assisted the researchers throughout. Together with Al Bammann and Bill Brandau, he assembled the set of questions which focused the research. He offered generous assistance of every kind. Darrell's patience, when the project expanded threefold in size and continued several months past the original completion date, is particularly appreciated. All the personnel at the Safford BLM office, particularly Sandy Phillips, have rendered much needed assistance.

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ARAVAIPA CANYON: TIMETABLE OF NATURAL EVENTS

Compiled from Oral and Written Sources

1866	Flood on the San Pedro, 20 buildings at Camp Grant washed away.
1873-74	Floods.
1885-1902	Intermittent droughts.
1887	Earthquake, recorded in all areas around Aravaipa.
1892-93	Worst year of drought.
1904	Wettest year, according to "old-timers."
1916	Flood, Aravaipa and throughout general area; confluence of Gila and San Pedro ran a half mile wide for over a week.
1917	Drought in Pinal County.
1918-21	Intermittent drought, individual wells and springs dry up.
1919	Flood.
1922	Flood.
1923	Flood in upper Aravaipa.
1926	Flood on the San Pedro and west-end Aravaipa. (Mercer cattle drowned in Clark Canyon).
1926-30	Relatively wet years.
1933-34	Drought.
1935	Good rains, followed by flood (furniture floating in Buzan, Brandenburg, White houses).
1940	Flood (December), original Brandenburg house on west end washed away.
1941	Flood.
1946	Flood (September).
1954	Summer flood, could be heard 20 minutes before it arrived.
1963	Flood, washed out fields on east and west ends.
1967	Flood, road impassible on west end.
1972	Flood.

1976	Drought.
1977-86	Rainy years, springs revived.
1979	Flood.
1983	Flood.

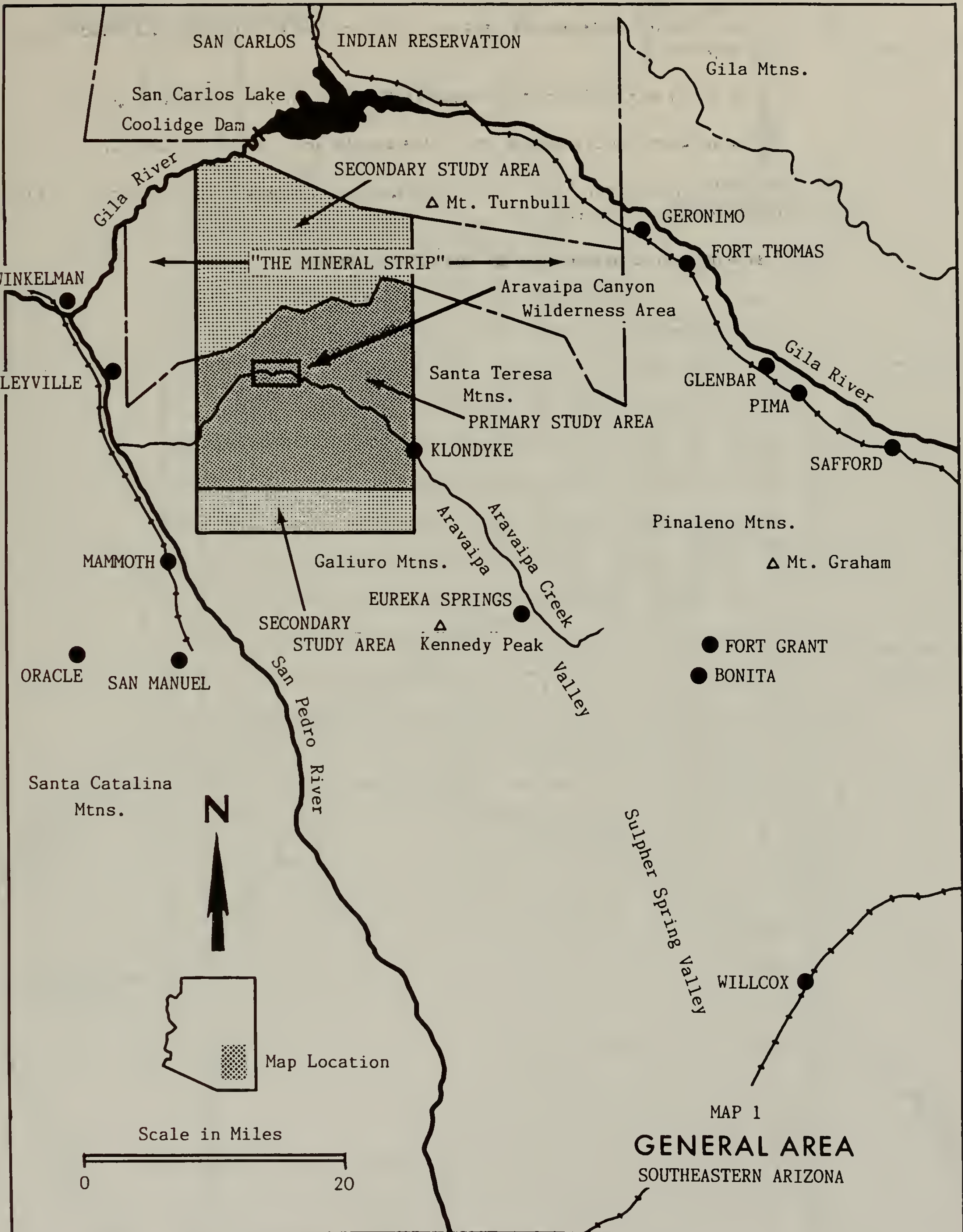
TIMETABLE OF HUMAN EVENTS

unknown	Amerindians settle on the San Pedro and in Aravaipa Creek.
1540-41	Spaniards explore and claim the area of Aravaipa.
1540-41	Coronado visits the Aravaipa Valley, observes ruins of a large abandoned structure made of red stone named Chichilticale.
1697	Father Eusebio Kino visits Sobaipuri villages on the San Pedro and meets Indians from two villages located upstream on an east-flowing drainage not far below the Gila (assumed to be Aravaipa).
c. 1715	Apaches move into a pass blocking access between Tucson and the Hopi villages (Eagle Pass).
1737	Father Ignacio Keller visits San Pedro Sobaipuri, finds some deserted villages.
1762-63	Sobaipuris abandon their farms on the San Pedro River, resettle in Tucson.
c. 1770s	Apaches move into the territory around "Big Slanted Rock" and begin casual irrigated farming.
1775	Captain Juan Bautista de Anza finds Chichilticale ruin still standing.
1793	Lieutenant Jose Ignacio Moraga of Tucson presidio oversees settlement of first "manzo" Apache of the Aravaipa band in Tucson.
1821	Mexico becomes independent from Spain.
1830	Lieutenant Antonio Comaduran of the Tucson presidio leads raid against Apaches in Aravaipa Canyon.
1832	Raid by unofficial militia against non-Aravaipa Apache groups in Aravaipa Canyon with compliance of "tame" Apaches of Tucson and Capitancillo Chiquito of the Aravaipas. Recovery of stolen horses and mules from Aravaipa Canyon.
1836	Apache peace settlement established at the confluence of Aravaipa Creek and the San Pedro River.
1841	Preemption Law in the United States (does not include Aravaipa area): Preferential sale of public lands to actual settlers at minimum price.
1847	Captain Comaduran attacks large group of Apaches in Aravaipa and recovers herd of cattle.

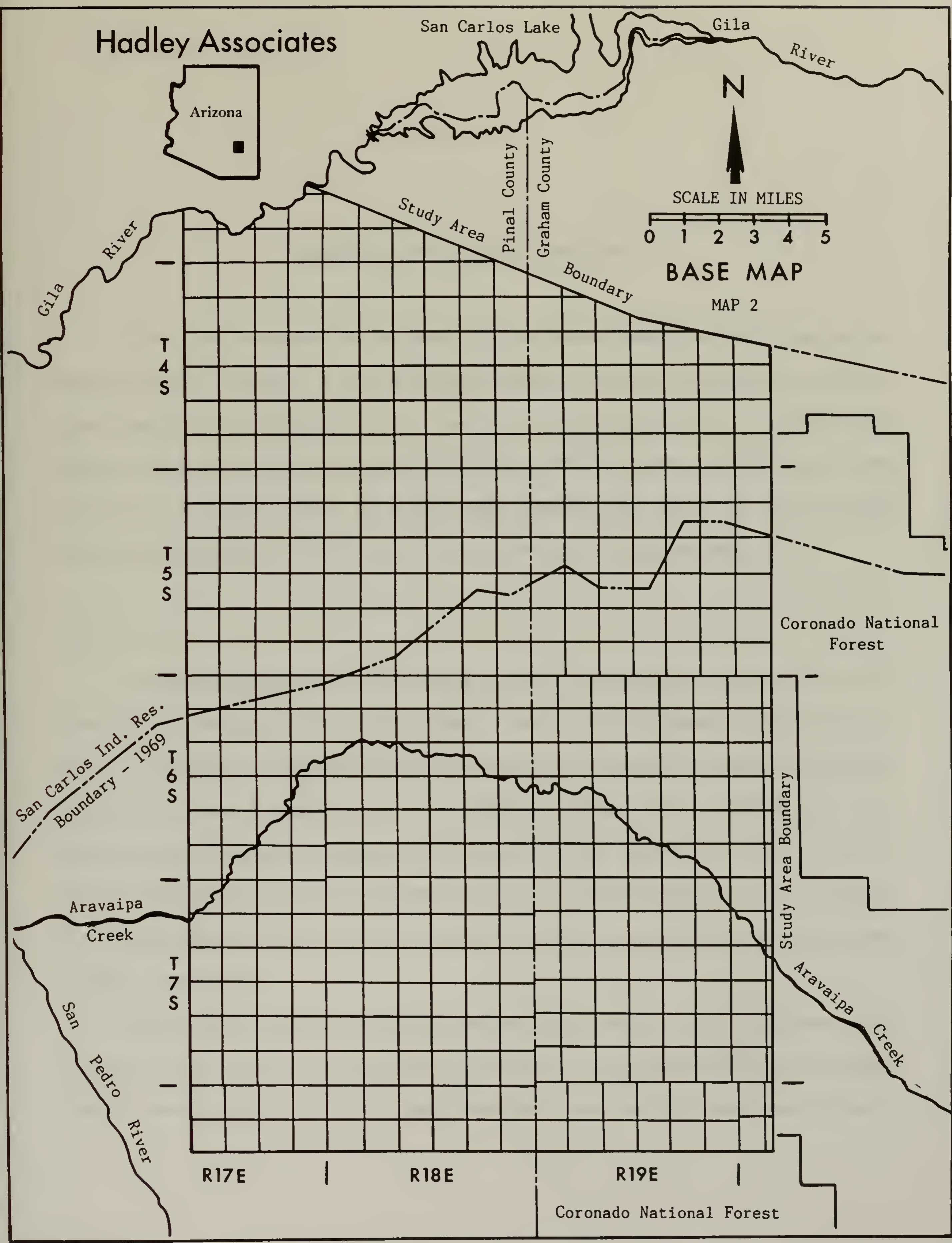
1848	Treaty of Guadalupe Hidalgo, annexes area north of Gila River.
1849	Guadalupe Luque and large group of Papago auxiliaries attack Aravaipa Apaches, recover cattle. Mexican Military established peace settlement at Aravaipa.
1853	Gadsden Purchase.
1854	Aravaipa becomes part of the United States.
1857	James Tevis and Mose Carson travel through Aravaipa Canyon.
1859	Camp "Arivaypa" established at confluence of Aravaipa Creek and San Pedro, location of former Mexican peace settlement for Aravaipa Apaches.
1862	Army post at confluence of Aravaipa and San Pedro abandoned during Civil War.
1862	Homestead Law offers title to 160 acres issued after five years' residence and cultivation.
1863	Captain Tidball and Jesus Maria Eliás lead raid in Aravaipa Canyon, killing a number Aravaipa (near confluence of Turkey Creek and Aravaipa Creek).
1865	Army post reestablished, renamed Camp Grant.
1867	William Bell travels through Aravaipa Canyon on railroad survey, first photographs of canyon made.
late 1860s	First reported prospecting and primitive mining at Copper Creek and Table Mountain.
1870	Aravaipa Apaches begin coming into army post at Camp Grant to ask for food; rationing station set up.
1871	Camp Grant Massacre of Aravaipa Apache, led by William Oury Jesus Maria Elias and O'odham leaders.
1871	Camp Grant Reservation for Aravaipa Apaches established at confluence Aravaipa creek and San Pedro.
1872	General Mining Law.
1872	Mining at future Aravaipa townsite begins.
1872	Colonel H. E. Hooker establishes Sierra Bonita Ranch, importation of large numbers of cattle into Aravaipa area begins.
1873	Timber Culture Law.
1873	Camp Grant Reservation formally disbanded, Aravaipa Apache relocated to San Carlos Reservation.
1873-74	Army post relocated from Aravaipa Creek to present location at Fort Grant.

1874	Al Seiber, Dan Ming, participate in "scout" through Aravaipa; large number Aravaipa Apache deaths (near Matanza Canyon).
1874-75	Wagon road constructed through the Aravaipa Valley to army telegraph station near emergence point of Aravaipa Creek (later known as "Dunlap," on maps "Proctor Ranch").
1874-75	Telegraph line put in through area later known as San Carlos Mineral Strip to San Carlos, connecting Aravaipa and San Carlos.
1874-77	Establishment first Euroamerican settlement in Aravaipa Canyon, probably by Epimenio Salazar and Dan Ming. By 1875, both Ming house and U.S. Army station (later Dunlap Ranch) have been built.
1877	Desert Land Law, reclamation through irrigation of up to 640 acres.
1877	Eskiminzin and Capitan Chiquito (Bullis) return from San Carlos Reservation to former farmlands on San Pedro and Aravaipa Creek.
1891	General Public Lands Reform Law, repeal of Preemption and Timber Culture Laws; reduction of Desert Land Law to 320 acres; creation of Forest Reserves from public domain.
1889-94	Apache Kid frequently raids through Aravaipa, hides out in cave on west end of canyon.
1905	Forest Service established within Department of Agriculture for administration of Forest Reserves.
1909	Enlarged Homestead Law, up to 320 acres of non-irrigable, semiarid land to homesteaders.
1912	Three-Year Homestead Law reduced settlement requirements from five to three years.
1914	Aravaipa Cattlegrowers Association organized.
1916	Stockraising Homestead Act allowed entries of 640 acres for grazing purposes. Creation of National Park Service.
1917	Pinal County Cattlegrowers Association organized.
1920	Mineral Leasing Law, allowed exploration and development of minerals on leased land.
1933	Soil Erosion Service established in Department of Interior.
1934	Taylor Grazing Act placed eighty million acres into grazing districts under direction of General Land Office.
1935	Soil Conservation Service created in Department of Agriculture.
1946	Bureau of Land Management created through merger of General Land Office and the Grazing Service.
1954	Recreation and Public Purposes Act allows sale and lease of public lands for public purposes other than recreation; electricity west end.

1956	Telephones west end.
1966	National Historic Preservation Act protects prehistoric and historic properties of regional and local importance.
1969	Establishment of Aravaipa Primitive Area by BLM through land classification process.
1969	First negotiations for purchase of land in Aravaipa by conservationist organizations.
1970	National Environmental Policy Act requires federal agencies to assess the impacts of their actions on the environment.
1976	Repeal of all homesteading acts and end of homesteading.



MAP 1
GENERAL AREA
SOUTHEASTERN ARIZONA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Arizona
San Carlos Lake
Gila
River
N
SCALE IN MILES
0 1 2 3 4 5
BASE MAP
MAP 2
Study Area
Boundary
Pinal County
Graham County
Gila
River
T 4 S
T 5 S
T 6 S
T 7 S
Coronado National Forest
San Carlos Ind. Res.
Boundary - 1969
Aravaipa
Creek
Study Area Boundary
Aravaipa
Creek
San
Pedro
River
R17E
R18E
R19E
Coronado National Forest

I

ARAVAIPA, THE NATURAL SETTING

The study area is an arbitrary polygon placed on portions of several watersheds (Map 3). These include the mid-reach and a few tributaries of Aravaipa Creek; upper Zapata Wash, upper Dry Camp Canyon and upper Copper Creek Canyon, all of which drain into the San Pedro; and four watersheds of the Mineral Strip Area which drain directly into the Gila. The primary study area can be divided into four topographic areas: the east and west ends of Aravaipa Canyon, the canyon corridor (including side canyons), and the surrounding "tablelands" (including canyon walls, the Copper Creek area and parts of the Mineral Strip).

TOPOGRAPHY

The rugged topography of the Aravaipa area placed limits on the availability of resources and services, everything from extracting minerals to bringing a midwife. Roads and a railroad connecting the east to the west end were not economically viable and their absence limited exports and imports. The rugged topography also protected many resources, from mountain lions to moonshiners, from discovery and persecution. It kept the east and west end communities remarkably separate with two somewhat distinct "neighborhood" histories. The narrow valley and floodplain bottomlands limited the growth of agriculture. Throughout human contact, the landscape was praised as beautiful. Increasingly, Aravaipa's topography has become a major reason for land protection and recreational development.

The area surrounding Aravaipa Canyon contains three distinct sections: an upper valley known as the "east" end or Aravaipa Valley, a lower valley known as the "west end," and a unique canyon sandwiched between the valleys and surrounded by tablelands. Aravaipa Canyon and its upper and lower valleys cover 541 square miles. The upper valley gathers seasonal runoff from parts of the Santa Teresa, Pinaleno and Galiuro mountain ranges, and from arroyos and erosion gullies that start at an ill-defined watershed divide separating the Aravaipa Valley and Creek from the Sulphur Springs Valley and Willcox Playa. The upper valley's relatively wide flat floor (approximately twelve miles wide) narrows to 1.2 miles in width near Klondyke. These bottomlands attracted homesteaders and ranchers, especially around springs. The canyon itself runs east to west. It cuts through the Galiuros for seventeen miles, rarely exceeding 1300 feet in width and sometimes narrowing to 100 to 130 feet. The west end, starting at the point where Aravaipa Creek breaks out of the canyon, is an everwidening floodplain that merges with the San Pedro river.

While the upper and lower valleys are wide and open, the canyon is narrow and dramatic. In places, the walls attain 700 feet in height. As you walk the canyon, a profusion of peaks appear and disappear behind each other. Along with Cave Creek Canyon in the Chiricahuas, the topography and wetlands of Aravaipa are the most highly praised of any small canyon in southeastern Arizona. The relatively flat, smooth gradient of the canyon corridor has traditionally been the site of through traffic from the upper watershed (Sulphur Springs Valley) to the San Pedro River. Small locations, where the corridor widens, have supported homestead, floodplain agriculture. Many of these floodplain terraces are now used for camping.

The highest peaks south of Aravaipa Canyon are in the Galiuros: Kennedy Peak (7,540 feet), Rhodes Peak (7,116 feet), Little Table Mountain (6,256 feet), Table Mountain (6,158 feet), Four Mile Peak (6,240 feet) and Holy Joe (5,415 feet). North of Aravaipa Canyon, the Galiuro Mountains are lower: Lookout Mountain (5,337 feet) and Brandenburg Peak (4,366 feet). In the northeast, above the entrance to Aravaipa Canyon, Horse Mountain (6,180 feet) is the most outstanding volcanic butte and Cobre Grande Mountain is a high ridge (averaging between 6,700 and 7,155 feet). The Santa Teresas, with many unnamed peaks, average between a low of 5,300 feet and a high of 6,166 feet at a peak at the headwaters of Blue Jay Tank. To the west, in the Pinalenos, West Peak (8,441 feet) and Blue Jay historically fed the cienagas and springs that, in turn, fed the aquifer of Aravaipa Creek. The greatest relief is 5,360 feet from the top of Kennedy Peak to the junction with the San Pedro.

The tablelands on either side of the canyon are complex terrains, with flatter portions such as mesa tops, canyon rims, butte tops, ridges connecting buttes, and the more level bottoms of canyons and draws. Steeper slopes include vertical cliffs, canyon slopes, butte slopes, higher mountain slopes (dissected by washes), and rolling hills. Tablelands north of the canyon between Klondyke and the San Pedro are cut by about twenty-five tributaries including seven major canyons: Buzan Canyon, Painted Cave Canyon, Javelina Canyon, Horse Camp Canyon, Booger Canyon, Paisano Canyon, and Hell Hole Canyon. The southside tablelands contain approximately nineteen tributaries with five major canyons: Four Mile Canyon, Turkey Creek, Parson's Canyon, Virgus Canyon, and Holy Joe Canyon. These incisions into the tablelands made road construction a nightmare.

In contrast to Aravaipa Canyon, the tablelands were rarely used by humans from spring to fall because of heat, lack of abundant water, and rugged terrain. Mining towns in the tablelands such as the Aravaipa townsite tended to be temporary. Lack of water and steeper slopes limited cattle use. The ruggedness provided excellent escape terrain for bighorn sheep but equally good habitat for domestic goats. The topography forced most motorized transport to circle the ends of the Galiuros or Santa Teresas/Turnbulls. A southside wagon road connecting Aravaipa Creek to Table Mountain and Mammoth could be traversed for hauling and personal travel but, to this day, it is barely passable by four-wheel drive vehicles. The northside trails went to the San Carlos Mineral strip and, essentially, have remained horse trails.

Changes in topography have not been well documented for the Aravaipa study area. Since the advent of Euroamerican settlement, the watershed has been expanding naturally, and the base level of the San Pedro has probably lowered. Although both these topographic changes are outside the scope of this report, they may accelerate the downcutting of the canyon corridor, the sanding-in of the main creek channel, or the shaping of the tributary channels.

GEOLOGY

Human interest in Aravaipa's beauty and mineral wealth comes from geologic events that began tens of millions years ago. These events fall into four broad periods: the Precambrian/Paleozoic bedrock, the Santa

Teresa complex/the Galiuro volcanics, the basin fill, and the Pleistocene-to-Holocene alluvium presently occupying the floodplain.

Precambrian and Paleozoic Events: The bedrock of Aravaipa is undivided Paleozoic and Precambrian granites. The Precambrian granites comprise the lowest known geologic layer to provide a geologic history of the area. But they have had little interest to human settlement. The Paleozoic limestones became host rocks for later ore deposits and have special plant communities. Miners and ecologists have sought them out.

Late Mesozoic and Cenozoic Events: The Aravaipa area was close to the southwest corner of the North America plate. The area was folded, faulted, intruded by magmas, and covered in volcanics as the North American plate drifted west over the very active edge of the Pacific floor and collided with other tectonic plates. During the Laramide Orogeny (seventy-five to fifty million years ago), heat from the Earth's mantle, crustal folding and breaking, melted sea-floor rocks. Mineral-rich solutions rose toward the surface and solidified. Porphyry copper, lead and zinc, particularly in areas with contact between the Paleozoic limestone and granites, deposited themselves in the Table Mountain Mining District. Nearby, in the Copper Creek area, there were fewer of these contact deposits. Instead, molybdenum and copper deposits formed in saturated solutions in the granites. In addition, breccia pipes, highly broken fingers of rock near Copper Creek (e.g., Childs Atwinkle Mine) filled with mineral solutions. After millions of years of natural erosion, these deposits became accessible to miners.

Tertiary Events: The Basin and Range Orogeny of fifteen to eight million years ago created fault-block ranges with a northwest-southeast trend. Aravaipa's upper valley and the San Pedro Valley still follow this trend. The ancestral Galiuro and Santa Teresa mountain ranges rose relative to these valleys and the graben structure of the present-day Aravaipa Valley emerged. (There is no evidence that Aravaipa's canyon through the Galiuros existed in Tertiary times.) As the mountain blocks rose, they also eroded and began to fill the valley. These "basin fill deposits" have been labelled the "Hell Hole conglomerates" and the "older alluvium." They started filling the graben fifteen million years ago.

During this same period, the Galiuro volcanics (andesitic and rhyolitic tuffs and lavas) extruded over the landscape. The Santa Teresa complex, which was more granitic, formed to the north. In the Aravaipa Mining District, vein deposits with variable amounts of lead, copper and silver formed.

As the mountain blocks uplifted higher, they warped the volcanic layers. The trough of one of these warps defined the path of least resistance for waterflow. Waterflow from the filled "valley" of upper Aravaipa, deflected by the Santa Teresas, turned west. By five million years before the present, the crossmountain erosion connected the upper valley of Aravaipa with the San Pedro and drainage switched from Willcox Playa to the San Pedro/Gila. Continually eroding the uplifting Galiuros, the waterflow has been able to "win the struggle" between uplift and downcutting, and maintain the canyon in which it presently flows. The headward erosion that incised the inner canyon continued until about one million years ago. Aravaipa Canyon remains one of the rare through-mountain channels in western geology.

These Basin and Range events created the major landscapes for human settlement: the beauty of the canyon; the relatively flat canyon bottom for easier travel; the "impermeable" geologic container that prevents the upper valley aquifer from leaking away; the "bottleneck" of the container near Stowe Gulch that forces groundwater to the surface and feeds Aravaipa Creek; the upper valley watershed that, during rare storm events, concentrates runoff too fast for the constricted canyon to discharge without dramatic floods; and many of the major ore deposits that became so attractive to Euroamerican settlers.

<u>Pleistocene Events</u>: Regional uplift of the Galiuros and Santa Teresas and twelve to twenty-four wet/dry cycles accelerated erosion and created terraces, especially in the Aravaipa Valley and along the San Pedro. The basin fill sediments now show three to five still identifiable levels. Within the canyon area itself, the more resistant tabular volcanic flows wore down to flat benches. These terraces and benches became the "uplands" of the present Aravaipa area: the major livestock grazing and browsing areas.

<u>Holocene Events</u>: So far in the Holocene, there have been three cut and fill cycles. In the last 10,000 years, the inner canyon may have backfilled two to five feet higher than present. The present erosion cycle (arroyo cutting) is gouging out recent, Pleistocene, and Tertiary deposits. The alluvium formed is called "young alluvium" but, in many places, it is difficult to distinguish from "older alluvium." From Eureka Ranch to Stowe Gulch, the young alluvium can be 0.5 to one mile wide. As the stream enters the canyon, the young alluvium is

only 300 to 1,500 feet in width. From the junction with Turkey Creek, the floor of the canyon ranges from twenty-five to 400 feet until it opens up at the west end. The minimum depth of the younger alluvium is a few tens of feet. These poorly consolidated sediments hold the groundwater resource for wells and human settlement. The younger alluvium also slows the flow from side tributaries to Aravaipa Creek, prolonging a higher mainstream flow.

The geological beauty of Aravaipa comes from its unique combination of ever-changing horizon line (pointed peaks, pinnacles, and flat buttes) and the changing sequence of colored rock types from east to west. To the north, near Stowe Gulch, a series of volcanic knobs sit up within the wider valley of Aravaipa. Before the canyon narrows, cemented conglomerates and volcanics have cracked vertically and eroded into tall spires and chimneys. Passing into the canyon from the east end, the flatter, cream, buff and brown walls of the Hell Hole conglomerates constitute the soft colored, elevated mid-ground view. They display bewitching deformations, cavernous recesses, and rocks of various sizes that delightfully dangle from within the conglomerate. In passing through the canyon, the conglomerates give way to new rock types -- the Tertiary volcanics and Precambrian erosional surfaces. The foreground saturated phreatophyte and paler desertscrub greens, contrasts with the chalkier colors of the canyon itself and the purer blues of sky (Scarborough p.c. 1990; Minckley 1981).

CLIMATE AND HUMAN CONCERNS

The climate of Aravaipa determined the crops that could be grown, the availability of forage for cattle, the recovery rate and species composition of rangeland, the success of citrus orchards, the amount of fuelwood needed by households, the frequencies of floods, fires, and severe freezes, the winterkill die-offs of wildlife, and the drought deaths of livestock. In short, climate shaped the lives of ranchers, farmers, trappers, and hunters.

The climate of southeastern Arizona and the Aravaipa area has biseasonal rainfall with biseasonal droughts. The winter frontal storms come from the north (Arctic and north Pacific); the summer storms from the southeast (Gulf of Mexico and Pacific); and the more occasional tropical cyclonic storms from the southwest (Baja California). Aravaipa sits in the tension zone between these frontal, monsoonal and dissipating tropical cyclones. The proportion of annual rains, the sequences of wet or dry years, and the intensity of flood from each storm type appear to be correlated with El Niño-related events. Failure of both summer and winter rains, consecutive years of drought, long intervals between rain storms, consecutive years of summer/fall rains, catastrophic freezes and catastrophic floods are the weather events of greatest concern to ranchers and farmers.

The west end of the canyon receives between ten and fifteen inches per year except in very dry or very wet years. Klondyke, on the east end of Aravaipa Canyon, averaged 14.1 inches between 1952 and 1977. Both ends averaged about 17.5 inches between 1978 and 1989. The rest of the study area averaged between fifteen and twenty inches except for drought and very wet years. Since approximately 1960, about half to 60 percent of the rainfall comes in winter. In the upper elevations of the Galiuros, Santa Teresas and Pinalenos, precipitation (rainfall/snow equivalents) is increased up to twenty-five inches per year (Sellers et al. 1974).

The mean January air temperature is between forty-five and fifty degrees F in January at the west end and about five degrees cooler toward the east end and in higher elevations. The peak areas are about ten degrees cooler than the bottomlands. Similarly, the lowlands have a mean July temperature between eighty to eighty-five F; the mid-elevations about five degrees cooler, and the highest peaks about ten degrees cooler (Sellers et al. 1974).

Evapotranspiration includes water losses from the ground surface on hot days, transpiration losses from shallow-rooted plants such as crops and from deep-rooted trees such as mesquite that tap the water tables, and losses from vegetation continually in contact with surface water (e.g., phreatophytes of Aravaipa Creek). Potential evapotranspiration is higher at the west end (40-45 inches), lower at the east end (35 to 40 inches), and lowest in the small part of the watershed in the high elevations of the Galiuros and Pinalenos (25 to 30 inches). Actual evapotranspiration varies between ten and thirteen inches throughout the study area. In areas with phreatophytes (the fourteen miles within the canyon before the 1983 floods), actual evapotranspiration has been estimated at thirty-five inches per year, approaching potential values. One estimate states that 94.3 percent of all the precipitation falling into the Aravaipa watershed is evaporated or transpired soon after falling (Ellington 1980). The "effective soil moisture," the amount of water available to plants, is borderline for dryland farming. The Aravaipa climate (high evapotranspiration rates, erratic rainfall, low rainfall, extensive shallow soils) encouraged homesteaders to garden near springs or along the perennial creek. Settlers focused great amounts of thought and energy on the development of groundwater and stream diversions for more reliable farming

(Chapter VIII). Following practices around the planet for areas with low effective soil moisture, humans raise livestock and try to balance grazing locations and stock numbers with natural and developed watering sites (Chapter VI).

CLIMATIC HISTORY

Climatic changes in the Aravaipa area have been documented but not analyzed in detail. The sources for climate history and interpetation appear in Table IA. The difficulty for the environmental historian is combining an incomplete climatic history with an incomplete history of human activities. Oral history can be most accurate for local special events: catastrophic freezes, floods, single-year droughts, and summer rains. Because of the unique nature of the Aravaipa watershed (narrow canyon, many tributaries, steep relief in the mid-reach), flash floods are particularly local and do not follow, for example, flood patterns reported for the Santa Cruz River in Tucson newspapers. Regional climate provides information on widespread freezes, droughts, and winter rains but does not record these local events, unless they are particularly severe and are considered newsworthy enough to be reported in a local newspaper. Decadal trends are difficult for both meteorologists and local residents to discern. Weather station data give the best picture for these longer term trends. Decadal trends are crucial to the history of renewable resources such as perennial grass and tree growth which respond to two- or three-year weather patterns. Only recently have decadal trends been organized coherently (Betancourt and Turner 1990). Until approximately 1900, Arizona remained in the tail end of the little "ice age" that began in the fifteenth century. Both the summer maximum temperatures and the winter minimum temperatures were cooler than during the early twentieth century. In other words, the soil provided more water to plants and less water to evaporation. Water remained in the soil later into the warmer springs because most plants could not utilize the water during the cooler winters. The cooling in the fall was consistent and predictable, while the time of spring warming was chaotic and changed every two to four years. The winters were drier and the summers wetter between about 1868 and 1890.

From 1850 to 1900, there were three medium-term winter droughts of five to seven years. In other words, there were three clusters of years with very dry winters. Floods were most common in the winter and fall.

From 1901 to 1940, the temperatures warmed. After 1930, not only was there a decade of warmer temperatures but also a decade of lower rainfall. Droughts came in single years, in fits and starts, not repetitive year-to-year droughts as before 1900. The most severe single-year droughts had both dry winters and dry summers. As residents remember, the worst drought occurred in 1933-34.

In 1941, conditions in the atmosphere changed again. Despite reported global warming, regional temperatures cooled once more, although "little ice age" temperatures were rare. The seasonal rains became more predictable with longer runs of seasonally wet periods or seasonally dry periods. But, low rainfall persisted. During the 1940s, there was year after year of subnormal summer rains. Between 1951 and 1956, the low summer rainfall continued and winter rains also diminished. During these 1950s year-round droughts, all plantlife was hurt.

The lower rainfall period lasted until the 1960s. In the 1960s, summer rains returned to pre-1900 levels. The cooler period of more predictable seasonal trends lasted until 1972. Since 1972, the temperatures have increased again and may have a trajectory of their own, because of human influences (global warming).

Dry winters inhibit winter-adapted annuals, biennials and shrub growth. Dry winters leave more of the nutrients in the soil for the summer growth spurt, reducing the competition between winter plants and summer plants. A rancher's "grama grass" dream decade would have cold, drier winters and wetter summers. This occurred before the turn of the century and erratically in the twentieth century (see Chapter XII).

During the period fifty to 100 years before 1880, severe freezes apparently went unreported in the desertscrub. Catastrophic freezes have become more common in the past 100 years. Catastrophic freezes frequently kill numerous individual plants among many desert scrub species and all age groups of saguaro (mild or severe freezes kill only old and young saguaro). Catastrophic freezes usually occur within seventeen days of the winter solstice, have low minimum temperatures, and fifteen to twenty consecutive hours of freezing. Years of regional catastrophic freezes recorded in southeastern Arizona start with a climatic record after 1910. They include January 1913, 1937, 1949, 1962, 1971, and December 1978 (Bowers 1980). No west end citrus farmers remain who could tell the story of these catastrophic freezes in Aravaipa during the earliest period of farming prior to 1910.

SOILS

The soils of the Aravaipa watershed covered in this report have not been studied by the Soil Conservation Service, except on the very east end. They generally fall into two over-simplified groups: shallow soils of the uplands and deeper alluvial soils of the valley bottoms.

The upland soils derive from volcanic parent materials with a dark, gravelly clay loam or gravelly loam top horizons, a twenty inch or less gravelly clay subhorizon, followed by bedrock. The alluvial soils exceed sixty inches in most areas with a gravelly fine sandy loam top horizon, and a gravelly sandy loam, loamy sand or gravelly sand subsurface. There are also some paleosols, relict soils in Oak Grove Canyon and near the Aravaipa townsite that developed in bygone days. These soils are exceptional to the above characteristics.

Except for small areas of the upper elevations of the Santa Teresas and Pinalenos, the majority of soils belong to the thermic semi-arid soil zone (Hendricks 1985). The soils have a mean annual temperature of fifty-nine to seventy-two degrees F with ten to sixteen inches of rainfall. The difference between mean summer and mean winter soil temperatures is greater than nine degrees F at fifty inches or, in shallow soils, at the soil-bedrock interface. The higher elevations of the Santa Teresas and Pinalenos have mesic subhumid soils. These are outside the study area.

The east end, where Aravaipa spreads out into the San Pedro, the soils belong to the Caralampi-Whitehouse Association. The soils derive from or sit on old alluvial surfaces. They are deep and vary from gravelly to fine-textured and gravelly to moderately fine-textured. The soils are found on slopes varying from level to moderately sloping to steep slopes on the dissected alluvial terraces. The east end also includes pockets of the Latene-Nickel-Pinaleno Association which are more limey than the Caralampi/Whitehouse group (Hendricks 1985; Tabor p.c.).

WATER -- SURFACE AND UNDERGROUND

The most unique features of the Aravaipa area are its perennial springs and stream and the upper valley groundwater basin. These springs provide an abundant source of water for southcentral Arizona and have become increasingly available for human, livestock and wildlife use through increased water storage (tanks, dams) near springs, diverted stream runoff, and improved pumping technology. The widespread location of springs has increased the available forage for cattle (see Map 4). Aravaipa Creek, a perennial stream, supports one of the best collections of native fish and one of the most attractive riparian forests remaining in Arizona.

Aravaipa is a rare watershed, its main stream flowing from one valley (the upper watershed) directly through a mountain range before joining a river channel in a second valley. This through-mountain channel has a year-round surface flow bounded by a dry upper reach and a dry lower reach. Aravaipa is one of the few creeks with an isolated perennial surface flow sandwiched between dry segments. Maximum flow (probably the most "reliable" flow) occurs near the center of the canyon between Hell Hole Canyon and the section immediately downstream from Painted Cave Canyon.

Aravaipa Creek has one of the few remaining perennial flows in southern Arizona. The perennial canyon flow originates from a "spring" in the main channel of Aravaipa Creek near the confluence with Stowe Gulch. The creek returns underground after it breaks out of the canyon into the lower valley about five miiles upstream from the confluence with the San Pedro River. Only with persistent rain or exceptional storms does the creek flow connect from the emergence point to the San Pedro River (2,180 feet). When connected from the Eureka Ranch to the San Pedro, the flow is about fifty miles long. In years of high rainfall, the emergence point migrates upstream. For instance, in 1978-79, the creek emerged about 0.5 miles above the canyon entrance (J. Schnell 1990).

The flow results from a large upstream groundwater basin (the "alluvial aquifer") supplemented seasonally by contributions from side streams. Groundwater flow converges at the entrance of Aravaipa Canyon where much of it is forced to the surface because of the restriction in the width of the porous sediments. But, at no point does Aravaipa Creek flow over completely consolidated rock. It flows over a "younger alluvium" which varies from a few tens to as much as 130 feet. The underground water moves up to 1,300 feet/day (Ellington 1980). At the west exit of Aravaipa Creek, the United States Geological Service estimated streamflow as 30.1 cubic feet per second (21,800 acre feet/year) for a thirteen-year record.

Other permanent waters in the Aravaipa study area include Bear Springs, Oak Grove Canyon, Parson's Canyon, Turkey Creek, Virgus Canyon and Whitewash Canyon as well as approximately forty other springs, many along the basin's geological margins or along faults. The majority of springs in the Hell Hole Conglomerate and Galiuro Volcanics occur on the north wall of Aravaipa Canyon. This may be the result of the smaller tributaries on the north side of the channel so that more water still travels within rocks. Some of these springs played a crucial role in spreading out livestock grazing pressure, prior to the construction of stock tanks (Map 3).

About 3.3 percent of the average rainfall leaves the watershed as runoff. This is considered high for southeast Arizona. Throughout the canyon itself, runoff averages about 0.5 to 1.0 inch each year but the runoff may concentrate all in one place or in one intense storm creating flash floods. Only the higher elevations of the Santa Teresas, Pinaleno, and Galiuros have runoff between one and two inches annually. Surface runoff at the junction of the San Pedro and Aravaipa is small (less than 0.1 inch) because of the flat riparian land and lower rainfall.

About 2.4 percent of annual rainfall becomes groundwater within the basin. The groundwater of the alluvial aquifer is replenished by rainfall which enters the aquifer from (1) spring and subsurface flows near the mountain/valley edge; (2) streambed infiltration of runoff from the highlands; and (3) direct infiltration of precipitation. Any environmental change that alters these processes will influence Aravaipa Creek and downstream users. This report will not discuss changes in groundwater balance outside the study area, even though they may influence human water use within the study area.

Groundwater is depleted by evapotranspiration, pumping, and stream discharge to the San Pedro. The upper valley aquifer supplies 8,500 acre feet/year as Aravaipa Canyon streamflow. In addition, in recent years, about 3,100 acre feet/year have been pumped from the valley aquifer for farming and other uses. Of the 3,100 acre feet used per year in 1980, 3,000 acre feet went to irrigation, thirteen acre feet for domestic purposes and forty-five acre feet for stock water. Previous use of groundwater included a flotation ore concentrator (1925 to the late 1940s) and greater domestic use for the larger populations. No detailed history of actual use is available (see Chapters V, VI and VII).

Most wells have been dug in the younger alluvium which covers the valley and canyon floor. These wells yield up to 1,200 gallons per minute and vary from ten to 100 feet. The depth to groundwater in other areas has normally varied from twenty-six to over 500 feet. The shallowest wells are in the canyon and the deepest wells are near Eureka Ranch. Agriculture irrigated by groundwater favored the mouth of Aravaipa Canyon and above the emergence point near Aravaipa Creek where the water table approaches the land surface, and the highest water yields occur in the younger alluvium with maximal saturated thickness.

At the southern end of Aravaipa Valley, .the groundwater divide and the surfacewater divide are approximately in the same ridge. This ridge effectively separates the Aravaipa from the Willcox Playa drainage. If this were not so, the huge pumping of groundwater in the Willcox drainage (over 300,000 acre feet/year in some years) could have depleted the flow to Aravaipa Creek. But no longterm declines in the Aravaipa Valley watertable have been recorded, as opposed to many other groundwater basins in Arizona. There appears to be no immediate concern for depletion as long as irrigated pasture and agriculture do not significantly increase. Nevertheless, because groundwater and surface flow are so tightly connected, the Bureau of Land Management acquired an instream water right for the canyon in 1989.

The quality of Aravaipa water is high except during floods when the waterflows become clouded with sediment or flushed with particle-bound heavy metals from historic mining operations. Because there are relatively small amounts of exposed limestone, cations appear at normal levels for Sonoran streams. Water users have few problems with hardness. Sodium enters the stream from some saline springs (e.g., near Turkey Creek) and contributes to increasing concentrations from the east to the west end. Contradictory evidence suggests that, at times, concentrations of mercury are above acceptable water quality standards for aquatic organisms (Minckley 1980). At times, cadmium approaches levels for more sensitive freshwater organisms. Turkey Creek has a particular water quality that, for instance, includes high manganese levels -- too high to meet drinking standards (Minckley, 1980). At present, there are four quality testing sites along Aravaipa Creek because of public health concerns and Aravaipa's unique waters status. Fluorides may be of concern in groundwater samples north of Stowe Gulch.

BIOGEOGRAPHY AND HUMAN CONCERNS

The Aravaipa region supports about 600 plants species and a large diversity of animal species. Aravaipa is important as the westernmost limit of Woodhouse's toad, the edge of known breeding range of nine mammals

(Table I. C) and two subspecies of fish. It is the northernmost breeding area for coatis. It supports seven native species of fish, a few derived from past connections to the Yaqui River drainage (e.g., Sonoran sucker). Both Eastern and Desert Cottontail rabbits overlap in the Aravaipa area.

The Sonoran, Chihuahuan, Madrean and Great Plains evolutionary lineages are represented by six biotic communities and about twenty-four terrestrial vegetation associations (Table I. G). In addition, an anthropogenic association on cleared floodplain fields has been identified. The aquatic communities can be divided into at least five major associations. There is no detailed vegetation map for the study area. The original George Whittell Wildlife Preserve has been mapped by Peter Warren and Susan Anderson (Johnson 1980) on a scale of 1: 24,000.

The five major terrestrial communities are: Sonoran Desertscrub; Desert Grassland/Semi-desert Scrubland; Chaparral; Evergreen Woodland; and Deciduous Riparian Forest. General descriptions of these communities can be found in Brown (1982). Other terrestrial habitats of interest to naturalists include: the Alligator Juniper Savanna of Big Table Mountain; Oak Grove Canyon; the Limestone Scrub association near Holy Joe Peak; and the Oak Spring Cabin area. Caves, tunnels and crevices are important for bats. The remarkable series of springs creates natural pockets of wetlands among the dry canyons.

Sonoran Desertscrub

Aravaipa is at the mid-latitudinal range of the Arizona Upland subdivision of the Sonoran Desert. The Sonoran Desertscrub community developed 8,000 to 9,000 years before the present. It nurtures tree, tall shrub and succulent life-forms, and is found on slopes, broken ground and intermittent drainages, typical of this subdivision. It merges with pockets of chaparral, desert grassland and Deciduous Riparian Forest.

Sonoran desertscrub occurs between 2,200 and 3,500 feet elevation with four identifiable associations. The Palo Verde-Saguaro-Brittlebush association is the most frost sensitive in the study area. The Creosote-Jojoba-Foothill Palo Verde association is well adapted to arid lands. This Sonoran Desertscrub is prized for its beauty. Individual "groves" or clusters of saguaro with nearby cottonwoods, pinyons, or junipers are somewhat unusual for a single area and provide an exciting aesthetic for hikers and naturalists. During adequate rains, cattle, goats, mule deer, burros and bighorn sheep grazed and browsed among the trees and succulents. Many mammals and birds feed on the fallen fruit of the cacti.

Desert Grassland/Semi-desert Scrubland

This is probably the most widespread community in the study area with the greatest variety of associations. This diversity, in part, occurs because the original grass cover of this community has largely been replaced (Chapter XII). Woody plants (mesquite, juniper, catclaw acacia, ocotillo, snakeweed, burroweed), dry-tropic stem and leaf succulents (sotol, beargrass, agave and yuccas), and cacti (prickly pears, cane chollas, Christmas cholla) have increased. In areas where shrubs dominate, the community can no longer be considered a grassland.

The semi-desert grassland community is usually above the Sonoran Desert (ca. 3,000 to 4,700 feet) but, in places in Aravaipa, it blends with the Arizona Upland subdivision. Its upper contact is with Madrean evergreen woodland and chaparral. In other places, it mixes with Chihuahuan desertscrub species in patterns heavily influenced by human intervention. The causes of change have been variously ascribed to reduced burning, overgrazing, livestock dispersion of seeds, changes in climate, and other factors (Chapter XII).

Interior Chaparral

The Interior Chaparral is found between 3,500 feet and 6,150 feet. It was an important community for the Angora goat industry in the Aravaipa area (Chapter VII) and supported the early bighorn population. The chaparral is characterized by scrub oak with many desert grassland and desertscrub species that have invaded and/or increased because of their relative resistance to livestock (nolina, snakeweed, wait-a-minute bush, prickly pears). The chaparral has limited growth forms, almost entirely evergreen shrubs with few trees or succulents. The shrubs are broader-leaved and evergreen compared with the small leaves of desert scrub.

Madrean Evergreen Woodland

From 4,500 to 6,150 feet, this evergreen woodland is dominated by Arizona and other oaks or juniper trees. It includes a unique perennial grass/juniper open "savanna" woodland on the top of Table Mountain which most resembles an intact community of Evergreen Woodland. The other associations have invader/increasers from the desert grassland and lack common evergreen woodland species reported in other areas, such as the muhlys, woolspike and cane bluestem (Brown 1982). Chaparral species enter all three associations. This community was known for its white-tail deer, wolves, grizzly bear and, more recently, coatis.

Deciduous Riparian Forest

The riparian forests of Aravaipa are, in part, relictual communities of trees from a more widespread prehistoric forest. Three very distinct associations or series belong to the Deciduous Riparian Forest: the now completely altered and always transitional Cottonwood-Willow (mixed broadleaf riparian); the Mesquite Bosque; and the Alder/Walnut/ Hackberry. The mixed broadleaf riparian association has received much attention in the history of the canyon (Chapters IV, VII, IX, and XII). It is among the most desirable of plant communities to protect because, in other parts of the Southwest, it has been decimated by land clearing, water projects, and cattle. It shelters one of the northernmost breeding populations of blackhawks as well as other more subtropical raptors. Mexican "specialties" such as the Elegant Trogon have been spotted in this community. It includes the tallest trees in the canyon.

The Mesquite Bosque association contains the highest and densest mesquite stands in the study area (Sand Canyon, Stowe Canyon, Bear Springs Canyon and Turkey Creek). There were more and larger mesquite bosques especially near Klondyke before land clearing for agriculture. Some researchers speculate that mesquite stands may be influenced by Amerindian as well as Euroamerican field clearing practices (Dobyns 1981). The mixed riparian forest with alder is essentially limited to Oak Grove Canyon. It is in a drainage with the most consistent surface water supply. The presence of alder has been of interest to naturalists. It has spread down and through the Aravaipa Canyon (Chapter XII).

During the 1800s, the surfacing of underground flow and the "ponding" of the restricted flow path also fed large cienegas in the valley immediately above and below the canyon. In the upper valley, the Grant Creek cienegas near Bonita and the Hooker Cienega have been impounded and drained. The "Water of the Dead" cienega just above Klondyke (last reported by Parke in 1857) has completely disappeared. "Cook's Lake," which extended from the junction of Aravaipa Creek with the San Pedro to Feldman, although diminished, is still a wooded swamp with cottonwood and willows but is now choked with aquatic plants. Although outside the study area, the "lake" at the confluence was important as the probable location of the nearest Sobaipuri village and the original site of Camp Grant (Hendrickson and Minckley 1984; Brown 1982).

Human-Dominated Associations

Old fields in the Aravaipa Creek floodplain support many weedy species (dove weed, prickly poppy, jimson weed) and vary from year to year with human intervention. They integrate with roadside vegetation at both ends of the canyon.

Aquatic Habitats

Aquatic microhabitats include the pool-riffle sequence and aquatic vascular plants of the mainstem as well as small backwaters. Green algae and diatoms dominate the flora and fauna of the main creek. Substrates for algal growth (stones, other plants, finer sediments) provide the majority of organic food upon which other creatures depend (Minckley 1981: 113). The deep pools support Aravaipa's special fish fauna. In the tributaries, tinajas and temporary pools are important watering areas for livestock and wildlife, especially bighorn sheep and white-tail deer. Humans have influenced these aquatic habitats by changing pool-riffle sequences, diverting channel flow to irrigate fields, changing water quality from mining, and stocking exotic fish.

Human settlment probably first occurred in Aravaipa during the evolutionary interplay of the Madrean, Sonoran and Chihuahuan biotic communities, possibly as a response to the region's biodiversity. The evolutionary history and distribution of species in Aravaipa became an important incentive for policies to protect the area. See Chapter XI for a more detailed discussion of the movement to protect Aravaipa's biotic communities.

FIRE

The yearly climatic cycle as it affects fire begins in April with the melting of the snow pack in the Galiuros and Santa Teresas. Pre-summer drought intensifies in May and June. Occasional "dry" isolated thunderstorms may occur. These storms generate little rain but can generate considerable lightning. By late July, the monsoonal rains have dampened the vegetation. A second drying sets in at the end of September, lasting through October, and occasionally to late November. In short, lightning fires can occur from April through November, with peak fire activity just before the height of the monsoon in July (Baisan 1990). Fires are not more common with drought. They are more frequent when drought follows two years of wet weather (and supposed build-up of fuels). Nevertheless, 1722, 1822, and 1879 (all drought years) had fires throughout the Southwest. This fire regime appears to have been consistent for the last 8,000 years. It had a significant influence on vegetation. The late spring/early summer large-scale burns appear to be teleconnected to El Nino events (Swetnam and Betancourt 1990).

The nearby Coronado National Forest leads the Southwest in the total area burned from lightning strikes. In the Catalina Mountains near Tucson, the peak occurrence of lightning strikes occurs between 5,500 to 7,500 feet elevation (53%). In southern Arizona, lightning fires are distributed by ponderosa pine (48%), followed by grass (26%), followed by brush (14%), mixed conifer (6%), and woodland (6%). The Aravaipa study area includes only woodland, brush, and grass (about 46% of lightning fires).

The chaparral species (manzanita, mountain mahogany, skunkbush) are all pyrophytes, which hold and spread fire well. In the grassland scrub areas, grass is considered a "fine fuel" and has difficulty holding a fire overnight. The mean fire intervals for the grassland scrub associations is not known but may be on an order of seven to twenty years.

In the Rincon Mountains near Tucson, a pattern of widespread fire ceased abruptly with the surrender of the Apache and the influx of Hispanic and Anglo settlers with their cattle herds (Chapter IX and XII). A similar abrupt decrease may be the case for the Aravaipa area, since few significant fires have been reported in the Aravaipa area after 1900. A decrease in fire may have retarded any return of the semi-desert scrub to grassland.

PLANTS AND HUMANS

Peter Warren and Susan Anderson collected 445 vascular plant species in the Aravaipa area (Johnson 1980). Perhaps another 100-plus have not been collected or are in the process of colonizing the study area. Lichens, fungi and other microbial taxa have not been catalogued. Forty-seven species of algae have been found in the main perennial creek. A warmwater algae in a springfed pool in Javelina Canyon has been suggested for further study. No particular plant species or genetic variety has been singled out as unique or particularly important in Aravaipa alone. Some of the best old growth Arizona walnuts remaining in the state grow in Aravaipa Canyon.

Consumptive uses of plants have been widespread. Wild foods, craft plants, and plant pharmacopeia were important to early settlers (Chapter IV). There is a long history of mescal consumption (Chapter II) and mescal production using wild agaves (Chapter IV). The quality of pasture and the conservation of grasses and browse for cattle and goats has an equally long history (Chapters VI and XI). The competition for browse and forage plants between wildlife and livestock is a largely undocumented part of this history of plants (Chapter X). Woody species have provided firewood, fenceposts, construction timber for homes and mines, export timber (walnut) and fuel for a variety of mining equipment (Chapters IV, IX, XII).

Thirty-seven exotic, non-native plants have been collected in the study area and, probably, another thirty to forty exist (Chapter XII). This is about ten percent of the flora. This does not include fruit trees and some ornamentals which would not survive without human care. Various plants have become plant pests (e.g., sow thistle, tumbleweed), particularly in agricultural fields. At least fourteen plant species poisonous to livestock have been identified (Chapter XII). Many are drought-fallback plants for cattle and sheep.

Nonconsumptive uses have been very important to both locals and outsiders. Aesthetic appreciation of the giant cottonwoods, sycamores, Arizona walnuts or special saguaros is common. Naturalists have been curious about changes in various species such as the loss of phragmites marshes and the spread of alder.

ANIMAL SPECIES AND HUMANS

The fauna of Aravaipa can be divided into terrestrial and aquatic groups. In addition to the six biotic communities, three environments are of special interest: human-made structures; caves, tunnels and crevices; and non-flowing water in human-made ponds, tinajas, and backwaters of streams.

No overview of invertebrates in the Aravaipa study area is available. Of the 109 insects collected or identified in the general Aravaipa area (Chandler and Chandler 1977; Burns and Minckley 1980), fifty-six insects are associated with aquatic environments and fifty-three with more terrestrial environments. The aquatic insects compare favorably to other Southwestern streams. Humans were involved with the malaria mosquito, termites, Hess flies, bees, and, indirectly, profited from the pollinators of cultivated and native plants, and from aquatic insects that are a major food supply of Aravaipa fish. Malaria mosquitos and screw worms have been controlled.

There are twelve species of fish within Aravaipa canyon and the surrounding tributaries. Seven are native to Aravaipa and five are introduced. The seven natives have played an important role as both supplement food for residents and in the conservation movement for the canyon. The spikedace and the loach minnow are federally listed as "threatened" and are considered high priority species for funding and protection by various government agencies. Both are endemic to the Gila River drainage. The loach minnow has a relatively sustainable population only in Aravaipa Creek. The canyon may be one of three localities with remnant populations of the osculus subspecies of speckled spikedace, which is at the lower altitudinal limit of its range in Aravaipa. The grahami race or subspecies of the roundtail chub is at its southernmost locality in Aravaipa Creek within the United States, although the species can be found as far south as Sinaloa, Mexico. These and other natives have been protected from exotic invaders by the unique natural "barriers" of dry channel beds at the upper and lower end of the canyon, and by catastrophic floods to which they are uniquely adapted. The human-made ponds now harbor the exotic fishes, catfish, largemouth bass, and mosquitofish. The green sunfish has built up temporary populations in the main stream. These populations are destroyed by floods. The red shiner, a major threat to the loach minnow, invaded the creek in 1990 (Minckley, p.c.).

There are sixty-eight amphibians and reptiles (fourteen of these are "hypothetical") and no exotics. Only the poisonous reptiles (western diamondback, blacktail, Arizona black, and Mojave rattlesnakes and, rarely, the tiger rattlesnake, coral snake and Gila monster) have played much of a role in human settlement. Considered dangerous pests, they were frequently killed. This destruction of individuals is probably not as devastating as destruction of rattlesnake dens. Chapter X discusses some of the changes in amphibian and reptile life brought on by human occupation of Aravaipa.

Aravaipa has 237 species of birds, excluding domestic birds. They have been part of human settlement as hunted food and non-consumptive science and recreational interests. Bird populations focused attention on Aravaipa, particularly the buff-collared nightjar, black hawk, zone-tailed hawk, and several "Arizona specialties" such as the vermillion flycatcher and the beardless-tyrannulet (in closely adjacent habitats). From an agency and conservationist point of view, Aravaipa includes birds of high priority such as Montezuma quail, wintering Bald Eagle, migrating Osprey, wintering goshawk, summer resident Peregrine Falcon, summer resident Zone-Tail and Black Hawks, wintering Belted Kingfisher, migrating Great Egret, visiting Caracara, summering Yellow-billed Cuckoo, migrating American Redstart, summering Trogon, and migrating Willow Flycatcher. These birds are on the state and/or federal lists requiring special attention. Hunting of Gambel's quail and doves remains an activity in the Aravaipa area and is a priority for wildlife management by government agencies.

Mammals have been entwined in all aspects of human settlement: predator control, hunting for food and sport, trapping, naturalist studies, conservation movements, livestock production, changes in the proportions and species of plantlife, erosion of soil, water supply, animal-derived pharmacopeia, and pest control (see: Chapter X). There are forty-nine species of mammals actually or probably living in the Aravaipa study area, excluding humans and domestic mammals. Aravaipa was known for some of the largest herds of collared peccary (javelina). It has a moderate population of desert bighorn sheep (150-200 or more). The Galiuros support some of the densest populations of desert mule deer and white-tailed deer. The Sanborn's long-nosed bat, Mexican long-tongued bat, southwest cave myotis, red bat, western mastiff bat, and gray wolf are all threatened, endangered species or sensitive species on the state and federal endangered lists. There are five extirpated species (gray wolf, grizzly bear, beaver, prairie dog, and pronghorn). The black bear, mountain lion and collared peccary are all high priority species for funding by government agencies either to protect habitat for recreational hunting or to reduce possible economic impact on the livestock industry (BLM 1990).

SUMMARY

Aravaipa Creek is one of the few natural, perennial streams left in Arizona. It is unique geologically because it cuts directly through a mountain range, rather than flowing around the mountains' foothills and is "quarantined" by dry to intermittent flows in the upper and lower reaches, protecting an exceptionally rich, native fish population. Aravaipa Creek supports one of the finest mixed broadleaf riparian woodlands left in Arizona. The whole watershed contains exceptionally abundant wildlife such as bird breeding sites for subtropical hawks, desert bighorn, an exceptional bat fauna in its many caves, plentiful populations of mountain lion, deer, and javelina. Part of the beauty of Aravaipa comes from its unique canyon, the diverse history of its surrounding peaks, and the startling juxtaposition of a perennial stream in an arid land.

The natural setting has set the stage for human activities. The topography of the Aravaipa area made east-west roads difficult and severe flashfloods spectacular. The narrow bottomlands limited agricultural development. The rugged landscape increased vulnerability to soil erosion. The geology provided an abundant mineral source, now depleted or uneconomical to exploit. The annual soil moisture, without supplemental irrigation, is largely suited to livestock grazing. Only along the creek and near a few springs was agriculture possible. The ample springs and groundwater allowed development of supplemental irrigation and widespread cattle tanks. The plantlife was basic to all human endeavors from goat and cattle growing to fuelwood and aesthetic feelings. The wildlife has been abundant and has increased income by trapping and hunting, decreased income by livestock predation, and been an extra source of food (fishing). The birds have been a major stimulus to non-consumptive use of Aravaipa Canyon. The next chapters describe the human activities in Aravaipa from the earliest period of occupation until the early 1970s.

TABLE I.A
ARAVAIPA TRIBUTARY WATERSHEDS

Name of Tributary	Stream Order	Elevations (feet)	Drainage Area (square miles)
Turkey Creek	6	5801-3050	22.00
Oak Grove Canyon	5	5801-3230	8.60
Garden Grove Canyon	5	5634-3590	5.55
[Oak Grove Garden	4	5801-3230	3.05]
Virgus Canyon	5	6256-2794	14.60
Parsons Canyon	4	5965-2995	8.78
Sunfish Canyon	3	4017-2669	1.06
Hells Half Acre Cyn	4	4300-2650	2.66
Buzan Canyon	5	4485-2608	7.90
Painted Cave Creek	4	4420-2657	5.99
Javelina Canyon	4	4150-2722	1.66

TABLE I.B
CLIMATIC INFORMATION ON THE ARAVAIPA AREA

Source	Location	Rain (years)	Temperature (years)
Sellers	Klondyke	1952-72	NA
Sellers	Ft. Grant	1931-72	1946-72
Weather Bureau	Dudleyville	1890-1925	NA
Weather Bureau	Ft. Grant	1873-1925	NA
Weather Bureau	Old Ft. Grant	1866 - 1872	NA
Informants	Aravaipa	Non-Quantitative	
Nielsen (1986)	Las Cruces (N.M.)	1850 - 1980	1890 - 1980

TABLE I.C
BIOGEOGRAPHICAL SPECIALTIES

Southwestern Woodhouse's toad
Baily's pocket mouse
Coati
Yellow-nosed cotton rat
Rock pocket mouse
Spotted ground squirrel
Roundtail chub (grahami subspecies)
Speckled dace (osculus subspecies)

TABLE I.D
NATIVE FISH SPECIES OF ARAVAIPA CREEK

Sonoran sucker
Desert mountain-sucker
Longfin dace
Speckled dace (osculus race)
Loach minnow
Spikedace
Roundtail chub

TABLE I.E
SUMMARY OF
ANNUAL PRECIPITATION

OLD CAMP GRANT Breckenridge, Ariz.		GRANT Fort, Ariz.	
Year	Inches	Year	Inches
1866	-----	1873	17.99
1867	-----	1874	17.81
1868	-----	**1875**	**20.91**
1869	-----	1876	19.68
1870	8.95	1877	10.13
1871	**35.21**	1878	16.46
1872	14.68	1879	12.82
Mean	17.03	1880	15.74
		1881	18.96
		1882	15.42
		1883	15.48
		1884	**25.67**
		1885	**9.21**
		1886	12.27
		1887	**24.32**
		1888	14.20
		1889	13.32
		1890	15.88
		Mean	16.85

TABLE I.F
SUMMARY OF ANNUAL PRECIPITATION

DUDLEYVILLE
Pinal County

Year	Inches
1889	-----
1890	-----
1891	**8.59**
1892	10.29
1893	**8.37**
1894	15.12
1895	15.92
1896	15.45
1897	10.03
1898	14.96
1899	9.65
1900	10.29
1901	14.15
1902	12.06
1903	9.42
1904	13.17
1905	**28.83**
1906	18.21
1907	17.84
1908	19.18
1909	-----
1910	-----
1911	15.57
1912	15.83
1913	14.71
1914	**20.94**
1915	18.42
1916	17.92
1917	11.89
1918	13.59
1919	19.06
1920	13.36
1921	14.22
1922	11.31
1923	**20.78**
1924	**7.49**
1925	-----
Mean	14.60

FORT GRANT
Graham County

Year	Inches
1873	17.99
1874	17.81
1875	**20.91**
1876	**20.12**
1877	10.69
1878	16.46
1879	12.82
1880	15.74
1881	18.96
1882	14.82
1883	15.48
1884	**25.67**
1885	**9.21**
1886	12.27
1887	**24.32**
1888	14.20
1889	13.32
1890	16.74
1891	12.21
1892	**7.90**
1893	13.85
1894	13.53
1895	13.22
1896	15.09
1897	13.87
1898	14.26
1899	**7.44**
1900	11.47
1901	12.40
1902	**9.70**
1903	**8.55**
1904	**5.08**
1905	-----
1906	10.49
1907	17.41
1908	13.72
1909	10.61
1910	-----
1912	-----
1913	12.70
1914	**20.14**
1915	16.56
1916	15.31
1917	11.61
1918	-----
1919	17.12
1920	**8.69**
1921	13.29
1922	10.47
1923	-----
1924	-----
1925	-----
1926	17.54
1927	13.88
1928	**9.84**
1929	-----
1930	19.69
Mean	14.38

KLONDIKE
Graham County

Year	Inches
1914	-----
1915	18.97
1916	19.17
1917	11.84
1918	15.88
1919	-----
Mean	17.53

TABLE I.G
SOME VEGETATION ASSOCIATIONS IN THE ARAVAIPA AREA *

SONORAN DESERTSCRUB 2500 to 3500 feet (west end)

1. Paloverde-Brittlebush-Saguaro Association (Lower Desertscrub)
   2500 to 2900 on south-facing slopes

2. Jojoba-Paloverde-Mesquite Association (Upper Desertscrub)
   2500 to 3500 feet on north-facing slopes

3. Creosotebush-Jojoba-Foothill Paloverde Association (Creosotebush Scrub)
   3300 to 3500 feet on steep southwest facing slopes

4. Desert Broom-Burro Brush-Catclaw Acacia Association (Desert Riparian Scrub)
   2500 to 2800 feet along intermittent drainages

DESERT GRASSLAND/SEMI-DESERT SCRUBLAND 3000 to 5000 feet

5. Side Oats Grama-Prickly Pear-Snakeweed Association (Jojoba Shrub-grassland)
   2900 to 4100 on south-facing slopes

6. Snakeweed-Yucca-Mesquite Association (Yucca Shrub-grassland)
   4200 to 4600 feet on level mesas

7. Mesquite-Turpentine Bush-Ocotillo Association (Mesquite Shrub-grassland)
   4300 to 4700 on south-facing slopes

8. Snakeweed-Scrub Oak-Bear Grass Association (Scrub Oak Shrub-grassland)
   3700 to 5700 feet on north-facing slopes

9. Blue Grama- Side Oats Grama-Buckwheat Association (Blue Grama Shrub-grassland)
   4700 to 5700 feet on level ridgetops on south-facing slopes

10. Snakeweed-White Thorn Acacia-Ocotillo Association (Semi-desert Scrub with Blue Paloverde)
    3400 to 4200 feet on south-facing slopes

11. White Thorn Acacia-Snakeweed-Prickly Pear Association (Semi-desert Scrub with Juniper)
    3400 to 4200 feet on south facing slopes (north of creek, east end)

12. Juniper-Snakeweed-Scrub Oak Association (Scrub Oak Semi-desert Scrub)
    3200 to 4200 feet on north-facing slope

13. Sotol-Snakeweed-Indigobush Association (Limestone Scrub)
    4500 to 4700 near Holy Joe Peak

14. Net-Leaf Hackberry-Catclaw Acacia-Gray Thorn Association (Upper Riparian Scrub)
    3200 to 5000 feet along intermittent drainages

CHAPARRAL 3500 to 5800 feet
15. Scrub Oak-Juniper-Wait-a-Minute Bush Association (Rock Terrace Chaparral)
3600 to 3900 feet on dissected rock terraces

16. Scrub Oak-Pinyon Pine-Snakeweed Association (Chaparral with Pinyon/Juniper)
3400 to 5500 feet on north-facing slopes.

17. Scrub Oak-Buck Brush-Squaw Bush Association (Scrub Oak Chaparral)
3400 to 5800 feet on north-facing slopes

EVERGREEN WOODLAND 4500 to 6150 feet
18. Arizona Oak-Skunkbush-Hollyleaf Buckthorn Association (Arizona Oak Woodland)
4500 to 5000 feet in canyon bottoms

19. Alligator Juniper-Mountain Mahogany-Beargrass Association (Alligator Juniper Woodland)
5400 to 5800 feet on north-facing slopes of Table Mountain

20. Blue Grama-Alligator Juniper-Can Cholla Association (Alligator Juniper Savanna)
5900 to 6150 feet on level mesa of Table Mountain

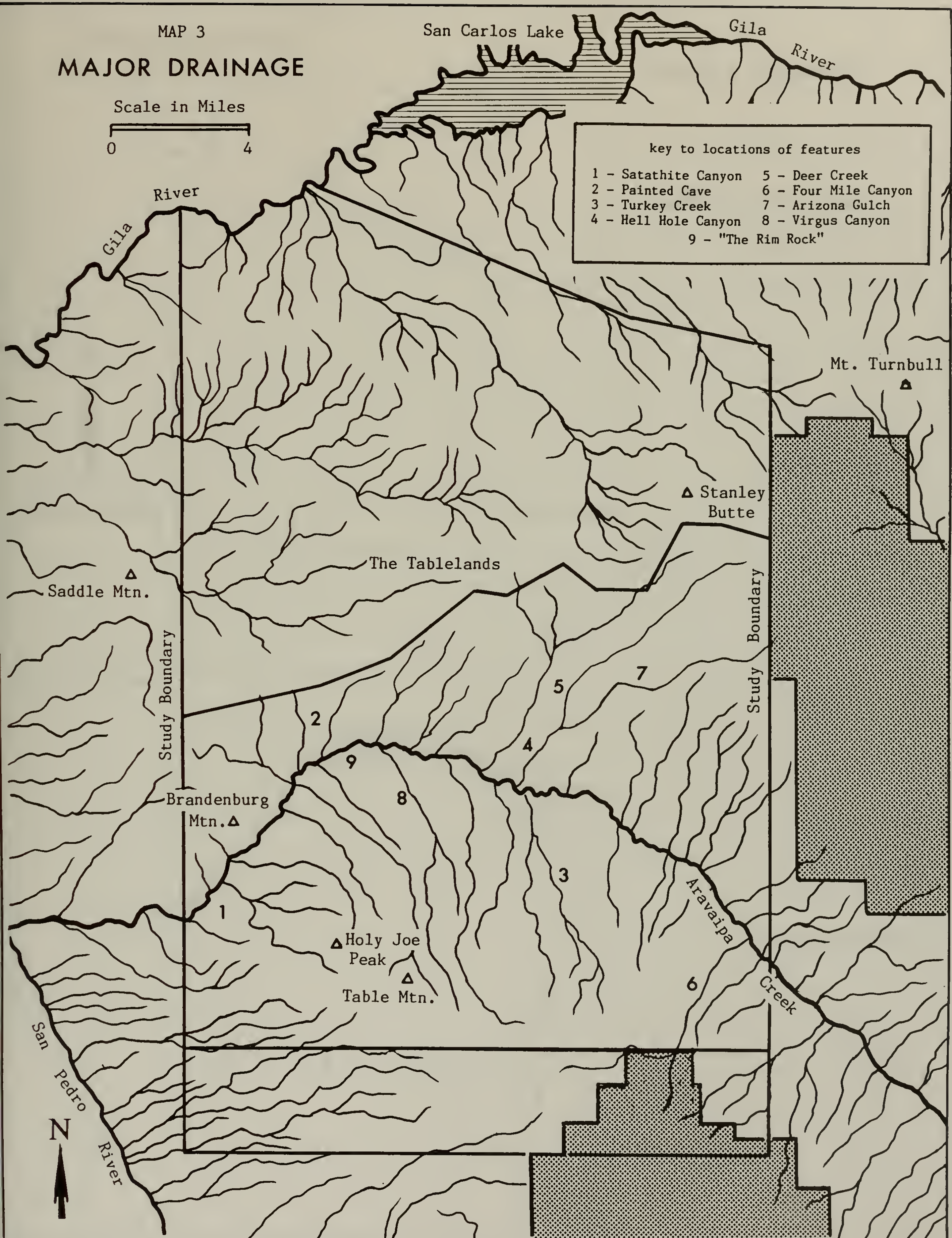
DECIDUOUS RIPARIAN FOREST 2500 to 3900 feet along major drainages
21. Mesquite-Acacia-Gray Thorn Association (Mesquite Bosque)
2600 to 3300 feet on level floodplain

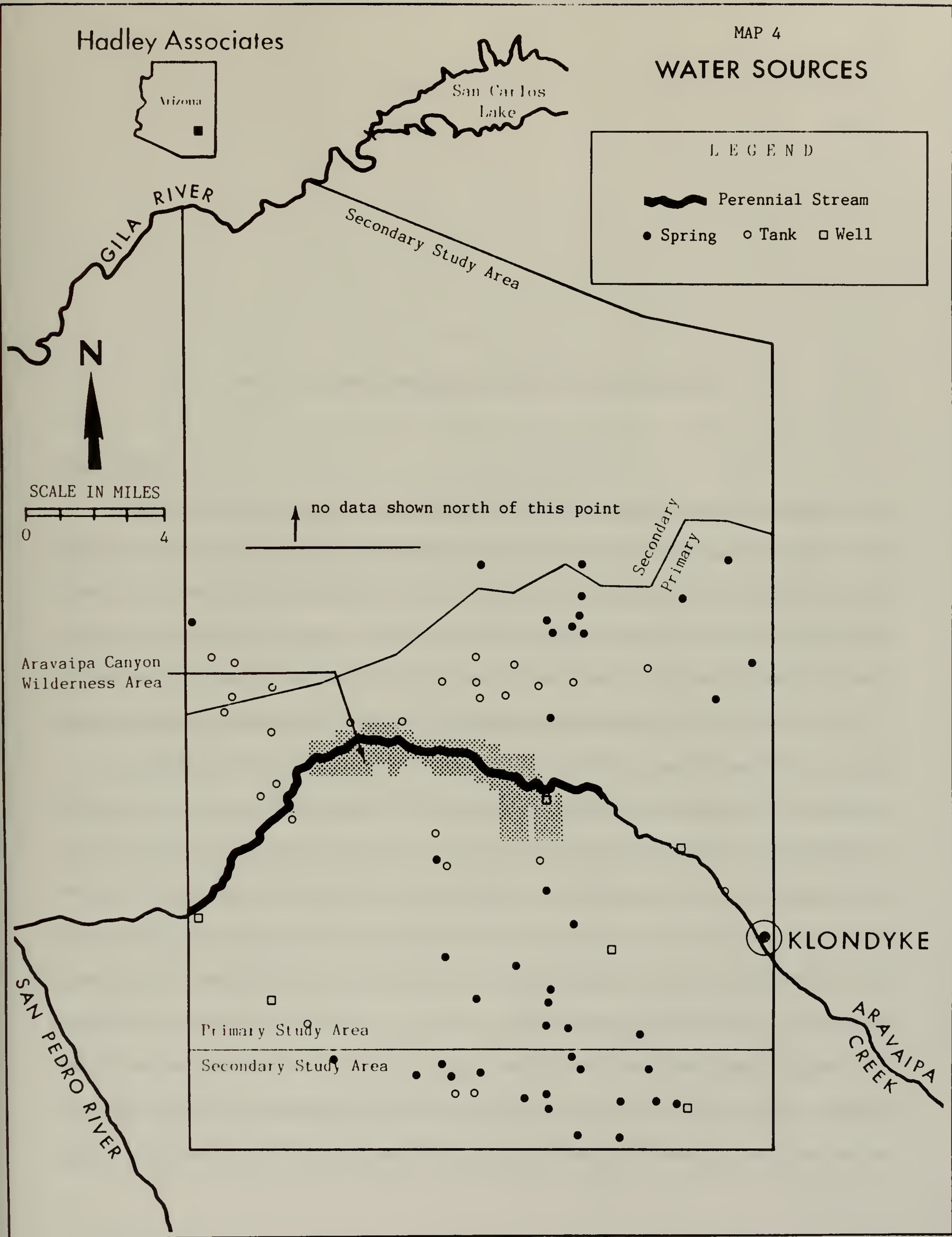
22. Cottonwood-Seep Willow-Willow Association (Riparian Forest)
2500 to 4000 feet along perennial streams

23. Alder-Walnut-Net-leaf Hackberry Association (Riparian Forest with Alder)
3300 to 3400 feet in Oak Grove Canyon

SECOND GROWTH 3050 to 3300 feet along Aravaipa Creek
24. Dove Weed-Prickly Poppy-Jimson Weed Association (Old Field Second Growth)
3050 to 3300 on level floodplains

*This Table is from Warren (1980) which was a survey of the Whittell Reserve and leased lands. Other Associations will undoubtably be found in unsurveyed areas.


MAP 3
MAJOR DRAINAGE
Scale in Miles
0
4
San Carlos Lake
Gila River
Gila River
key to locations of features
1 - Satathite Canyon
2 - Painted Cave
3 - Turkey Creek
4 - Hell Hole Canyon
5 - Deer Creek
6 - Four Mile Canyon
7 - Arizona Gulch
8 - Virgus Canyon
9 - "The Rim Rock"
Mt. Turnbull
Stanley Butte
The Tablelands
Saddle Mtn.
Study Boundary
Study Boundary
Brandenburg Mtn.
Holy Joe Peak
Table Mtn.
Aravaipa Creek
San Pedro River
N
1
2
3
4
5
6
7
8
9


Hadley Associates
Arizona
MAP 4
WATER SOURCES
San Carlos Lake
LEGEND
Perennial Stream
Spring
Tank
Well
GILA RIVER
Secondary Study Area
N
SCALE IN MILES
0
4
no data shown north of this point
Secondary
Primary
Aravaipa Canyon Wilderness Area
KLONDYKE
ARAVAIPA CREEK
SAN PEDRO RIVER
Primary Study Area
Secondary Study Area

II

BACKGROUND, THE EARLY HISTORY OF ARAVAIPA

OVERVIEW

During the prehistoric period Hohokam, Mogollon, and Salado peoples occupied the Aravaipa area. Sobaipuri (Upper Pimans) practiced irrigated farming in the lower San Pedro Valley near the confluence with Aravaipa Creek, and may have had settlements on the creek itself. In 1763 Spaniards assisted in the relocation of the Sobaipuri San Pedro settlements. After Sobaipuri removal, the "Aravaipa" band of the Pinaleño Apache occupied the area. The Aravaipa Apache developed an economy which mixed casual irrigated agriculture, hunting, gathering, and raiding. They imported the area's first recorded livestock, obtained during raids.

Spanish explorers first entered the area during the 1540s, recording remains of large, impressive ruins which may have been located in the Aravaipa Valley. Members of Coronado's party offered the first descriptions of the flora, fauna, and water courses of the area. Father Eusebio Kino travelled along the San Pedro River in 1697 and his companion Juan Mateo Manje wrote descriptions of Sobaipuri villages near Aravaipa Creek. Spaniards frequently clashed with the Aravaipa Apache, although some members of the band, called *manzo* ("tame") Apaches, settled near Tucson. During the Mexican period, clashes continued until the army set up an *establecimiento de paz*, a peace settlement, at the confluence of the Aravaipa and the San Pedro. After the 1854 Gadsden Purchase, raids attributed to the Aravaipa Apache led the United States Army to establish Camp Grant near Aravaipa Creek. A reservation near Camp Grant existed for less than two years and in 1873 the Aravaipa Apache were relocated to the San Carlos Reservation. After a brief interruption, several of the original families returned to their former homes on Aravaipa Creek and the San Pedro, resuming Native American occupation of the area until the mid-1930s.

AMERINDIAN OCCUPATION OF ARAVAIPA

Archaeological remains indicate significant Hohokam, Mogollon, and Salado occupation in the Aravaipa area. Estimates of population numbers and dates of occupation are conjectural at best. However, a number of significant ruins in the Aravaipa Valley, Aravaipa Canyon, Turkey Creek and throughout the entire Aravaipa watershed indicate wide-spread long-term prehistoric and protohistoric occupation (Bronitsky and Merritt 1986). Hohokam remains are concentrated on the west end of the study area, particularly in the area near the San Pedro River, and date from the period preceding 1200 A.D. Evidence of Salado occupation is concentrated in the eastern portion of the study area and dates from about 1300 to 1450 A.D. Both groups practiced agriculture. Salado sites are particularly associated with large areas of cleared land, canals, and other agricultural features. (Bronitsky and Merritt, in *The Archaeology of Southeast Arizona: A Class I Cultural Resource Inventory* (1986), provide a detailed discussion of prehistoric and protohistoric occupation of the study area.)

During the protohistoric period, the period immediately preceding historic time, Aravaipa was occupied by Upper Pima. When the Spaniards arrived, they encountered Piman-speaking groups inhabiting the San Pedro Valley, although they found few Amerindians in the area north of the Gila River, which they referred to as the *gran despoblado* (great wilderness). Although exact routes are a subject of speculation, early Spanish explorers (1540s) observed the ruins of abandoned Indian habitations while travelling through an area which may have been the Aravaipa or an adjacent valley near the Gila River. One hundred and fifty years later Father Eusebio Kino, the first resident Spaniard in Pimería Alta, found the Sobaipuri, a group of Upper (or Northern) Pima, occupying the San Pedro Valley. The Sobaipuri were practicing irrigated agriculture from large villages along permanent rivers when the Spanish explorers first observed them.

Western and Chiricahua Apache groups began to move into the Pimería Alta during the late seventeenth and early eighteenth centuries, possibly as part of the aftermath of the 1680 Pueblo revolt. The Spanish sporadically recorded the effect of Apache raiding on the Sobaipuri. It eventually became so intense that during the mid-eighteenth century, Spanish officials intentionally relocated them. After Sobaipuri removal, the Apache moved into the area, occupying it until they were concentrated on reservations by the United States Army in 1873.

The name Ari-vaipa derives from the Hispanicized form of the Upper Piman (Sobaipuri) words *ali* and *waxia*, meaning "small" (*ali*) and "water" (*waxia*) (Dobyns 1981: 21). The Spanish retained the Sobaipuri name for the region and in later years the Sobaipuri name was applied to the Western Apache band that inhabited the canyon. Although known by Euroamericans as *Aravaipa* Apaches, the Apache themselves referred to the band who resided in the area by their clan name, *Tcé jiné*, Dark Rocks People, Surrounded by Rocks, or Rocks All Around Us (Goodwin 1942: 27; Marlo Cassadore p.c.; Ola Cassadore Davis p.c.). The term *Tcé jiné* ("dark rocks") derived from a portion of their teritory near the Galiuro Mountains.

THE EARLY HISTORICAL RECORD OF ARAVAIPA

During the 1540s, Spanish explorers accmpanying Coronado penned the first written descriptions of an impressive ruin in an area which may have been the Aravaipa Valley. Two chroniclers of the Coronado expedition, Juan de Jaramillo and Pedro de Castenada, refer to the ruin as Chichilticale, the Yaqui name for *red house* (Winship 1969: 21-22, 90-96, 164-67, 225). The ruined structure, red in color and made of stone, stood at the beginning of the *gran despoblado* (wilderness). It became an important landmark for subsequent sixteenth century explorers, and today still provides an indication for reconstructing the routes of various expeditions.

Geographers and historians are still debating Coronado's exact route, using Chichilticale as the major landmark. Historian Herbert Eugene Bolton and geographer Carl Sauer both placed Chichilticale in the Aravaipa Valley, although at slightly different locations. Sauer and Bolton both trace the Coronado route from the San Pedro River northward by way of the Arivaipa basin, through Eagle Pass between the Pinaleno and Santa Teresa Mountains, to the Gila River (Sauer 1932: 36; Bolton 1949: 32). According to Sauer, the Jaramillo account indicates that Chichilticale was in the Aravaipa basin since it was encountered before Eagle Pass. However, the Castaneda account indicates a site on the Gila, where the ascent of the Colorado Plateau began. Sauer suggested a large ruin on the Haby ranch, at the base of the ascent to Eagle Pass, as the site indicated by Jaramillo, but thought that a site on the Gila River bluff, a mile north of Geronimo, fit the Castenada description (Sauer 1963: 89-90; Sauer and Brand 1930: 424). Bolton thought a large ruin on the 76 Ranch near the foot of Eagle Pass to be the more likely location, and his opinion is supported by archaeologist Emil Haury (Bolton 1949: 106; Haury 1984: 14-19). Both sites were occupied by late prehistoric Pueblo people who produced Gila Polychrome pottery. Whatever its exact location, the ruin remained a landmark for Spanish travellers for two centuries. Walls of a large rock and adobe ruin were still standing in 1775 when visited by Captain Juan de Anza (Haury 1984: 14-19).

The references to Chichilticale from the Coronado expedition contain the earliest descriptions of local flora and fauna although the exact species are again a matter of debate. Castaneda recorded that at Chichilticale the "spiky vegetation," a probable reference to Sonoran desert plants, ceased and the wilderness began. In the wilderness he found great quantities of pine nuts, oaks with sweet acorns, rosebushes, pennyroyal, and wild marjoram; watercress in the springs; "barbels and picones" in the rivers; and "gray lions and leopards" (Winship 1969: 91). Jaramillo reported that after leaving Chichilticale, the group descended to a "deep and reedy river" (Winship 1969: 225), which historians have assumed to be the Gila.

THE SOBAIPURI

Over a century later in 1697, Captain Juan Mateo Manje, accompanying Father Eusebio Francisco Kino on his fourth exploration, recorded the next descriptions of the Aravaipa area. As Kino's party travelled northward down the San Pedro, they passed through several Sobaipuri villages (Muyva, Arivavia, Tutoyda, Comarsuta and Ojío), shortly before reaching the confluence of the San Pedro and Gila rivers. Manje wrote two accounts of the trip, in which the descriptions of the San Pedro settlements differ slightly. In one account, he stated that the largest village, Arivavia, contained 500 inhabitants living in 130 houses (Burrus 1971: 334); in the other account 375 inhabitants in seventy-five houses. From Arivavia, Kino's party continued three leagues to Tutoyda (population 100), another three leagues to Comarsuta (population eighty), another three leagues to La Victoria del Ojío, the northernmost settlement on the San Pedro and home of Captain Humari, which had seventy houses and 380 persons (Burrus 1971: 364-65).

At La Victoria del Ojío eighty-five men, accompanied by their women and children, arrived from Tubo and Busac, two auxiliary villages "located on a small creek which runs from the east and joins the river" (Burrus 1971: 339, 365; Kearns 1954: 83). Manje stated that these up-stream villagers were "frontier Indians [who] live nearer to the Apaches, Jocomes and Janos. . . their chief sworn enemies." Kino's party continued north down the river and after six leagues (approximately eighteen miles), "came to the place where this river joins with the great Jila River" (Kearns 1954: 83). Altogether Kino's party censused a population of 2,000 persons living in fourteen villages along the San Pedro; almost half of the population lived in the northern villages near the Gila. Bolton (1964) located La Victoria del Ojío at the confluence of Aravaipa Creek. If he is correct, as is indicated by the distance of the village from the confluence of the Gila, Busac and Tubo were located on Aravaipa Creek, the only stream flowing from the east on this portion of the San Pedro.

Manje noted that the San Pedro valley was broad and productive, had an abundance of grass for livestock, was crisscrossed by irrigation ditches, and had irrigated fields in which cotton, squash, watermelon, beans and corn were growing. The natives wore fine cotton *mantas*, and lived in houses of poles and mats, some of which were vaulted and oblong. The natives built special houses for the Spaniards and gave them more beans and corn than they could carry away (Burrus 1971: 364-65). Since the landscape and agricultural descriptions are fairly detailed the failure to mention cattle or other domesticated livestock indicates that they had not yet arrived on this portion of the San Pedro.

Over the years many Spaniards proposed founding of missions, *villas* (towns), or *presidios* (forts) at the confluence of the San Pedro and the Gila, but none were established. In 1732 Father Ignacio Keller, accompanied by Captain Juan Bautista de Anza, visited six mission *visitas* (missions without resident priests) which serviced 1,800 people along the San Pedro (Hammond 1929: 227). The influence of these missions was certainly minimal since when Keller returned to the San Pedro in 1737, he found that the Sobaipuris had abandoned most of their rancherías on the northern San Pedro as a result of Apache attacks. When he attempted the same trip in 1743, Apaches forced him to turn back (Officer 1987: 35).

By 1763, the Spanish decided to relocate the San Pedro Sobaipuri. The agricultural groups had lost so much manpower that they did not actively oppose relocation. Spanish troops under the command of Captain

Francisco Elías Gonzalez assisted in the evacuation and approximately 400 Sobaipuris moved to vacant farmlands along the Santa Cruz River near Tucson. Apparently unaccustomed to European livestock, the relocated farmers resisted attempts by the priest at San Xavier to introduce cattle and sheep (Dobyns 1976: 20-21).

The military consequences of Sobaipuri relocation were ill-advised. The Spanish inadvertently removed the buffer which Sobaipuiri settlements had provided, and opened up the San Pedro Valley as a major corridor for Apache raiding into more southern areas of Sonora. After 1763, Apache raids increased (Dobyns 1976: 22). Subsequent Spanish documents lament the misguided Sobaipuri relocation, frequently suggesting that Spanish interests would have been better served by reinforcing the Sobaipuri with a presidio near the confluence of the San Pedro and the Gila.

THE SPANISH AND THE ARAVAIPA APACHE

The subsequent history of relations between the Western Apache and the residents of Sonora provides a dismal record of army campaigns, informal raids, and broken peace promises. Although Apaches may have lived in the Aravaipa area prior to Sobaipuri removal, after 1763 they took full control of the region. The Aravaipa, *Tcé jiné,* band of the western Apache practiced farming, although the extent of the farming operations, and the exact location of the farms cannot be precisely determined. They also maintained herds of cattle and horses in Aravaipa at least on a temporary basis. While Sobaiburi population can be estimated from the number of persons counted by missionaries in the seventeenth century and the number at the time of relocation (a drop in population from 2,000 to 400), Apache population can only be gleaned from numbers killed in various battles and the number of persons later relocated to the San Carlos Reservation. However, a rough estimate, based on Spanish and Mexican military diaries and later U.S. Army figures, indicates that possibly 1,000 Apache of the Aravaipa band occupied Aravaipa Canyon and the nearby mountains throughout the eighteenth and early nineteenth centuries. Their territory extended from Mt. Turnbull and the Santa Teresa Mountains to the southern end of the Galiuro Mountains, and from the head of the Aravaipa Valley to the San Pedro (Goodwin 1942: 27-30).

During the last years of the Spanish empire, officials enacted a new approach to Apache control. While the *Reglamento* of 1772 was actively implemented (1772-96), Spanish officials initiated peace treaties with individual bands of the Apache nation, resettled Apaches near presidios, and distributed provisions, liquor, and poor quality firearms for hunting. The policy intentionally created Apache dependence on the Spanish. It worked effectively for more than twenty years until funds for Apache support dissipated as Spain became preoccupied with the Mexican independence movement (Ogle 1970: xx). Members of the Aravaipa band were among the first Apaches to take advantage of the Spanish offer of resettlement. On January 5, 1793, José Ignacio Moraga, who had served as lieutenant of the presidio of Tucson since 1788, received the first group of *manzo* (tame), or peaceful, Apaches in Tucson (Dobyns 1976: 98-99; Officer 1987: 66). Nautil Nilche, leader of the Vinictinines band of Aravaipas, arrived with fifteen warriors and their women and children (McCarty 1976: 61-63). According to oral tradition in Tucson, the *manzo* Apaches were good farmers and Christians. They assisted with the finishing work on the church at San Xavier del Bac, and also helped construct the San José mission and industrial school north of Tucson (Dobyns 1976: 41-42).

MEXICO AND THE ARAVAIPA APACHE

During the period when the fledgling government of newly independent Mexico controlled what is now southern Arizona (1821-54), Apache raiding intensified. Tucson, where the major garrison was located, experienced a drop in population, a decline in economic activity, and constant guerrilla warfare against the Apache. In late May, 1830 Lieutenant Antonio Comadurán of the Tucson presidio recorded a fairly detailed description of an expedition through Aravaipa Canyon in pursuit of Apache raiders. His troops set out from Tucson, headed directly for the San Pedro, stopped at *Tres Alamos* (north of present Benson, Arizona), and continued toward the *Sierra de Santa Teresa*, stopping at the *Cajón de Agua Caliente* (Hooker Hot Springs). When they reached the *Agua de los Muertos*, the remnant of a cienega in the Aravaipa Valley, Comadurán sent out a party of infantrymen to reconnoiter the source of a large cloud of smoke. They traced it to Aravaipa Canyon, the *Agua Nieve de San Calisto* (Snow Melt Canyon of the San Calisto, or Galiuro Mountains). There the Mexican troops attacked and killed several Apaches, whom they surprised while burning ground cover near the entrance to the canyon (Dobyns 1981: 16-26).

Two years later another raid in Aravaipa occurred. On June 4, 1832, the Sección Patriótica, a group of irregular Mexican troops operating with the assistance of Pima auxiliaries under Jefe Joaquín Vicente Elías, defeated a large force of Apaches in the *Cajón de Arivaipa*. The force of enemy Apaches included a number of runaways from the *manzo* communities in Tucson and Santa Cruz. The former residents of the Tucson camp had formed an alliance with a group of twenty-five warriors led by Capitancillo Chiquito of the Aravaipa band. The battle raged for four hours, leaving a body count of seventy-one Apache warriors, constituting a major victory for the Mexican troops. Elías took thirteen captive Apache children back to Tucson, and recovered 216 horses and mules, with the loss of only one Mexican soldier (Kessell 1976: 284-86).

On March 5, 1836 a large peace parlay was held in Tucson between the presidial soldiers and the Pinaleño band of Apache, neighbors of the Aravaipa. Representatives of the Aravaipa band were included as well. The Pinaleños maintained that they had been unjustly blamed for hostilities perpetrated by supposedly peaceful Apache bands of the Janos, Chihuahua presidio. Now eager to make a truce and end reprisals against them, both Pinaleños and Aravaipas agreed to settle peacefully at the junction of Aravaipa and the San Pedro, where the Mexican created an *establecimiento de paz* (peace settlement). Travel to Tucson would only be allowed with express permission from the presidial commander. Every two weeks the Pinaleño leaders were to report to the commander on activities at the settlement, particularly regarding any information they might have gathered concerning pending hostilities (Officer 1987: 136-39). The Mexican military had reintroduced the Spanish peace policy, and created a precursor to later United States reservations.

Apaches at Aravaipa soon provided the Mexican military with valuable information, including a report that a large party of Americans had built a fort and planted corn on the Gila River (Officer 1987: 136-39). In January 1837, three Pinaleños from Aravaipa informed Lieutenant Colonel José María Martínez of the Tucson presidio that Apaches from Janos were plotting to assassinate Colonel José María Elías Gonzalez, attack Captain Comadurán at Santa Cruz, and obliterate the *manzo* Apache camp at Tucson. Although Colonel Martínez trusted the Aravaipa Pinaleños as genuine allies, his Pima and Papago allies near Tucson still considered them enemies. During the late summer of 1837, Chief Azul of the Gila River Pima brought Martínez fifteen pairs of Apache ears, expecting to obtain the usual reward for evidence of enemy dead. The

Mexicans had little luck in discouraging this type of intertribal warfare, which understandably contributed to the unrest of the Apaches settled at Aravaipa (Officer 1987: 141-42). Conflicts between the Apache and their long-standing enemies, the Pima and the Papago, continued into the American period and played an important role in the infamous Camp Grant massacre.

During the war between Mexico and the United States (1846-48) the Apache renewed their harassment of Mexican settlements in the San Pedro and Santa Cruz valleys. Although the leader of the Pinaleño Apache made repeated peace overtures, Apache raids against Tubac and San Xavier continued. Apaches at Aravaipa, settled so close to Tucson, provided a convenient target for reprisals, and whether guilty or not, were frequently blamed for depredations. On September 10, 1847, Captain Comadurán set out from Tucson with a party of 210 men, made up of seventy-seven regular soldiers and the remainder Mexican, Pima, and *manzo* Apache auxiliaries. After a four-day march, the party reached Aravaipa Canyon, and on September 14th engaged a heavily outnumbered band of Pinaleños. The Mexican troops killed sixteen warriors, seven women and four boys, took fourteen prisoners of both sexes, and recovered thirty horses and eight head of cattle (Officer 1987: 206-07).

In 1849 the situation in southern Arizona was further complicated by the temporary presence of thousands of Anglo-American gold-seekers on their way to California. Inter-tribal conflict continued, and may actually have been exacerbated by the Americans, some of whom proved to be disreputable brigands who attacked Mexican citizens and sold Apache scalps. During the first week of October, Guadalupe Luque, member of an old Hispanic family, led a group of Papago to Aravaipa Canyon, to attack Apaches considered responsible for recent raids on Tucson. After the successful raid, Captain Luque allowed the Papago to keep twelve captive children, ten horses and fifteen head of cattle. Several groups of shocked Forty-niners witnessed Papagos celebrating this victory in a scalp dance held the night of October 3rd in front of San Xavier church (Officer 1987: 238).

The following year "Pinaleño" Apaches, a term which by this time included members of both Pinaleño and Aravaipa bands, attacked the settlement of Santa Cruz, Sonora, where they captured fifteen-year-old Inez Gonzalez, an incident which achieved considerable fame in the pages of John Russell Bartlett's report of the boundary survey. Some twenty years later, some elderly Aravaipas told San Carlos Agent John Clum that

Mexican soldiers from Janos had harassed the Aravaipa for this incident, killing three Aravaipa women who denied that their band had taken part in the kidnapping and refused to lead the soldiers to their ranchería (Clum 1936: 17).

THE UNITED STATES AND THE ARAVAIPA APACHE

At mid-century, the United States inherited the "Apache problem" through the 1848 Treaty of Guadalupe Hidalgo acquisition of land north of the Gila River, and the 1854 Gadsden Purchase of the territory between the Gila and the present international boundary with Mexico. Initially, amicable relations between Apaches and Americans were disrupted when the Apache refused to comply with American regulations prohibiting raids into Mexican territory (Ogle 1970: xxii). In a typical incident in July, 1854 Captain Hilarion García of the Tucson garrison led an expedition against the Aravaipa Apache to recover a small herd of cattle, stolen from Imuris, Sonora. After this raid, the Apache sent women emissaries to Tucson to make peace arrangements with the Mexicans. Although Governor Gándara of Sonora could not enter into formal treaties with Apache bands residing in American territory, he supported the concept of a negotiated settlement with the Aravaipa. Gándara issued specific instructions that any treaty should include provisions for prisoner exchange with Mexico and for setting up Apache peace settlements, where rations would be distributed and payment given for military service against other hostiles (Officer 1987: 277-78).

American soldiers, largely inexperienced in Apache warfare, had little success in containing the Apache. During the Civil War, protection against Apache raids decreased markedly and citizens began to take protection into their own hands, frequently calling for assistance from more experienced Mexican and Papago Indian fighters. In 1863, shortly after Arizona achieved territorial status, a company of Californian volunteers on their way east to fight Confederates joined a Tucson expedition in an attack on a group of Pinaleño Apaches in Aravaipa Canyon. Led by Captain T. T. Tidball and Jesus María Elías, an experienced Indian fighter, the group included civilians from Tucson, Papago Indians from San Xavier, and some *manzo* Apaches. They made a surprise attack at dawn and killed fifty Apaches in Aravaipa Canyon (Officer 1987: 306).

When surveyor William Bell travelled though the canyon only four years later, his surveying party discovered evidence of this raid, finding several skulls and human bones opposite a large cave in the northern wall of the canyon, capable of concealing about fifty men. Bell reported that the raiders wanted to break up the main Apache ranchería in Aravaipa and that they had been guided by "tame" Apaches from Camp Grant, the new American army post at the confluence of Aravaipa Creek and the San Pedro River. They had entered the head of the canyon, and discovered the Indian village at dusk. Employing an old Spanish and Mexican tactic, they waited until dawn to attack, and succeeded in killing the fifty Pinaleños with the loss of only one soldier. Only twelve of the band of seventy Pinaleños escaped. All the rest were massacred by the "tamed" Apaches, while the Americans, Bell reported chauvinistically, killed only warriors (Bell 1869: 67). It is likely that this attack took place near the cave behind one of the Salazar houses near the confluence of Turkey Creek.

The proximity of the Aravaipa band to Tucson continued to cause problems for American settlers, and vice versa. In 1859, the army had established a small temporary post, Fort "Arivaypa," near the mouth of Aravaipa Creek. In 1860, it was renamed Fort Breckenridge and given official status, but soon after this the army abandoned and burned it as Union troops withdrew from Arizona. The post was re-established, as Fort Stanford, at a nearby location on the return of Union troops in 1862. It was renamed Camp Grant in 1865 (Granger 1985: 295). The post remained active until 1873 when it was moved to the western slope of the Graham Mountains near Bonita, Arizona, and was subsequently known as "new" Camp Grant.

After the Civil War, President Grant's Indian peace policy had little support from residents of Arizona Territory. The policy treated Indians as wards of the state, calling for their concentration on reservations, with simultaneous war against those who refused to comply. The plan called for the concentration of the Western Apache on four reserves, including one for the Aravaipa band and other Pinaleño groups near Camp Grant at the confluence of Aravaipa Creek and the San Pedro River (Ogle 1970: 81), where the Mexicans had established their 1832 peace settlement. In April 1870, General George Stoneman took charge of implementing the peace policy in Arizona. Recognizing the inadequacy of the territory's eighteen isolated and understaffed posts, Stoneman encouraged settlers to protect themselves. Citizens in Tucson soon organized a Committee of Public Safety along with several companies of Arizona Volunteers, one of which was headed by Antonio Azul, son of the Pima leader who in 1837 had delivered the fifteen pairs of Apache ears to Lieutenant Colonel Martínez in Tucson (Officer 1987: 142).

In February 1871, 300 Aravaipa Apaches, led by their leader Eskiminzin (*Hackí bánzín* or "Angry Men Stand In Line For Him"), arrived at Camp Grant where they told Lieutenant Royal E. Whitman, the officer in charge, that they wanted to settle on the reservation (*Arizona Citizen* 3/11/1871). Whitman, who had been assisting the hungry Indians with informal food distributions for several months, had no orders covering such a request and forwarded it to Washington. While waiting for the response, the Aravaipa stayed near the army camp, and Whitman continued distributing provisions. At the post, the Aravaipa worked cutting wild hay for the fort in exchange for credit with the post trader (Thrapp 1967: 83; Browning 1982: 28). General Stoneman had initially infuriated Tucson residents with his inactivity and economy measures. However, during the spring of 1871 he patrolled through the Pinaleño Mountians and succeeded in frightening 550 more Aravaipas and Pinaleños into Camp Grant, where they were added to the Aravaipa already there receiving rations (Ogle 1970: 79).

Meanwhile, sporadic Apache raids continued in areas not far from Camp Grant. The Arizona press blamed Stoneman's policy for all the Indian problems in the territory and complained bitterly about the Camp Grant reservation and feeding system. Governor A. P. K. Safford and the territorial legislature supported "the Tucson ring," who demanded that General Stoneman remove the Aravaipa. In April, residents of Tucson decided to take matters into their own hands. Under the leadership of prominent Tucsonan, William S. Oury, a group of vigilantes met secretly to organize an expedition against the Aravaipa. The group set out for Aravaipa Canyon, under the leadership of Jesus María Elías, leader of the 1863 Aravaipa raid, and his brother Juan Elías, both experienced Indian fighters and members of a family who had recently lost five relatives in Apache raids (Officer 1987: 307). Of the 148 participants in the attack on the Aravaipa at Camp Grant, forty-eight were Mexican, ninety-four were Papago, and six were Anglo. The group assembled east of Tucson on April 28, 1871, marched secretly up the San Pedro, and two days later, at dawn, attacked the unsuspecting Indians at Camp Grant.

The raid was similar to that of 1863, and just as effective. Although the number varies in different reports, more than 100 Apache were killed; only eight of the dead were men. As in the 1863 attack, the raiding party brought children back to Tucson as prisoners, some of whom were sold by the Papago in Sonora. The Aravaipa subsequently exerted great effort to obtain the return of the twenty-nine captive children (Officer 1987: 306-08).

Eskiminzin and other members of his band who fled during the raid and had escaped to the nearby mountains returned the following day to care for the wounded and bury the dead. Eskiminzin apparently accepted Lieutenant Whitman's statement that the army had not been responsible for the attack and the survivors, who had no food reserves, continued to live near the army post (Ogle 1970). Six months later, the Aravaipa band was again attacked, this time by soldiers. After this second raid, Eskiminzin retaliated, killing San Pedro rancher Charley McKinney (Clum 1929).

Although reported favorably in Tucson newspapers, the incident, which came to be known as the "Camp Grant Massacre," aroused national indignation. Easterners demanded justice for the perpetrators, but they were quickly acquitted by a jury in Tucson.

The Camp Grant massacre coincided with increased interest in mining in the territory, and the publication of J. Ross Browne's report on Arizona's mineral resources. With the new interest in mineral exploitation in Arizona, Governor Safford pressured for a quick solution to the "Apache problem." A peace commission under the direction of Vincent Colyer, a Quaker, was quickly assembled and sent to Arizona. Colyer intended establishing an official reservation at Camp Grant with Lieutenant Whitman in charge (Ogle 1970: 92). In September 1871, Colyer held a council with two Aravaipa leaders Eskiminzin and Capitan Chiquito, possibly a successor to the previous leader, Capitancillo Chiquito, as second in command of the Aravaipa band. While in Arizona, Colyer realized that Camp Grant was a precarious location for the Aravaipas and attempted to persuade them to move to the Camp Apache region. When the Aravaipas rejected his plan, Colyer reluctantly agreed to a reservation contiguous to the post (Ogle 1970: 93).

On November 9, 1871, President Grant established Camp Grant as an official reservation. During its brief existence, until December 14, 1872, more than 1,000 of the Aravaipa and Pinaleño Apache received rations every ten days. Raiding in the Tucson area continued, and since the reservation had no daily muster, it was possible for Apaches at Aravaipa to roam large amounts of territory and return by the designated ration day.

Increased marauding led to a new storm of criticism, reminiscent of the situation which immediately preceded the massacre. The reputation of the Aravaipa Apache worsened. Writing during the late 1870s, Hiram Hodge (1877) considered them only "somewhat agricultural," and credited them with being "so fierce that although they were only a few hundred in number, they had "exterminated" the Sobaipuiri Pima during the late eighteenth century, and had "laid waste" to many towns in northern Mexico prior to the Gadsden Purchase (Hodge 1965: 163).

On November 5, 1871, a group of "Mohave Apache" (actually Yavapai) killed three members of George Wheeler's geographic survey team near Wickenburg, initiating a flurry of national publicity (Ogle 1970: 98-100). The territorial "war party" used the incident to secure Whitman's removal as agent to the Aravaipas, placing the Apaches at Camp Grant in greater danger. In 1872, after a series of unpopular agents, the Aravaipa held a council demanding Whitman's restoration, the return of their stolen children, and a new reservation in a healthier location farther removed from the whites (Ogle 1970: 104). General O. O. Howard, newly charged with Indian diplomacy in the territory, quickly initiated the removal of the Aravaipa to the San Carlos Reservation, and restored Camp Grant to the public domain. In February 1873, the army transferred 1,500 Apache from Camp Grant to San Carlos (Hastings 1959: 146-60).

Resettled at "old" San Carlos, on a site near Coolidge Dam now under the San Carlos Lake, the problems of the Aravaipa continued in spite of increased provisions and the initiation of irrigated farming on the reservation. Opposing Apache factions challenged the traditional leadership of Eskiminzin and Capitan Chiquito. In 1873, Capitain Chiquito, charged with harboring murderers and trading stolen stock to the Zunis, was sent to Yuma prison (Ogle 1970: 128). On January 1, 1874 Major Randall, head of the Agency guard, arrested Eskiminzin for unidentified crimes. Eskiminzin and a large group of followers promptly escaped to the mountains. During Eskiminzin's absence the Gila flooded, cutting the fugitives off from the reservation. Unable to return, the absent Apaches were automatically considered renegades. Lieutenant Schuyler and Chief of Scouts Al Sieber pursued the renegades for three months, and finally in April 1874 induced them to surrender to General Crook at San Carlos. Army troops held a series of skirmishes with the renegades in which at least eighty-three hostiles were killed and twenty-six prisoners taken (Thrapp 1967: 158-60). One of these skirmishes took place in Aravaipa Canyon near the site of Dan Ming's future ranch (Ming file AHS). Matanza Canyon, across Aravaipa Creek from the Ming Ranch, received its name from the presence of many bones and skulls, including those of children, which remained visible on the surface of the ground for years (V. Tapia 1989). In all likelihood, these were the remains of the Apache killed during the 1874 skirmish.

In August 1874, John Clum took over as agent at San Carlos. On his arrival, Clum, who befriended the Aravaipa and considered them the "pacifists of the Apache nation" (Clum 1936: 17), found that Eskiminzin had been placed in irons "as a preventative measure." Clum had Eskiminzin released and the two men cooperated well throughout Clum's administration. Clum established the San Carlos Apache police force, which was commanded at different times during his administration by two future Aravaipa ranchers, Dan Ming and Clay Beauford (a.k.a. Welford Bridwell). In May 1876, Clum took a group of Apache, including both Eskiminzin and Capitan Chiquito to Washington and the eastern United States, as part of a "wild Apache show" (Clum 1929: 1-27).

After their return from Washington, Eskiminzin's band began farming on the reservation on a private basis with considerable success. However, when Clum left the reservation in 1877, both Eskiminzin and Capitan Chiquito moved their families back to the Aravaipa area. The move returned over one hundred Apaches to their former homes. By August 1878, Eskiminzin had a farm on the San Pedro with over 140 acres under cultivation in grain, corn and beans, a small herd of cattle, tools, horses and a wagon. As early as 1878, he harvested sixty acres of grain (Ogle 1970: 188). Capitan Chiquito, with the new surname of Bullis, returned to fields on the lower Aravaipa, just above the site of the Camp Grant massacre, where he and his six wives and children farmed for more than thirty years. After the General Allotment Act of 1877, the Aravaipa families received title to their farmlands. Capitan Chiquito Bullis and his relative Lon Bullis were granted fee simple allotments of 160 acres, held in trust through the Indian Bureau (Aravaipa file, Bureau of Indian Affairs).

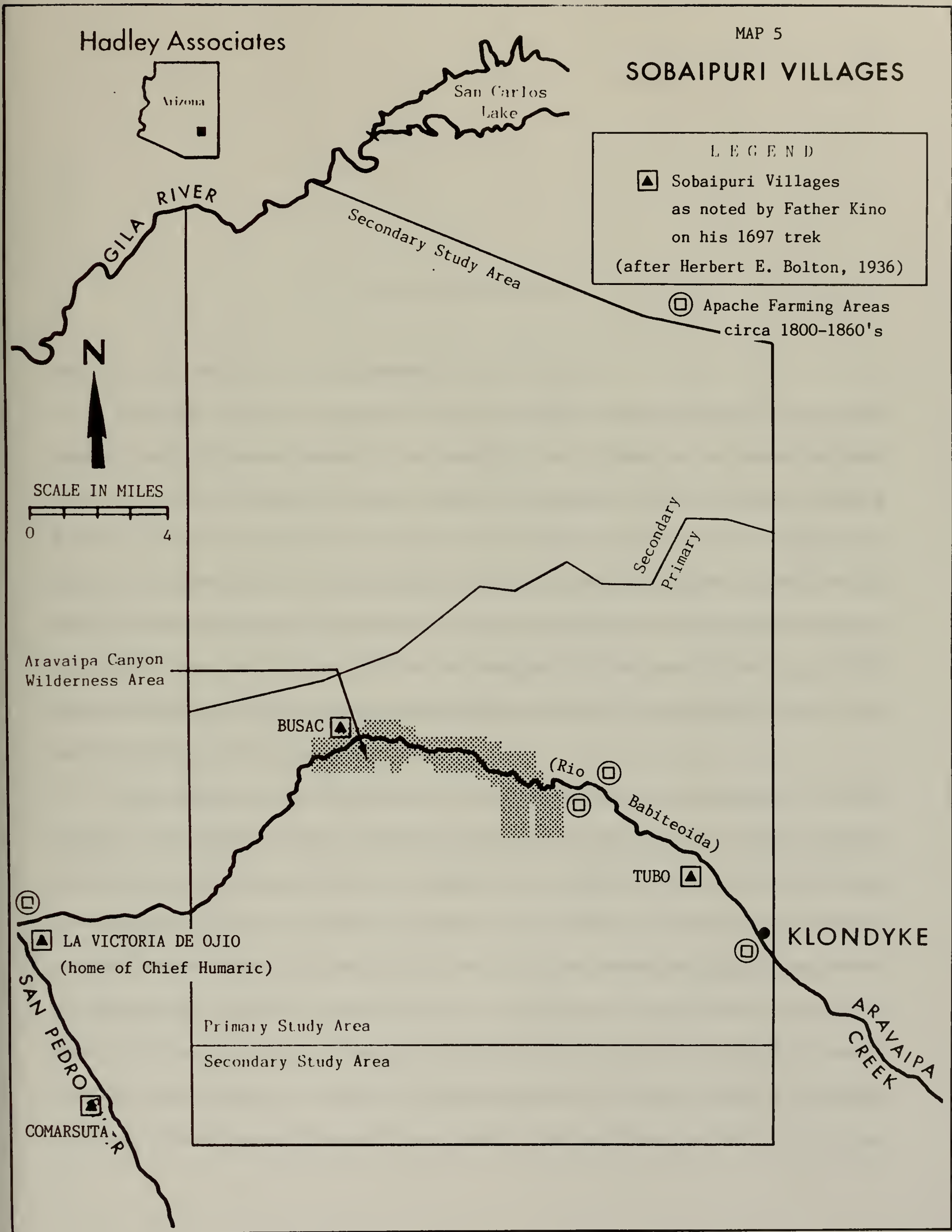
Throughout the early 1880s newspapers continued to report pursuits of renegade Apaches through Aravaipa Canyon. Even after considerable settlement had taken place in Aravaipa, the canyon remained an important corridor for San Carlos Apache on their way to Mexico (*Arizona Daily Star* 2/22/82). The Apache Kid, renegade member of the Aravaipa band, knew the Aravaipa well and used it for his hide-out. San Carlos army scout Tom Horn, who worked as a cowboy on the Dunlap ranch and later achieved great notoriety as an outlaw, reported that in 1888 he had pursued the Apache Kid, following his raid on the Table Mountain mining district. During the raid, Bill Diehl was killed and Bill Atchley's horse herd was stolen (Horn 1904; Forrest & Hill 1947: 40).

Although the former Aravaipa leaders continued to farm peacefully on their allotments, they suffered from backlash related to the Apache Kid's depredations. In 1888, a group of citizens arrived at Eskiminzin's ranch, harassed the women of his family and destroyed his crops (Clum 1929). In November 1889, the Apache Kid escaped from captivity on his way to the Yuma Territorial Prison, killing two law officers in the process. Between 1889 and 1893 the Apache Kid continued to pass through Aravaipa. Mrs. Callie Brandenburg, an early settler on the west end of the canyon, reported that the Kid wintered in a cave above her home during the early 1890s (Brandenburg file AHS). Newspapers claimed that both Eskiminzin and Chiquito Bullis were the Kid's father-in-law. In September 1890, Arizona newspapers reported that Chiquito Bullis, "a formerly peaceful Indian," had joined the Apache Kid's band of renegades, but quickly surrendered himself to John Forrester, a white man married to an Apache who lived at the mouth of Aravaipa Creek (*AC* 9/15/1890). White backlash forced both of the Aravaipa leaders to temporarily take refuge on the San Carlos Reservation (Clum 1929: 1-27). After the Apache Kid was reportedly shot by "Hualapai" Clark on the Mercer ranch near Sombrero Butte in 1893, both Capitan Chiquito and Eskiminzin returned to their farms (Knox 1931: 77-87). Capitan Chiquito lived in Aravaipa until the early 1920s. Eskiminzin died in 1895, but his descendants continued to farm on their San Pedro land. The presence of these two Apache family groups created a continuity of Apache residence in Aravaipa Canyon.

ENVIRONMENTAL IMPACTS OF AMERINDIAN SETTLEMENT

Although Amerindian residents of Aravaipa left a definite imprint on the land, clearly visible to early explorers, the full extent of their environmental impact is a matter of speculation. It is clear that their cultural alterations of the landscape were more limited in scope and extent than those of later settlers. For example, foot trails caused less disturbance than wagon or car roads. Livestock were probably present only temporarily after raids and in limited number. Although Amerindians practiced irrigated agriculture along Aravaipa Creek, they imposed no large-scale alterations of the creek bed. Amerindian hunting practices had not disturbed the beaver in Aravaipa Creek, or noticeably depleted any of the area's big game populations.

The most significant Amerindian environmental alterations probably resulted from the widespread practice of fire drives for hunting and fire clearing for agriculture (Dobyns 1981; Pyne 1982). Some scholars speculate that the Amerindian practice of making numerous small diversion dams for irrigation may have slowed the water flow in tributary creeks and deterred large-scale flooding and erosion in the area's water courses (Dobyns 1981: 59). Scholars also speculate that post-contact fluctuations in Amerindian populations caused by epidemics, forced relocations, or increased warfare had altered long-established patterns of environmental control (Dobyns 1981). This was the case in the Aravaipa area, where the upper Pima population had been reduced by epidemics during the seventeeth century, the Sobaipuri population had been eliminated by forced relocation (1762-63), and the Aravaipa and Pinaleño Apache had been prevented from pursuing traditional agricultural and hunting practices by the conflict with the U.S. Army (1860s and 1870s). Thus, when Anglo-American explorers and settlers wrote the first detailed descriptions of Aravaipa Canyon during the nineteenth century Army-Apache conflict, they were describing an environment in which human alteration had recently decreased.


Hadley Associates
Arizona
MAP 5
SOBAIPURI VILLAGES
San Carlos Lake
LEGEND
Sobaipuri Villages as noted by Father Kino on his 1697 trek (after Herbert E. Bolton, 1936)
Apache Farming Areas circa 1800-1860's
GILA RIVER
Secondary Study Area
N
SCALE IN MILES
0
4
Secondary
Primary
Aravaipa Canyon Wilderness Area
BUSAC
(Rio Babiteoida)
TUBO
KLONDYKE
LA VICTORIA DE OJIO
(home of Chief Humaric)
Primary Study Area
Secondary Study Area
SAN PEDRO R
COMARSUTA
ARAVAIPA CREEK

III

THE STARTING POINT

ARAVAIPA ON THE EVE OF EUROAMERICAN SETTLEMENT

An attempt to recreate the appearance and the native plant and animal species of Aravaipa during the nineteenth century relies on examination of written descriptions, land use records, and interviews with the oldest residents of the area. This chapter presents the earliest written descriptions. Early observations are limited in detail, and reflect the interests and concerns of the writer. Military observers, for example, considered the canyon to be a difficult passage and dangerously exposed to Indian ambush. Early explorers, settlers, surveyors, miners, and developers viewed the canyon with an eye to resources and resource accessibility. Early hunters and trappers, left the best record of animal populations, but focused on animals they wanted to eat or trap, or which they considered harmful. In the same manner, vegetation descriptions focused on usable plants: fuelwood, fence posts, mining timbers, and edible grasses and brush.

When explorers and settlers penned these first descriptions, they were not writing of a "pristine" Aravaipa. Even environments largely undisturbed by human impacts exist in a state of change, initiated by natural events. In Aravaipa, Amerindians had subtly altered their surroundings for a period of at least 800 years. Environmental historians have long dispelled the romantic myth of a "virgin land" in which pioneers subdued an unoccupied wilderness (Smith 1950; Nash 1967). In Aravaipa, Spanish, Mexican, and Angloamerican pioneers were hard-working, courageous, and visionary, but they did not subdue a pristine wilderness. Instead, they initiated a century-long pattern of Euroamerican land change on an area previously inhabited for centuries. When the first settlers arrived, Amerindians had already imposed their own cultural changes on the landscape of Aravaipa. Cultural impacts of European livestock, domestic plants, and diseases (smallpox, measles, typhus) frequently predated the arrival of the first Euroamericans (Crosby 1972; Castetter and Bell 1942). Although specific documentation for Aravaipa is unavailable, it is highly likely that when explorers first viewed the canyon, elements of Euroamerican culture had preceded them. The starting point, then, becomes arbitrary. For the sake of convenience, the study of Euroamerican cultural impacts on the Aravaipa begins with the earliest lengthy descriptions.

Between 1854 and 1856 two government surveying parties examined alternative railroad routes along the 32nd parallel. One route approximated the present railroad line through Willcox and another went through Aravaipa Canyon. Although the initial survey report favored the more southerly route, Lieutenant John G. Parke selected a route through Aravaipa. He estimated that the cost of the two routes would be roughly equal; however, the Aravaipa route was shorter by almost thirty miles. With an eye to future development, he noted that the Aravaipa route had the advantage of shifting the railroad "from barren ground to cultivable valleys..." (Parke 1857: 26-27).

The report states that Parke's surveyors had "discovered" the *arroyo of the Aravaypa*, which passed through the "trough between the Pinaleno Mountains on the northeast and the Calitro (Galiuro) Mountains on the southwest." The engineers noted that the name "Calitro" was used by the oldest residents of Tucson, and derived from the Spanish name for lime, "found in abundance there." Unfortunately they did not mention their source for the name Aravaipa. The engineers noted that the descent through the valley was at a rate of forty feet per mile to the entrance of the canyon, through the canyon itself at a rate of ninety-seven feet per mile. They proposed to "locate the line upon the slopes of this gorge and over the mesas, by leaving the stream at the western end of the canyon, and continuing for a short distance over the mesa to the bed of an arroyo which debouches about three miles below the mouth of the Aravaypa..." (Park 1857: 26).

Water sources for the Aravaipa route were to be found at a number of springs. The report explicitly mentions Bear Springs, a series of six springs, twenty-nine miles distant from Railroad Pass, "similar in character to all others encountered in this region, rising from the plain which, for several hundred square yards around, is covered with salsolaceous plants." The next source was a cienega, two miles beyond Bear Springs, in which water rises in the bed of the stream. On the eastern slopes of the Sierra de Calitro they found "several springs of a limited capacity, such as Pheasant, Antelope, and Dove springs." Although devoid of the detail and poetic enthusiasm of later descriptions of Aravaipa, Parke remarks that, "the Calitro Mountains present many advantages: permanent water exists in many places near the plain. The slopes are covered with a luxuriant growth of grama grass, and the gulches are filled with oak, ash, and walnut timber, the whole appearance of the country strikingly resembling many localities among the Coast Range of California.... Game is also abundant--antelope, black tailed deer, and a species of grouse..." (Parke 1857: 26-27).

"Captain" James H. Tevis, who spent the years between 1857 and 1860 in southern Arizona and served as station master for the stage station at Apache Pass, penned the next description. During September/October of 1857 Tevis accompanied "Uncle" Mose Carson, brother of Kit Carson, on a hunting and trapping expedition "down the Aravaipa Canyon to the Gila River, then up to the San Francisco." Tevis and Carson "lived like two kings" on an abundance of game. Tevis's geographic descriptions are not detailed and are sometimes confused. He described a campsite near Aravaipa Canyon on the "Gila" (substitute San Pedro), a one day trip from Cañada del Oro, where beaver dammed the narrow stream and flooded their camp. Tevis observed that the sacaton grass was *very* high and the undergrowth *very* thick (Tevis 1954:43).

In 1857, engineer James B. Leach and topographer N. H. Hutton wrote descriptions of Aravaipa Creek while surveying for the El Paso Fort Yuma Wagon Road. They ascended the canyon from the west, noting that there was no surface water at the mouth of Aravaipa Canyon. Hutton observed that "Arrivaypa Creek" originated 8.0 miles upstream, in "a large marsh, or lagoon, from which a small stream, in many threadlike branches, winds off toward the mountains.... The valley (for five miles) has been and now is cultivated by Indians, for a width of one-half or three-quarters of a mile along the stream; their ascequias and cornfields being visible at the time of exploration. Above this marsh permanent water ceases, and a valley from ten to fifteen miles in width extends southward to the Playa de los Pimos.... The stream of the Arrivaypa, was found to flow over a gravelly and sometimes rocky bed, having about the volume of the San Pedro" (Hutton 1859: 88). Hutton thought there were approximately 1,500 acres of arable land at the "head of the Arrivaypa," and about three or four thousand at the "head springs." This description indicates that in 1857-58, the emergence point for Aravaipa Creek may have been some distance above its present location.

In 1867, William A. Bell, an English geographer, approaching from the east, recorded the earliest detailed description of the Aravaipa Valley and Aravaipa Canyon, while working with the survey party for the Kansas Pacific Railroad's projected southern route. On November 17, following the main party of surveyors, accompanied by only two members of the cavalry troop, Bell passed by Bear Spring and Kennedy Springs, "thirty miles down the Aravaipa Valley." The three men immediately encountered Indian sign, and not catching up to the main party of a dozen wagons, they continued to ride on through the rainy night. Traveling down the valley, they had their first view of Aravaipa by intermittent moonlight.

> The moon rose and the clouds broke a little, so that now and then a glimpse was gained of the world around. On each side towered up a mountain range; between them lay the flat monotonous plain. At last we came to a sudden depression or groove in the centre of the valley; the land had sunk from beneath, and formed a second little valley at the bottom of the first. This was the commencement of the canada of the Aravaypa. We descended into it, and followed along the dry, grass-covered bottom until the sides had assumed the magnitude of bluffs. The ground became more fertile; brushwood, and even willows, grew in places; and soon a well-defined water-course could be made out running along one side of us (Bell 1869: 60).

At this point, Bell and his companions had arrived at Eureka Springs, where they found the water "warm and sulfureous, and neither fit for man nor beast." The wet and exhausted Bell finally spotted a white tent, and assuming he had overtaken his party, cried out "Friend," only to find himself in the midst of a "motley group of brigand-looking fellows, who ... pointed their long rifles at us." These proved to be the Indians they had been tracking, a group of Mexicans on their way from Texas to California, wearing moccasins, and riding unshod horses. In the morning they discovered that two American prospectors had joined the party of Mexicans for protection. All agreed to proceed together. Ten miles beyond Eureka Springs, they encountered another large spring which bubbled up from the ground in the center of the canyon; "from it flowed a perennial stream of considerable volume ... filled the valley below this point with thick luxuriant vegetation" (Bell 1869: 61).

Bell clearly recognized passing over a divide at which point the descent toward the Gila River began and which he described as the beginning of the "basin of the Aravaypa" (Bell 1869: 62). He further distinguished between the "canada of the Aravaypa, a groove at the bottom of the trough between the mountains," and the "canyon proper." The distance from the beginning of the "canada," or trough, to the first section of the canyon proper was twenty-five and a half miles. Still in the trough, Bell's small party finally caught up with the main group at a camp site which they named "Los Alamos Grandes," six and a half miles before the entrance to the canyon proper. In this area, they discovered an extensive Indian ruin on a slightly elevated piece of ground behind their camp site. It was covered with the "stone foundations of many buildings, large and small. The divisions of the rooms and entrances could plainly be made out." The ruin contained large quantities of broken pottery, "such as the Pueblo Indians make..." (Bell 1869: 61). The area described could be the ruin on the Haby ranch, which some experts believe to be Chichilticale.

Their next campsite was at the entrance to the canyon itself, near a large spring and a "conic hill," which they called "Look-out Mountain." The spring, which was situated under the hill, gushed out of the ground and more than doubled the size of the Aravaipa stream. Above the spring, "Look-out Mountain" commanded an extensive view "both into the canon and up the canada in the opposite direction." On the summit of this hill they found the stone foundations of a building, which they assumed had been used as an Indian look-out point. From this camp at the entrance of the canyon (near the emergence point and Matanza Canyon), Bell and a companion rode several miles into the hills above, to obtain the best view of the journey before them. Bell, reflecting his English perspective, described the surrounding country as a succession of desolate, treeless mesas. The most prominent feature they observed was an extinct volcano which provided the main obstruction to the northward course of Aravaipa Creek, preventing it from continuing its course directly to the Gila. They named it Saddle Mountain, a name later replaced by Lieutenant Stanley in his favor (Stanley Butte). The views obtained on this trip to the canyon's rim persuaded them to abandon their wagons, which were sent back to Camp Goodwin (Bell 1869: 63-65).

For the next six days, the group descended through Aravaipa Canyon. "Luxuriant vegetation fills up the space between the walls; the undergrowth consists of willows, young trees, bunch grass, reeds, etc., forming in many places an impenetrable thicket; and above them a succession of noble trees tower up toward the sky...." During their trip down the canyon, they observed abundant evidence of Indian occupation, and followed a clearly visible Indian trail all the way through the gorge. They passed several ruins, the remains of a number of Indian camps, several wigwams "perched upon the top of the cliff" in the upper canyon, and a number of small irrigating canals "where the space between the walls left a sufficient extent of bottom-land for such a purpose." The surveying party discovered the skulls and bones of the Indians massacred by the Tidball-Elias party in 1863 (Bell 1869: 67-68) across from a large cave (probably behind the Bill Salazar house). Apache wigwams became more frequent during the last eight or ten miles, particularly in the valley between the canyon and Camp Grant (Bell 1869: 74).

Bell's party found abundant game, including deer, quail, doves, turkey and beautiful birds, and continually observed the work of the beavers (Bell 1869: 69). After approximately seven and a half miles in the canyon proper, they came to the first of two "narrows," where huge perpendicular walls towered above them and the bed of the stream filled the entire passage. The first narrow was followed by an open space of some fifteen acres filled with grass and "splendid timber, cotton-wood, sycamore, live oak, ash, willow, walnut, and grotesque old mesquites of most unusual size" (Bell 1869: 70). Following his passage through the area which is now called the "box," Bell observed major changes in the landscape, including new rock formations and the first appearance of saguaros. As they began to emerge from the canyon, Bell observed a "huge mountain of igneous formation, consisting of six basaltic terraces one above the other, which formed a landmark for miles around..." (Bell 1869: 74). This formation was evidently Brandenburg Mountain. Eight miles beyond, the Aravaipa joined the San Pedro, south of Camp Grant. He remarked that in this last valley nearly all the water sank into the earth, and that residents of the fort told him that for many weeks during the year no surface water entered the San Pedro from Aravaipa (Bell 1869: 74).

The survey from Railroad Pass to Camp Grant followed this route, and gave the following distances:

Summit of Railroad Pass	0
Playa de los Pimas (center of trough)	6.50
Head of Aravaypa Cañada	22.52
Eureka Spring	5.89
Head of Aravaypa Canyon	19.41
Leave high-walled canyon	14.49
Camp Grant	12.12

An 1870 army report compiled by the Surgeon General's Office adds additional information on the environment of Aravaipa. The report corroborates Bell's statement that the stream went underground for several miles above the confluence, except during rains, when the shallow, sandy bed frequently overflowed and became unfordable. The army had attempted several times to reclaim land on the banks of Aravaipa Creek. Large-scale irrigated cultivation failed, but somewhere in the vicinity the soldiers had gardens in the river bottom. Drinking water came from a well, ninety feet deep, in the parade ground. Since malarial diseases were a major problem in the camp, the well was protected from surface water in order to prevent contagion from upstream swampy areas. Malaria was so rampant, that during several winters, the hospital was inadequate to care for the large number of soldiers who suffered from "fevers." In 1868, the troops had to be moved to a temporary convalescent camp, twenty-eight miles south of Camp Grant on the road to Tucson (Report of the Surgeon General, etc. 1870: 466).

Lieutenant John G. Bourke, stationed at Old Camp Grant between 1870 and 1875, adds more details to the composite picture of Aravaipa. He considered Camp Grant a dismal, malaria-infested post, but found the nearby canyon very beautiful (Bourke 1971: 1-16). He mentioned only two ranch/farms on the San Pedro, one operated by Joe Felmer and his Apache wife, and another run by the part-time freighters, Israel and Kennedy. He described an extensive prehistoric village adjacent to the post, and noted a dry streambed in Aravaipa Creek for a distance of five or six miles above the confluence. Bourke, who participated in numerous scouts through Aravaipa Canyon, penned the first description of its many side canyons, including a harrowing incident in which he hurriedly rode down the steep, slippery trail in Deer Creek to send an ambulance back up the main canyon to bring in a wounded trooper. Bourke also described two branches of the trail between Aravaipa and San Carlos (the San Carlos Trail), one which left the main canyon at its most precipitious section, "where the basaltic outcroppings begin," and the other which left the "extreme head" of Aravaipa and passed through Hawk Canyon (Bourke 1971: 47, 100).

The composite picture of Aravaipa, which emerges from these early descriptions, presents an Aravaipa substantially different in certain respects from the Aravaipa of today. The entire area near Aravaipa appears to have been wetter, with beaver dams, marshes and cienegas which no longer exist. Malaria presented a significant health hazard at the confluence where water stagnated. The Sulphur Springs, San Pedro and Aravaipa valleys were covered with bunch grasses and antelope. Game was abundant and repeatedly encountered. The creek flowed gently in banks which had not been downcut. No gravel bars were reported and the creekbed was lined with sand, bordered by lush banks with an abundance of small trees and brush, almost impenetrable in places. A canopy of large mature trees bordered the creek. Litter covered the ground on the creek banks, and in many places, particularly in the upper canyon, the surveyors found it necessary to chop their way through the dense undergrowth. Bell describes mesquites of enormous size, and towering cottonwoods. There is no mention of fire. Indian impact on the canyon was evident but gentle. Aravaipa still presented an image of largely undisturbed land.

Aravaipa Creekbed, circa 1890. Photographed by Joseph C. and Wallace B. Parker of the Atlantic and Pacific View and Portrait Company of Tucson. The Wallaces were itinerant photographers who took several pictures of Aravaipa.

View of Aravaipa Canyon looking west, c. 1900. Photographer is standing on hill above the Ming Ranch house. Note: creek is at photo left. Road at right is very narrow. Hay field, which appears in Photo 12, page 227, is at photo right. (Irene Kennedy Collection)

Lower Aravaipa, Creek bed, 1935, by Tad Nichols.
(Tad Nichols Collection)

IV

SETTLEMENTS

OVERVIEW

This chapter presents a brief summary of the way people settled on the land in Aravaipa, the pull factors which brought them there, the push factors which made them leave, and the lives they lived there. It covers the period from earliest settlement during the late 1870s, through the peak of Aravaipa population and prosperity during the 1920s. During this period, the study area had five mining camps with over 100 in population, two dispersed rural villages on the east and west ends of Aravaipa Canyon, dozens of isolated ranches, and one market center (Klondyke) for the miners, farmers, and ranchers of the area.

After 1930, for a variety of reasons, Aravaipa attracted fewer new settlers, and the few new arrivals followed settlement patterns similar to those already established by their predecessors. During the 1930s, the depression forced some unemployed individuals and families back to Aravaipa, but the absence of mining activity forced others away. In 1934, the Taylor Grazing Act, which reorganized grazing on public domain lands, ended the possibility that a small plot of free land could be converted into a substantial holding. During the 1930s the out-migration of second and third generation children began, since depressed economic conditions made it difficult for them to support themselves in a rural area. However, all of the vigor was not gone from Aravaipa's communities, and population held relatively steady through the mid-1940s. By the time of World War II, Aravaipa exemplified Arizona's demographic trend away from rural areas and into urban centers. Except for the re-opening of the Aravaipa Mine (1942-1957) by an Arkansas firm, which brought many of its own employees to Arizona and hired few of Aravaipa's experienced miners, there was little to attract new settlement in the area. Beginning in the 1950s, Aravaipa's population began to decline significantly.

Environmental impacts of the settlers varied according to economic activities and family size. The density, dispersal patterns, and customs of the population determined many of these impacts. Trapping is discussed in Chapter X; gathering of wild foods in Chapter IX. This chapter focuses on the home activities of the residents of Aravaipa's dispersed rural villages, and of the ranch families who lived in areas isolated from any of the communities or mining camps. Information contained in this chapter relies heavily on oral history interviews with members of several of Aravaipa's multi-generation families.

SETTLEMENTS AND POPULATION

Settlements in the Study Area

The study area includes portions of several distinct subdistricts: a section of the Aravaipa Valley, Aravaipa Canyon, Copper Creek, the Table Mountain area, and the San Carlos Mineral Strip. The study area falls within two counties: the western portion is in Pinal County, established in February 1875, and the eastern part is in Graham County, which was created from parts of Apache and Pima counties in March 1881. The Aravaipa area contains incomplete portions of separate watersheds which appear to be unconnected geographically and have remained unconnected by road to the present time (1990). However, during the late nineteenth and early twentieth century, all parts of the study area were socially and culturally integrated. Individuals from each of the areas were acquainted with and regularly visited residents of the other areas. Several families moved from one settlement to another within the study area. During the days before automobile travel became common, the absence of roads was insignificant: residents visited each other by horse or by foot.

Aravaipa's various settlements include: four mining camps, at Table Mountain, Copper Creek, Stanley, and Aravaipa; two dispersed rural farm villages at the east and west ends of Aravaipa Canyon which had schools but did not have stores or post offices; and one distribution center, with stores and post office, at Klondyke.

Early Settlement

Although Camp Grant provided army protection on the west end of Aravaipa Canyon after 1857 (Bourke 1971), threat from Apaches prevented significant settlement in the Aravaipa area for another decade. The earliest Mexican-American and Angloamerican settlers arrived in Aravaipa during the late 1870s, prior to resolution of conflicts with the Apaches. The remains of structures constructed by some of the 1870s and 1880s settlers can still be seen. Many of them were built with Indian defense in mind, and contain "portholes" through which the barrel of a rifle could be placed. Notable structural remains from this period include the house at Stone Cabin, south of Aravaipa Creek; the four ruined walls of a one-room stone house in a canyon bottom at the center of the bighorn sheep enclosure on the Dry Camp Ranch; and an intact, roofed stone house on the Mercer Ranch near Sombrero Butte.

The earliest known settlers on the east end of Aravaipa Canyon were Dan Ming and Epimenio Salazar, who arrived during the late 1870s, possibly together. On the west end of the canyon, Alexander Vail, who settled at Trails End Ranch, and the Brandenburg family, who farmed on Aravaipa Creek across from Brandenburg Mountain, were the earliest settlers. Unfortunately the original homes of Ming, Vail, and Brandenburg are no longer standing.

Population: Pull Factors, Occupation, and Ethnicity

The major pull factors on the east end were mining, stock raising and farming, in approximately that order. The west end, with its lower elevation, warmer climate, and abundant water, attracted farmers, particularly fruit growers. A series of short-term local mining booms had the greatest effect on demography throughout the entire study area, attracting numerous single male miners, some of whom remained in the area, married and raised families. Resolution of conflicts with the Apaches led to significant in-migration during the 1890s. Mini-mining booms, which took place at the Aravaipa mines, Stanley, and at Table Mountain during the decade, all contributed to settlement throughout the general area.

The United States censuses for 1860 and 1870 enumerate several dozen soldiers stationed at Camp Grant, the only population near the study area. The first census to mention Aravaipa is that of 1880. One incomplete page enumerates a population of sixty for *Arivaypa Canyon*, although it is not clear whether the enumeration includes the entire canyon or only the portion on the east end, which is more probable. In 1880, Aravaipa residents were listed as farmers, cattlemen, and miners in equal proportions, with one blacksmith. Many of those listed must have been temporary settlers, since their names do not appear in subsequent census records. By 1910, Aravaipa's east end population, counted as part of the "Klondyke precinct" in Graham County, had risen to approximately 334. The count included residents of the Aravaipa mining camp, the Grant Reef Mine, Klondyke, and the settlement in Aravaipa Canyon. Occupational distribution had shifted significantly, with "miner" listed as the most frequent occupation. The most common places of origin were Arizona Territory, Texas, Arkansas, Sonora and Chihuahua.

On the west end, settlements near the mouth of Aravaipa Creek (Mammoth, Dudleyville and Feldman, all established after 1880) were counted together with the west end of Aravaipa Canyon, making population analysis more difficult. However, the 1910 census makes it clear that the majority of residents area-wide were farmers and ranchers. The west end never developed a pattern of ethnicaly distinct settlements, nor did it experience a similar influx of immigrants from Mexico. West-end population has remained relatively stable throughout the period studied and has actually increased in recent years, a result of week-end residents and retirees.

After 1910, Aravaipa's east end population remained relatively stable for thirty years, although brief periodic surges of immigration from Mexico occurred during the Mexican Revolution and during the increase of mining activity at the Aravaipa mine in the 1920s. A big population decline came during World War II, followed by a temporary recovery when the mines reopened in the late 1940s. Not until after 1957 did the local population decline permanently.

Ethnic ratios indicated in the 1880 census point to an almost equal number of Anglo and Hispanic residents. However, by 1910, the Klondyke precinct had an approximately sixty to forty ratio of Hispanic to Anglo residents, and a distinct pattern of ethnic distribution had emerged. On the east end, a preponderance of Hispanic families resided within the canyon, below the emergence point of the creek. Outside of the canyon, between the emergence point and the junction of the Willcox-Safford road, the majority of the population were Anglos, with occasional Mexican-American farmers and goat ranchers.

Aravaipa's settlement pattern reflected concentrations of religious groups as well as ethnicity. The majority of the Hispanic settlers in Aravaipa Canyon were Catholic. Former residents recall that the Turkey

Creek-Table Mountain area was settled largely by members of The Church of Jesus Christ of Latter Day Saints. Although not exclusively Mormon, that area did have a significant number of LDS settlers. On the west end, the majority of settlers were Anglo-American, a pattern which was reinforced by an influx of immigrants from Texas after 1920.

Settelement on the East End

The dispersed rural village on Aravaipa Canyon's east end grew up around the Ming Ranch, and although it does not have a name at the present time (1990), the village was originally called "Mingville." By the early 1890s, the dispersed community in the canyon had a school, a dance hall, a cemetery, and at least twenty-five dwellings scattered along the banks of the creek for approximately seven miles. J. Frank Wootan, who attended school in Aravaipa Canyon in 1890, when his father was working for Dan Ming, recalled in his memoirs that the school house was made of cottonwood logs "with plenty of cracks you could throw a dog through" (Wootan file AHS; J. Wootan 1989). The original school in the canyon stood on the site of the Clay Turnbull place and was burned by arsonists in the 1950s. By the mid-1930s the canyon school had an enrollment of forty-five and had been moved to a location next to the Sam Turner place, where the ruins of the foundation are still visible. The school closed during the 1940s.

Klondyke, several miles east of the canyon settlement, became the area's distribution center during the mid-1890s when the Aravaipa and Grand Reef mines were operating. Although Klondyke never developed into a village with many homes, it had two stores, a post office, a saloon, a school, and a stamp mill for ore, and was surrounded by dozens of widely separated ranches, farms, and mining prospects. In one of his memoirs, J. Frank Wootan claims responsibility for having bestowed the name Klondyke on what he called a "country store," rather than a settlement (Wootan file, AHS).

In 1907, local settlers cooperated in the building of a school at Klondyke. Gregory Haby, Frank Wootan, Al Upchurch, Doctor Parker, Jake Weathersby and Wylie Morgan constructed a small schoolhouse on Jake Weathersby's field above the former Weathersby home. Frank Wootan sank a well next to it. Attendance grew until by 1936 approximately thirty-five students were enrolled at Klondyke (E. Claridge 1989).

From the mid-1890s, Klondyke had a mercantile store operated by a number of different owners. Shortly after 1900, Wylie Morgan ran a saloon next door. During the 1920s, George Chambers opened a second store on the Grand Reef road. The Klondyke store serviced a large area which extended from the Aravaipa box on the west, Turkey Creek and the slopes of the Galiuros on the south, the slopes of the Santa Teresas on the north, and Cottonwood Canyon on the east. This is approximately the same area formerly occupied by the Aravaipa band of Apaches, whose largest farming center was at *Tsé nan te lé* (Big Slanting Rock) near Klondyke (Goodwin 1942). For both the Aravaipa Apache and the Euroamerican settlers, Klondyke was a center.

West End Settlements

On the west end in Pinal County, most Aravaipa Canyon settlers were farmers. Early residents estimate that there may have been fifty to one hundred people living between the "Aravaipa box" and the San Pedro before 1900 (F. Wood 1989). Newspaper articles mention twenty families during the first decade of the twentieth century, with farms and ranches scattered along Aravaipa Creek for approximately ten miles above the confluence with the San Pedro. At different times, the west-end settlement had schools at two separate locations, but never had a post office or store. Residents of the canyon went to nearby towns on the San Pedro for mail and supplies.

Duration of Settlements

The study area had several post offices. The duration of a post office indicates the time span that an area had sufficient population to support postal service. The first east end post office was established at "Mingville," on the Ming ranch and operated for one year during 1881 (1/26/1881 to 12/16/1881). The Dunlap post office operated from Burt Dunlap's ranch (3/22/1883 to 4/17/1892), a few miles above Mingville. In 1892, its name was changed to Aravaipa. The townsite at the Aravaipa Mine also had a post office with Mrs. Harry Firth, the wife of the mine manager, serving as the first postmistress. Its dates of operation (4/18/1892 to mid-1930s) indicate that originally it may have been a substation of the post office at Dunlap. North of the Aravaipa Mine, at the Stanley Butte camp, the "Stanley" post office operated from 11/15/1906 to 9/13/1926. Klondyke has had a post office since July 22, 1907, with John F. Greenwood as first postmaster (Barnes 1960: 123; 129; 132). It is still in operation today.

On the west end the closest post offices to the Aravaipa settlement were those at Dudleyville (5/9/1881 to the present), and another slightly closer at Feldman (11/22/1911 to 5/15/1928). Copper Creek had a post office from 3/6/1907 to 8/31/1942; and Sombrero Butte from 6/18/1919 to 5/31/1945 (Arizona Post Office records, Arizona Historical Foundation).

The communities on Aravaipa Creek retained some of their vitality after the decline of mining (1930s) and truck farming (1920s). The beauty of the canyon, the fertility of the soil, and the ease of subsistence farming induced many settlers to remain in Aravaipa. In contrast, Stanley, on the arid slopes of a small mountain, where mining was the only means to make a living, suffered complete depopulation. In 1910 the mining settlement had a population of approximately 200, made up almost exclusively of single males. When the mines stopped operating, almost all the residents left (U.S. Bureau of the Census). The possibility of subsistence farming at times when no other employment was available prevented a similar drop in the population at the settlements in Aravaipa Canyon and Klondyke.

Many settlers throughout the Aravaipa area actually homesteaded, filing homestead claims and proving up on their land within the appropriate time. Many others, however, did not. Squatting was a common practice, particularly during the initial phase of settlement prior to 1910. Possibly twenty percent of the settlers in Aravaipa simply appropriated a piece of land, clearing, constructing buildings, and making major "improvements" without papers of any kind. Since most of the materials were free and the labor was their own, the investment seemed negligible. Conversely, many ranchers filed claims on properties which they never intended to inhabit in order to claim the surrounding range, obtain grazing leases, or secure water rights. Therefore, the issuance of a homestead deed is not a definite indication of actual residence on the site, nor an accurate record of population. Combined with the frequency of squatting, nonresident homesteading complicates demographic research (Homestead files, U. S. Bureau of Land Management, Phoenix).

HOMESTEAD ECONOMY

During the period between 1880 and 1910, a distinct settlement pattern developed in Aravaipa, which, with some minor variations, was common to both the east and west ends of the canyon. Up and down Aravaipa Creek, and in nearby areas, a typical "homestead" emerged. Although the place of residence may not have been legally homesteaded, the residences, work buildings and associated subsistence areas conformed to the idealized image of the nineteenth century "homestead." Settlers arrived in Aravaipa with varying quantities of capital, possessions, and skills, influencing the type of settlement they developed. A few arrived with a herd of goats or cattle and sufficient capital to hire laborers to clear land and construct buildings. Many others brought only their labor as economic security. Expecting to find work as miners, goat herders, cowboys, or farmhands, they constructed temporary shelters, planted a garden, and practiced subsistence agriculture. Many of the earliest settlers lived in shed-like structures, *jacales* as they are called in Mexico, or in tents, until they were able to construct dwellings. Others lived in caves to which they added porches and other domestic refinements. Joe Flieger and Abe White, both substantial ranchers on the west end, lived in caves for several years. Bill Smith resided in a spacious cave in lower Virgus Canyon near the Aravaipa box. Other settlers, like the Salazars and the Allbrittons, used caves as barns or storage areas (J. White 1990; B. Salazar 1990).

The general pattern of the homestead was similar whether the family had immigrated from Mexico or was Anglo-American in origin. During the first decades of settlement, the typical Aravaipa homestead consisted of the following: house, well, sheds, a fenced garden and orchard, wagon, plow, a few horses, chickens, a few pigs, and a milk cow. The settler cleared brush and small trees from an acre around the house, and planted a subsistence garden and an orchard nearby. Most homesteads, even those directly on the Aravaipa Creek, had a well for domestic purposes. Pigs, chickens, dairy cows and horses were penned only at night and grazed freely in the area surrounding the home site.

Settlers built their houses of lumber or adobe. They purchased milled lumber, but adobe came from selected areas where settlers knew that the mud with high percentages of clay would make "good bricks." The adobes for Epimenio Salazar's dwellings, and Cuca Salazar Gonzalez's house, for example, came from a small plot at the downstream end of the Salazar fields (V. Tapia 1989). Some houses were made of stone. The

Brandenburgs constructed a large stone house in lower Aravaipa which washed away in the 1941 flood (J. White 1990). The Mings' original house contained a stone wing. Alexander Vail, one of the earliest settlers on the west end, constructed a house from enormous square-cut logs, which he hoisted into place alone, employing a self-designed set of winches (Vail file AHS). The recycling of building materials was common. After the mining "booms" at the Aravaipa and Grand Reef mines were over, many settlers tore down the abandoned lumber buildings at the camps, and reconstructed them on their properties. Jake Weathersby used the old telegraph poles from Fort Grant to build one of the corrals behind his ranch house. Settlers recycled all of the lumber from the large buildings at the Grand Reef.

Most of the early settlers in Aravaipa had large families, which were desirable since the entire group worked as an economic unit, participating in both the primary and secondary economic activities. All members of the family cooperated in performing subsistence activities and domestic chores. Children had assigned tasks associated with ranching and farming activities, and their labor was particularly important when cattle had to be gathered or crops harvested. All the larger boys helped bailing hay. Children tended the homestead livestock, helped with farm chores, herded cattle or goats, and frequently provided some additional income from trapping.

The wives of homesteaders often took charge of the vegetable garden and orchard, considering these activities an integral part of domestic economy. Food preservation and preparation were time-consuming activities in the days before refrigeration. Women canned vegetables, fruits and meat. They also dried large quantities of fruit, including portions of the wind-fall apples and pears (V. Tapia 1989). Fruits were dried outside on a special drying table and brought inside at night for protection. Buckets of milk were chilled in the well. Vegetables and other perishables were stored in a storage cellar or in an "Arizona cooler," a cooling device made of a frame box with shelves, covered with gunny sacks, kept cool by dripping water (R. Whelan 1990; V. Tapia 1989). Cooking frequently took place outside during the summer, in order to avoid the heat of the wood stove. Most families made jerky from either beef or venison, and men played a larger role in jerky-making and all activities associated with butchering, although women did the canning of beef and venison (S. Rubal 1990). Another common method of preserving meat was to "lard down" cooked steaks, packing them in rendered lard in large cans.

Homesteaders supplemented their income with a variety of economic activities, including trapping, woodcutting, fence building, the sale of produce, part-time mining, and ranch work. To earn spending money, women often cooked and sold food at local gatherings or dances, did domestic work for sick neighbors, or took in laundry for miners. The wagon trip to Willcox or Safford for supplies took two days, and wagons seldom went empty into town. Homesteaders took produce, fence posts, or firewood for sale to groceries and lumber yards. The Vindiola family conducted a regular business providing slaughtered hogs to butcher shops in Safford and Willcox (N. Vindiola 1990). Homesteaders' wagons returned with 100-pound sacks of flour, barrels of sugar and coffee, and sacks of salt. On the way to and from town, east end families often camped at Cottonwood Canyon or near the Eureka Springs. The west end trip for supplies to Mammoth or Winkelman involved the same commodity exchanges, but took less time.

In addition to the family vegetable gardens and orchards, several settlers had small "truck" farms varying in size from one to five acres. The majority of homesteaders planted a few extra rows of the crops which were part of the personal subsistence pattern, including corn, beans, melons, squash, root vegetables and greens. Money from sale of the excess produce was incidental, although it occasionally provided crucial income (C. Whelan 1990; J. Sanchez 1989; R. Whelan 1990; V. Tapia 1989).

An additional source of supplemental income during prohibition was the manufacture and sale of liquor. This long-practiced method of creating a value-added product from undervalued farm produce has been an additional source of income to American farmers since before the American Revolution. Prohibition increased the market value of the product. Aravaipa was ideally situated for clandestine activities. Stills could be hidden in hundreds of isolated draws and canyons. "Moonshiners," the manufacturers, buried large barrels of liquor or hid them in hay stacks for later sale to "bootleggers," the illegal wholesale dealers who transported the liquor to saloons in small barrels or gallon jugs. Several Aravaipa residents were skilled moonshiners, but few were bootleggers. Moonshiners made a large variety of liquors, including: corn whiskey, called *mula blanca*; mescal, a less distilled form of Mexican tequila; *tisguin* a slightly fermented corn liquor, called *tulapai* by Apaches; and pear, peach and plum brandy. A number of people made liquor for home consumption only, while others had substantial distilling operations, large enough to supply a number of wholesalers. The remains of stills can still be found in El Alambique Canyon, above the Salazar cemetery, in the box canyon above Buford Camp, in the Devil's Hole and many other parts of Aravaipa.

Many informants report that "practically every side canyon had a still during prohibition" (B. Salazar 1990). Liquor sold for approximately $5.00 a gallon, the price fluctuating according to availability and quality (V. Tapia 1989; V. Mercer 1990; N. Vindiola 1990). More liquor was distilled during the spring and summer because the mash fermented faster. Moonshiners added sugar, honey, and fruit to flavor their product. Only the larger producers had equipment for testing the alcohol content, and some moonshiners allowed the product to run to 100 or 110 proof. Competition among moonshiners resulted in the theft of several stills, two of which were removed from the Youngs' place on Deer Creek (S. Baker 1990). Several farmers used a portion of their corn crop to make *mula blanca*. On one east end farm, corn liquor was produced in a large still behind the alfalfa field, stored in two or three barrels buried in the ground and hidden under loose hay. The farmer sold the corn liquor locally to bootleggers for $5.00 to $6.00 a gallon (*GG* 3/4/27). The west end was well known for its fine fruit brandy, which greatly increased the income from local orchards and made its way into speakeasies in all the surrounding mining towns. Some of the distillers became local celebrities, particularly a Spaniard who lived on a west end farm and made a variety of high quality fruit brandies. Two west-end settlers had a still below Mining Mountain where they made corn liquor. A wood-cutter, who lived near the Mercer Ranch and supplied the Copper Creek area, was famous for the excellent mescal produced in his *viñata* (V. Mercer 1990; B. Salazar 1990).

Inevitably some of the moonshiners were caught. In August 1929, Sheriff Seth Dodge received a "tip-off" that a large distillery was being operated on "the Bob Angle place" near Klondyke (part of the T-Rail Ranch). Tracing members of the Estrada family through a corral into an adjoining canyon, Dodge discovered a seventy-five gallon copper and brass still, which he considered to be "one of the largest and finest he had ever seen." Two members of the family were arrested (*GG* 8/30/1929). Felix Muñoz was arrested making whiskey, while his ten-year-old son assisted him by stirring the mash. Arrests occurred fairly frequently and convictions were common (*GG* 5/9/24; *GG* 3/4/27). However, fines were not large, and little social censure accompanied what many Aravaipa residents considered an acceptable occupation.

ENVIRONMENTAL IMPACTS

The cultural impacts which homesteaders imposed on their environment can be visualized as a series of concentric circles spreading out from the home site. The inner circle at the homestead itself was the area of primary impact; the second circle beyond the homesite constituted the area of secondary or moderate impact from domestic grazing and protective trapping; the third circle, a larger area of tertiary impact, extended well outside the homesite to locations where settlers cut fuel wood and gathered wild plants. Within this third circle, however, impacts on particular locations (fuel wood-cutting or grazing areas) could be intense.

Under the Aravaipa pattern of homesteading, each family impacted between one and five acres near the residence, through farming and domestic use. In this primary impact area, immediately surrounding the living quarters, the land was cleared and leveled, water was diverted from the creek, the native vegetation was largely removed, exotics replaced native plants, and domestic livestock (as opposed to range livestock) grazed intensely on any remaining areas of native vegetation. In the secondary area of moderate impact domestic stock grazed intermittently, the family gathered wild plants for domestic use, and trapped wild animals for protection of domestic animals and for fur sale. The impact in the secondary area varied according to individual practices. James Brandenburg, for example, who had 150 head of unpenned hogs at his west end homestead, must have impacted this area severely.

The third and more distant impact area extended far from the homesite. In this area settlers gathered plants and herbs, cut fuel wood and fenceposts, and grazed their livestock. Many settlers were familiar with a substantial pharmacopoeia of wild plants (both native and exotic), which they used for treating both humans and animals. They often gathered these plants far away from the homesite. They also gathered a significant number of edible wild plants for their own consumption (see Chapter IX for a discussion of plant gathering.) In the days before bottled gas stoves, families both heated and cooked on wood-burning stoves. The average family (approximately six members) consumed between four and eight cords of wood each year, depending on house size and temperature preferences. The preferred woods for cooking and heating were oak, juniper and mesquite. Although cottonwood and other less dense woods could be used for quick start-up fires, they do not make good stove wood because they burn quickly. Cedar and juniper provided wood for fence posts. Cottonwood and other light woods were occasionally used for stays in fence lines. Ocotillo was often used for chicken coops and pens. If cut while dormant, and subsequently watered, ocotillo will reroot and provide some protection against burrowing predators.

ETHNIC VARIATIONS IN SETTLEMENT PATTERNS

Between the late 1870s and the 1920s, Aravaipa residents included members of three separate ethnic groups with distinct cultures or subcultures: Apache, Hispanic, and Anglo-American. After the conflict of the 1880s ended, several members of the Aravaipa Apache band resettled at their former home near the mouth of Aravaipa Creek. During their stay on the San Carlos Reservation, Apache farming practices had radically altered with the adoption of "modern" methods (see Chapter VIII for a discussion of Apache farming.) However, they continued many of their other former cultural practices. The six wives of Capitan Chiquito Bullis continued to live in Apache style structures, each having her own house. Constructed of reeds or ocotillos plastered with mud and roofed with Johnson grass and mud, the houses usually had one room. Cooking was done outside. The houses were built on the trail toward Table Mountain to preserve the best bottom land for farming. The Apache families continued to gather traditional edible and medicinal plants, particularly mescal, acorns, and saguaro fruits (W. Johnson 1990). They continued making traditional corn liquor, *tulapai*, and older Anglo-American residents of the canyon recall noisy celebrations (A. Buzan Matteson n.d.). The Apache families did not integrate into the little rural community at Aravaipa, and apparently did not send their children to the school. Anglo-American residents of the canyon recall that when any member of the extensive Bullis clan died, the house was burned according to Apache custom. After the death of Capitan Chiquito in the 1920s, most of his family moved back to San Carlos. However, members of the family continued to summer on their land near the confluence for many years, arriving with herds of horses and burros (A. Buzan Matteson n.d.; C. Wood 1990; F. Wood 1989).

Other groups of Aravaipa Apaches made several trips every year from San Carlos to the Klondyke area to pick acorns and to gather a large variety of native foods and medicines. They came on horseback, brought all their food and cooking equipment with them and camped in choice acorn locations. They often stayed for weeks, camping near the houses of friends among Aravaipa's east-end Hispanic community, particularly Doña Chepa

Duran, an elderly Apache woman who had been taken captive in Mexico as a child, subsequently married in Mexico, and later moved to Aravaipa with her husband, becoming one of the settlement's *parteras* (midwives). Mrs. Epimenio Salazar had one particularly close friend among the Apache women (V. Tapia 1989). Lupe Salazar was friendly with General Crook's scout John "Nosey" (B. Salazar 1990).

The Hispanic community concentrated along the east end of Aravaipa Canyon between the emergence point and Deer Creek Canyon. By 1920, a stable community of fifteen to twenty Spanish-speaking families lived in this area. Some of the Hispanic families arrived from Mexico during the 1870s and 1880s; many of these Mexican-American families resided in the canyon through the third generation. The families of Epimenio Salazar, Juan Martínez, and Laureano Moraga were among the first arrivals. The major in-migrations of settlers from Mexico occurred during the mining boom of the 1890s and during the Mexican Revolution (1910-20), which coincided with a second mining boom at the Aravaipa Mine and Grand Reef Mines. Although many of 1920-generation of Mexican immigrants were skilled miners or cowboys, they often arrived with almost no economic resources, and little understanding of the English language or of American customs (J. Sanchez 1990).

Many of Aravaipa's early Hispanic settlers never learned English. They frequently did not take out citizenship papers and many never homesteaded the land they occupied for years, nor took out papers of any kind (M. Ramírez 1990). The Vindiolas, Chacóns, Alvarados, Garcías, Moragas, Martínezes, and Quijadas were among the east end settlers who did not file homestead claims (A. M. Valenzuela and R. Valenzuela 1990). Acquiring citizenship and the practice of voting followed individual preferences. Some Aravaipa Hispanics voted regularly even though they were not citizens; others became citizens but did not vote. The *Great Register of Graham County* for 1904 includes the names of Juan Martínez, José and Rafael Moraga, and Epigmenio Zalazar [sic.]. All were registered to vote. Martínez and the Moragas had not taken out citizenship. However, Epimenio Salazar, born in Mexico, was listed as *naturalized* in Solomonville in 1895. Salazar was one of the first settlers in Aravaipa, if not the first. His wife Crespina had lived for many years near Bonita, where she had worked for the army at Fort Grant. Although Epimenio had taken out citizenship papers and voted, for years he ignored the admonitions of his son Lupe to file a homestead claim or file on water rights, assuming that since he had arrived first, he had a right to the land. He was correct in his assumption that the government recognized preemptive rights, but failed to grasp the need for legal protection. His children, who attended local schools and were comfortable with the Anglo-American legal system, later filed the necessary claims (B. Salazar 1990).

Unfamiliarity with the culture, customs, and language placed immigrants from Mexico at a relative disadvantage to those of the Anglo-American settlers who had greater economic resources, or had access to banks, loans, and the network of cattle and agri-business contacts from which they could expand their economic base. On the other hand, Hispanic families, particularly immigrants from Mexico, had the advantage of a more elaborate, traditional folk culture. Families, who had lived in isolated sections of Sonora and Chihuahua for generations, had long been accustomed to procuring a comfortable existence along the banks of desert rivers, very similar to Aravaipa. They were familiar with a larger pharmacopoeia of native plants, had a more elaborate native cuisine, and had the ability to produce a wider variety of tools and implements from the materials they found in their environment. The community was able to provide itself with a number of goods and services. Two *parteras* (midwives) lived in Aravaipa and babies were delivered at home. The midwives were also adept at curing a number of ailments and visits to the doctor were infrequent (V. Tapia 1989). Among the Hispanic families, it was common to grow a small medicinal herb garden, in addition to collecting wild medicines. *Yerba buena* (peppermint) and *té manzanilla* (chamomile) were the most commonly used domestic herbal remedies. An elderly immigrant from Mexico was a saddle maker. He repaired saddles and made *tapederas* (stirrup covers), *reatas* (braided rawhide ropes), quirts, and horsehair reins (B. Salazar 1990). Many of the Hispanic women in the canyon made cheese for local consumption and sale. They milked a few range cows, clabbered the milk with *cuajo* (cow tripe), and produced *queso ranchero*. In addition to the county school, an elderly woman, Doña Mariquita, taught reading and writing in Spanish (V. Tapia 1989).

Although there were few obvious differences in the settlement patterns of Hispanic and Anglo-Americans, some subtle differences existed. In general, Hispanic settlers had smaller holdings and settled in a denser community. With the exception of the Salazars and the Zapatas, most of the larger ranches and farms in the Aravaipa area were Anglo-owned. The majority of Hispanic settlers worked for wages in addition to their subsistence activities, and members of the community lived a proud and independent life.

Anglo-Americans tended to live in a more widely dispersed pattern. In general, Anglo-Americans had larger property holdings and were more frequently in the livestock business. Their ranches, whether for cattle or goats, were more widely separated, and houses and work buildings tended to be larger and occupy more space. Although the impacts created by the homestead differed little from those of the Hispanic community, ultimately the Anglo-American community left a greater imprint on the land through the construction of roads, larger numbers of livestock, and operation of mines.

SOCIAL LIFE

The Hispanic community on Aravaipa's east end had a very active community life. A number of accomplished musicians lived in the canyon, and dances and fiestas were a frequent occurrence. All holidays, those of both Mexico and the United States, were celebrated. In 1914, Epimenio Salazar constructed a dance hall on his property. Although later converted into a family chapel, the building had intensive use during its early years. In September 1925, the *Graham Guardian* announced, "three dances have been held in the lower canyon *this week*" (*GG* 9/25/25). In December 1926, while workers from the Aravaipa Mine had vacation, "a three day and night dance was given at Epimenio Salazar's Dance Hall on Christmas Eve, with more than 100 people in attendance from Willcox and Safford" (*GG* 1/1/26). Weddings were also elaborate events, usually held at home. Although no church was ever constructed, a priest made regular visits to the canyon to say mass in one of the homes and in later years services took place in the former dance hall (V. Tapia 1989).

Separate social activities for the Anglo-American community on the east end centered around the Klondyke School. In March 1915, a meeting of the Klondyke "Mothers Club" was held at Mrs. Frank Wootan's home, with "Mmes. Weathersby, Allaire, Greenwood, Wilson and Rex in attendance" (*GG* 3/12/1915). "Klondyke Sociability Runs" were held throughout the summers. Tourists went en masse in cars, particularly "Hupmobiles," to Klondyke where they were treated to a goat barbecue, an afternoon of calf roping and horse races, followed by a dance, and breakfast the following morning compliments of the Grand Reef Milling Company (*GG* 3/19/1915). During the 1920s, dances in the Klondyke school house with "real snappy jazz music" were advertised a week in advance. The former home of Burt Dunlap, later owned by Mae Dowdle Davidson, added considerable elegance to Klondyke with its fine furnishings, elaborate parties, and a clay tennis court surrounded by chicken wire.

During World War I special Fourth of July parties were given for servicemen. Soldiers included Ben Roten, Joseph Whelan, Edwin Wootan, Sam Morgan, and Claude McClintock. Others who registered for the draft were Jesús Moraga, Louis Moraga, Juan Martínez and Burt Morgan. Klondyke had church services every third Sunday of the month. During World War I, Elder E. B. Tenny held meetings at Klondyke's Union Church. One service in 1915 was followed by the "first organ concert ever held in Aravaipa Canyon" (*GG* 11/26/1915). During the 1920s, Baptist ministers held Sunday school in the afternoons (*GG* 2/19/1925).

Patterns of settlement established between 1890 and 1920 remained largely unchanged for the next three decades. Despite population decline during the 1930s and 1940s, people continued to live in essentially the same way on isolated ranches and in dispersed villages on the east and west ends of the canyon. Some limited trade in goods and services went on within the communities, along with considerable "trading" of work, informal exchange of labor for round-ups, ditch repair, and house and barn construction. People exchanged visits by horseback between settlements, attending dances and gatherings at both ends of the canyon. Family residence remained relatively stable, with many families remaining on the same homesteads or ranches for two or three generations. This pattern was more noticeable on the east end of the canyon, where considerable intermarriage among Aravaipa settlers occurred during the first and second generations.

During the boom years of the 1920s, Aravaipa's small communities were self-sufficient, providing their own education, religion, organized sports, and entertainment. Prohibition undoubtedly added vigor to the social life of the Klondyke area, since the area's remoteness gave party-goers more protection from the law. However, with the beginning of the Depression and the end of prohibition, life in the canyon became quieter. Individuals began to seek employment and social life elsewhere. Both ends of the canyon received public electric service during the 1950s, and roads were improved. Local telephone service arrived at east end mines during the 1920s; general telephone service arrived on the east end during the 1950s, and the west end had telephone service after 1967. However, despite these new conveniences, residents left the canyon. After the Athletic Mine closed its operation at Aravaipa in 1957, population on the east end dropped radically. The west end maintained a larger population, but with a different composition. Since it was less isolated from larger communities than the east end, as small farmers and subsistence settlers began to seek employment elsewhere, they were replaced by part-time residents and retirees. On both ends of the canyon, during the 1960s, local schools were closed as part of the rural school consolidation program which occurred throughout Arizona.

1880 CENSUS (incomplete)

NAME	RACE	SEX	AGE	RELATIONSHIP	OCCUPATION
Busnater, John H.	W	M	73		
Luther, John	W	M	22		Farmer
Davis, H.J.	W	M	65	Father	Farmer
Davis, C.	W	M	12	Son	At house
Hoag, Ezra	W	M			Miner
Bridewell, W. C.	W	M	32	Husband	Farmer
Bridewell, C.	W	F	21	Wife	Keeping house
Hunter, F. F.	W	M	35	Husband	Cattleman
Hunter, B. E.	W	F	28	Wife	Keeping housse
Hunter, Alice M.	W	F	5	Daughter	At house
Hunter, Mary E.	W	F	4	Daughter	At house
Hunter, V. E.	W	F	2	Daughter	At house
Mier, A. H.	W	M	31	Husband	Machinist
Mier, C. E.	W	F	23	Wife	Keeping house
Mier, H. S.	W	M	9	Son	At house
Mier, M.	W	M	3	Son	At house
Mier, P.	W	M	2	Son	At house
Rogers, B. B.	W	M	43		Cattleman
Roberts, E. M.	W	M	31		Laborer
Roberts, M. E.	W	F	27		Keeping house
Lassiron, John	W	M	67	Husband	Farmer
Lassiron, J.	W	F	62	Wife	Keeping house
Galarfy	F	F	51	Sister-in-law	
Galarfy, N.	W	M	69	Brother-in-law	Blacksmith
Lauren, E. A.	W	M	28		Farmer
Massing, E. A.	W	M	35	Husband	Farmer
Massing, D. M.	W	F	33	Wife	Keeping House
Massing, Lattia	W	F	2	Daughter	At house
Knight, R. H.	W	M	43		Farmer
Lynch, Patrick	W	M	60		Farmer
Latich, C. P.	W	M	34		Farmer

KLONDYKE PRECINCT
1910 CENSUS

NAME	HEAD OF FAMILY/ORIGIN	WIFE/ORIGIN	# CHILDREN
Wootan		Millie/Texas	5
Morgan	S. William/Texas	Ida/Texas	2
Samaniego	Feliciano/Mexico	Rafla/Arizona	2
Moraga	Deffina/Mexico		1
Leon	Juan/Arizona	Juana/Arizona	2
Moraga	Luana/Mexico	Juana/Arizona	6
Samaniego	Juan/Mexico	Francisca/Mexico	
Kennedy	John H./California		
Ortega	Jesus/Mexico		
Modeles	Maria/Mexico		
Bostamonte	Francisco (lodger)/Mexico		
Santa Cruz	Jose/Mexico		
Salazar	Epigmenio/Mexico	Liepina/Mexico	7
Parra	Jose/Arizona	Pastora/Arizona	2
Martinas	Juan/Arizona	Delores/Mexico	6
Duran	Emilio/Mexico	Josefia/Arizona	5
Nolan	William/Texas	Mag/Texas	6
Leona	Benito/Mexico	Maniard/Arizona	
Garcia	Francisco/Mexico	Maria/Mexico	
Leon	Alberto/Arizona	Elena/New Mexico	
Vaca	Sam/Mexico	E./Mexico	2
Finch	Harry/Pennsylvania	Rosa/San Simon	1
Vindola	Jesus/Mexico	Terreca/Arizona	3
Porter	David/England		
Landsman	Frank (roommate)/Germany		
Finnciar	Tomas/New York		
Dunn	William/Michigan		
Wootan	Joseph/Texas		
Graham	John R./Tennessee		
Upchurch	David/Texas	Maggie/Texas	6
McClintock	Wallin T./Arizona	Betty/Arizona	
Johnson	Arthur (lodger)/Sweden		
Complas	Luke B./California	Jennie/Canada	
Wilson	Drew/Texas	Amy/Arizona	1
Sisson	Tomas/Minnesota		
Rural	Jose/Mexico	Antonia/Arizona	2
Rex	Tomas J./Texas	Mary C./Texas	4
Morgan	Wiley/Texas	Amanda S./Texas	3
Noscas	Jesus M./Mexico		
Rubal	Sacarais/Mexico	Delfina/Mexico	
Garcia	Louis (brother-in-law)	Rita (sister)	2
		Esther Rubal (sister)	
Campos	Jesus/Texas	Carmen/Arizona	6
Chamber	Charles/Tennessee	Adelaide/New Jersey	
Quinn	James/New York	Gracie/California	2
Nounty	Albert S./New York		
Rogers	Claude/Texas		
Wootan	James R./Texas	Mary A./Texas	5
Martin	Henry E./New York		
Welcher	Edward (partner)/Kansas		

KLONDYKE PRECINCT
1910 CENSUS
(Cont'd)

NAME	HEAD OF FAMILY/ORIGIN	WIFE/ORIGIN	# CHILDREN
Rortio	Castro/Mexico		
Franco	T. (partner)/Mexico		
Salsen	Charles/New York		
Collisten	Kenneth (partner)/New York		
McCulley	Clara/Massachusetts Jenette/Canada		
Cherry	Floyd/Ohio	Rosa S./Ohio	1
McClintock	William H./Arizona	Katy/Arizona	2
Sibley	Rupert/New York	Belle/Pennsylvania	4
Vye	James (lodger)/Canada	Lillian (lodger)/Neb.	
Hall	Henry/Wisconsin	Elizabeth/Wisconsin	2
Porchard	Thomas/Wisconsin		3
More	William/England	Alma/Illinois	3
McGovern	Nathan/Canada	Julia/New York	
Rhodes	William/Arizona	Minnie/Arizona	
Ellsworthy	David/New Mexico	Nellie/Iowa	2
Puffett	William/Texas		
Millson	Fred (partner)/New York		
Stanyre	Frank/Iowa		
Clark	Richard/Arizona	Edna/Arizona	
Take	Harry/Japan (3 partners)		
Costa	Jose/Mexico	Nicolana/Mexico	3
Sabata	Tonitia/Mexico (1 lodger)	Francisca/Mexico	9
Costa	Miguel/Mexico	Antonia/Mexico	4
Valenzuela	Rafullio/Mexico		2 nieces
Echolo	Rosa/Texas		2
Gardner	Alex/Louisiana	Piscella/Mississippi	
Whelan	Kate/California		3
Whelan	Edward/Arizona	Mamie/Nevada	1
Johnson	Thomas/Texas	Margaret/Iowa	1
Jackson	Edwin/Massachusetts		
Madrid	Antonio/Mexico	Jesus/Mexico	9
Franco	Jesus/Mexico	Felista/Mexico	6
Greenwood	John F./Texas	Fanny B./Texas	6
Graham	Mary/Texas		2
Ferguson	William A./Kentucky	Mary S./Virginia	2
Weathersby	Jacob/Texas	Mary/Kentucky	1
Monge	Frederick/Mexico		
Portier	Henry D./Missouri	Fanny K./Texas	4
Hayes	Conie L./Texas	Sally/Louisiana	1
Wooten	T. Kane/Texas	Laura/Arizona	3
Francis	William/Illinois	Margaret/Texas	4
Hammong	Douglass/Texas	Mattie/Texas	1
Haby	Gregory/Texas	Mary/Texas	2
Alexander	Albert/Indiana	Bertie/Texas	1
Barras	Manuel/Mexico		
Vartia	Inas/Mexico		
Rolin	William/Tennessee	Sada J./California	3
Walker	Albert/Texas	J./Arizona	1
Colman	Field T./Texas	Daisy/Texas	1

ARAVAIPA RESIDENTS/VOTERS

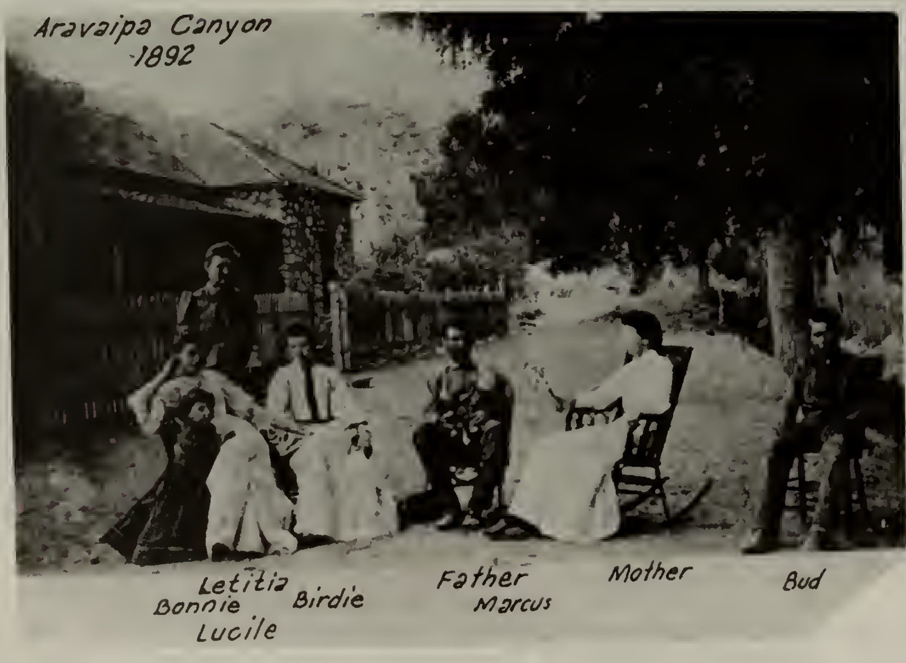
GREAT REGISTER OF 1904
Graham County, Territory of Arizona

NAME	AGE	ORIGIN	NATURALIZATION
Adams, R. I.	42	USA	
Adams, William	68	USA	
Albriton, W. H.	67	USA	
Allison, O. W.	46	USA	
Bernard, W. E.	22	USA	
Brito, Rafael	27	USA	
Chamgers, Charles E.	48	USA	
Duke, J. M.	51	USA	
Dempsey, J. E.	60	USA	
Euran, Joseph C.	32	USA	
Faris, A. J.	54	USA	
Forbes, William	60	USA	
Firth, Henry T.	47	USA	
Gardner, Mabry	38	USA	
Howard, A. J.	41	USA	
Jayne, Delos D.	42	USA	
Kunzman, Frank	54	USA	
Knowles, R. S.	40	USA	
Munoz, B.	30	USA	
Morgan, Wiley M.	44	USA	
Maders, W. H.	39	USA	
Monyose, Luse	58	USA	
Martinez, Juan	41	USA	
Moraga, Jose	24	USA	
Moraga, Rafael	27	USA	
Nash, J. E.	36	USA	
Olney, Ben W.	33	USA	
Parker, H. D. (M.D.)	44	USA	
Pern, Gaspi	40	USA	
Page, Arthur D.	21	USA	
Parra, Jose	21	USA	
Robles, Pete	21	USA	
Rubal, Jose	22	USA	
Rubal, Juan	34	USA	
Sanford, John P.	21	USA	
Stapleton, T. C.	62	USA	
Sanford, J. T.	24	USA	
Sawyers, M. S.	33	USA	
Scully, George	69	Ireland	July 16, 1874, San Bernadino
Scott, Edwin B.	27	USA	
Sanford, George W.	52	USA	
Tift, H. H.	50	USA	
Upchurch, D. A.	32	USA	
Villa Lobos, Estaban	50	Mexico	March 20, 1893, Graham Co.
Valensuela, Francisco	22	USA	
Wooten, Frank	27	USA	
Weathersby, J. P.	29	USA	

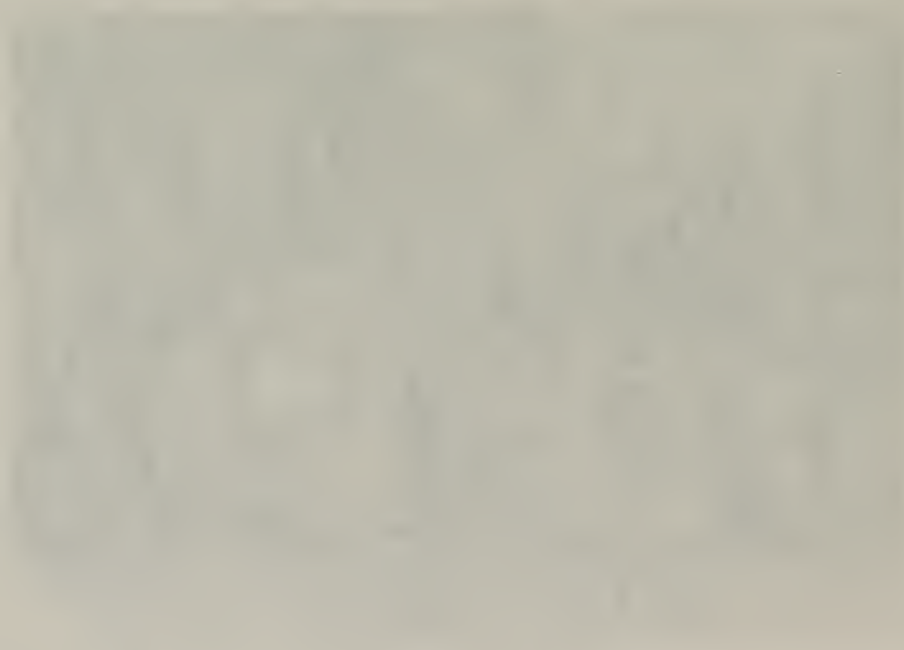
GREAT REGISTER OF 1904
Graham County, Territory of Arizona
(Cont'd)

NAME	AGE	ORIGIN	NATURALIZATION
Weathersby, R. N.	30	USA	
Wight, W. L.	23	USA	
Wight, John B.	21	USA	
Wilson, J. R.	68	USA	
Wootan, W. L.	26	USA	
Wight, L. L.	52	USA	
Wilson, W. H.	65	USA	
Weathersby, R. H.	32	USA	
Warren, W. C.	68	USA	
Williamson, Charles	72	USA	
Whelan, Edward M.		USA	
Zalasar, Epigmenio	41	Mexico	1895, Solomonville, Arizona

Dan Ming Ranch, Upper Aravaipa, c. 1890s. Note height of trees in orchard and cultivated fields.

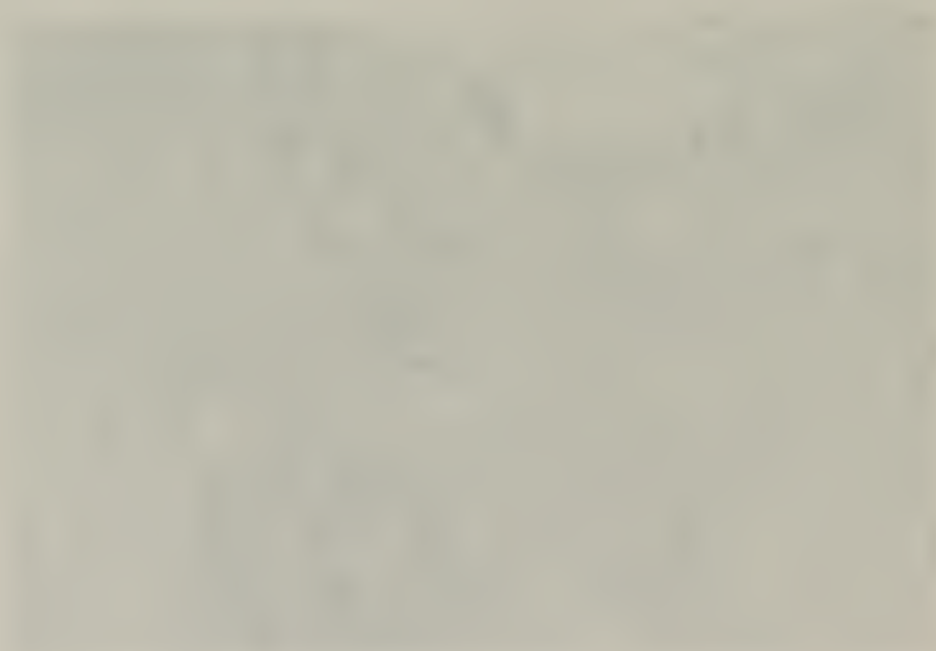


The Daniel Ming family at their home in Aravaipa Canyon, 1892.
(Arizona Historical Society)



Victoria Salazar Tapia on the rim above Aravaipa Creek, 1930s (Victoria Salazar Tapia Collection)

Members of the J. R. Wootan Family at their house on the east end of Aravaipa Canyon, c. 1900. (Graham County Historical Society, Safford)



Members of the White family with produce, 1920s.
(Jep and Peggy White Collection)

Members of the White family at Stone Cabin ruins.
(Jep and Peggy White Collection)

V

MINING

OVERVIEW

Early prospectors in the Aravaipa area found some evidence that exploratory mining had taken place during the Spanish and Mexican periods. Territorial mineral exploration began during the 1860s and 1870s, when miners set up several primitive smelters. After termination of conflict with the Apache, prospectors explored the entire region and by the early 1890s, the Aravaipa area had five active mining districts. The creation of a mining districts expresses human economic activity. Therefore, Aravaipa's districts do not conform to the United States Geological Survey's designated mineral districts, which reflect geological history and mineralization. Although production records for the Aravaipa area are vague, the Aravaipa-Grand Reef and Cooper Creek districts had the longest periods of operation and greatest development. Activity at Table Mountain was early and brief. The mines near Stanley, on land claimed by the San Carlos Reservation, had active mining only until the 1920s and the Deer Creek Coal Fields, also on the contested San Carlos Mineral Strip, had low production.

The Aravaipa area experienced three periods of intense mining activity which could almost be described as localized mini-booms, interspersed by periods of inactivity. The first phase took place between the late 1880s and the 1910s, centering first in the townsite of Aravaipa and at Table Mountain and later shifting to Stanley and the Grand Reef group of mines. The second phase began during World War I and continued until the early years of the Great Depression, and was centered in the Klondyke-Grand Reef area. The third phase, initiated by the World War II economic recovery, took place in Copper Creek, and to a lesser degree in the Aravaipa-Grand Reef area and consisted of molybdenum and lead mining. This phase continued into the 1950s, at which time all mining activity in the area ceased and the local population declined radically.

The Aravaipa Grand Reef complex, Table Mountain and parts of the Stanley district are within the Aravaipa watershed. Portions of the Stanley district and all of Copper Creek and Deer Creek are in separate watersheds, however they are included here in order to present a fuller picture of the area's mining history. Mining activity in all Aravaipa districts had significant impact on the socio-economic and demographic structure of the region. Direct environmental impacts from mining include: mass wasting of tailing piles and destabilized hillslopes; increased leaching of heavy metals into floodwaters and, possibly, groundwater; and increased sediment loads in creek channels which may have caused changes in channel depth, width or meander patterns.

EARLY HISTORY

Throughout Arizona, between 1000 and 1450 A. D., Amerindian people practiced limited amounts of crude mining, largely for clay, coal, and salt (*Arizona Bureau of Mines Bulletin* 1950: 21-22). During the Spanish and Mexican period, exploration for minerals and a limited amount of casual mining occurred in southern Arizona, consisting largely of placering for gold and crude smelting of silver from outcroppings. Early Anglo-American prospectors reported *antiguas*, ancient Spanish mines, in mountains throughout southern Arizona. Rumors persist that both Table Mountain and the Aravaipa township had been mined before Anglo-American settlers arrived, and that both areas had ancient adobe smelters. Prospectors definitely described the remains of adobe smelters at Stanley (Barnes 1960) and at the Bluebird Mine near Copper Creek.

Spanish and Mexican miners employed *arrastras* to grind ore in a stone-lined hole in the ground. To extract precious metals, they used the *patio* process, in which mercury was applied to the ore. They also smelted small quantities of ore in *vasos*, adobe smelting furnaces. Primitive smelting required labor-intensive processes, consumed large amounts of wood as charcoal, and required high grade ore with proper proportions of lead for oxidation to litharge, necessary for the smelting process (Tenney 1927-29: 270-74; Young 1976: 26-29; Pfefferkorn 1949).

Exposure of the area to gold-rush prospectors in 1849, road building, and army posts all contributed to the expansion of southern Arizona's mining. Many miners returned from California to Arizona Territory after the Gadsden Purchase of 1854. In 1856, a metallurgist for Sylvester Mowry's Patagonia mine, reported that the

Maricopa Mining Company was operating a copper mine near the junction of the San Pedro and Aravaipa under the direction of Andrew B. Gray, the United States surveyor who worked on the Arizona-Mexico boundary survey. After 1857, the San Diego and San Antonio stage line followed the Leach wagon road along the San Pedro River, making the Aravaipa area more accessible. The establishment of the army post (later Camp Grant) near the confluence of the Aravaipa and San Pedro in 1859 increased protection from Apaches. In 1860 only one miner was living at the San Pedro settlement near Fort Breckinridge. However, after the Civil War, when the army introduced a more substantial military presence in Arizona Territory, mineral exploitation began in earnest (Mowry 1864; Ross 1932; Tenney 1927-1929).

The earliest recorded prospecting at Copper Creek took place during the Civil War. In 1863, miners extracted high-grade silver and lead ore from the Blue Bird mine in that district. However, little other mining activity took place for the next decade. During the 1870s, the high price of metals and the army presence at Old Camp Grant encouraged exploration. Lieutenant J. B. Wheeler's 1871 "Report of Exploration of the Aravaipa Canyon," completed during the investigation which followed the Camp Grant massacre, indicated that prospecting was already underway on the upper Aravaipa. "Dr. Atkinson, Mr. Brick, and others" had made mineral locations which gave "evidence of being very rich in silver and copper" (quoted in Hodge 1965). In the fall of 1871, Philip Kohlheyer and Charles Blackburn filed five claims of 320 acres each in the Deer Creek coal field. On the east end of Aravaipa, local rancher "Colonel" Welford C. Bridwell (a.k.a. Clay Beauford) obtained small amounts of ore and reportedly erected a small smelter near the deposits later owned by the Aravaipa Mining Company. By 1883, work had begun in the Stanley district at the Copper Belle deposit and the Friend Mine. Silver and copper prices remained high throughout the 1870s and 1880s, and promotional literature, including Hiram C. Hodge's widely circulated 1877 work, *Arizona As It Is, or The Coming Country*, quoted Wheeler's mineral reports (1965: 133). However, after the mid-1880s the price of copper fell to a low of nine and a half cents per pound, and silver dropped to $1.00 an ounce, causing a temporary setback at many camps (Tenney 1927-1929: 21).

A general spirit of optimism pervaded the initial period of settlement in Aravaipa. Increased protection from Indians, high metal prices, and exposure of the Aravaipa area to army personnel stimulated settlement. Within a few years of Apache removal to the San Carlos Reservation in January 1873, the first miners and cattle ranchers began to settle in Aravaipa, with many individuals pursuing both enterprises simultaneously. Early

Aravaipa ranchers, like Bridwell or the Dunlap brothers, could not resist the appeal of prospecting. Although both men perceived mining as a sideline, they filed a number of claims. Connection to the army provided another impetus for prospecting and settlement. Captain John Burgess, who developed the Table Mountain Mine, had been an Indian agent at San Carlos; Welford C. Bridwell, one of the earliest ranchers on the east end of Aravaipa, was former chief of scouts at San Carlos; and General J. L. Bullis, who had extensive mining interests immediately south of the townsite of Aravaipa, was another former Indian agent at San Carlos. Optimism and expectations of high returns from mining were confirmed by Dr. F. L. Ransome's 1904 United States Geological Survey report on the geology of southern Arizona. The report initiated a race for the more favorable ground in many districts, and many inactive operations resumed work under the auspices of larger companies (Ransome 1904).

GOVERNMENT MINING POLICY

The General Mining Law of 1872 coincided with the period of initial settlement in the Aravaipa area. Coming at the height of entrepreneurial expansion during the Gilded Age, the new mining law was designed to encourage exploration and allow the prospector/developer to reap the full benefits of his discovery. The law gave prospectors several important privileges: free access to all public lands not explicitly withdrawn from mining; the right to explore for and develop mineral deposits without prior notification of federal officials; and the security of a vested property right for the duration of mining. Valid discovery was the only requisite. Once the claim was recorded, the claimant was free to construct buildings, cut timber, graze cattle, or divert water, as long as the uses and developments were "incident to mining" and the miner provided proof of $100 in location and assessment work annually on each claim on the mining property. This amounted to approximately one or two months of work per year during the 1870s and 1880s. If not completed, other interested miners could pick up the inactive claim. In reality, even the small amount of assessment work was hedged in many cases. Once the claimant began actual mining or filed to patent the claim after proof of $500 total work, the law required that the claimant prove the deposit could be mined at a profit, under "current market conditions." The federal government then issued title to both surface and mineral estates, charging a patent fee of $2.50 an acre for placer claims and $5.00 an acre for lode claims. The new mining law offered a major inducement to the mining industry and had the additional benefit of being self-regulating since inactive claims could be contested and re-registered by competing miners. More than any natural resource law, it gave industry a free hand to develop public land, and provided generous legal protection to the domestic mining industry (Hinchman 1990: 5). It offered a major inducement to prospectors in the Aravaipa area, offering access to use of land and security of tenure while active exploitation of the resource was taking place.

HISTORY OF THE DISTRICTS

1. ARAVAIPA-GRAND REEF

The Aravaipa group of claims, at the townsite of Aravaipa, included nineteen patented and five unpatented claims, one of which had been mined for lead-silver and copper ores since the 1870s. The principal workings consisted of the Arizona, the Orinoco, and the Number One mines. Locators filed the first recorded claims in 1872. Early prospectors included Charles Cunningham, John Harr, Charles McGeary, local ranchers Burt and Horace Dunlap, and "Colonel" W. C. Bridwell, who reportedly built the small smelter found near the Aravaipa mine. In 1889, J. W. Goddard purchased prior claims in the Aravaipa area and organized the Aravaipa Mining Company. Between 1890 and 1895, the company expended more than $300,000 in development work, building an engine house at the Arizona shaft and about eight buildings at the Aravaipa townsite, including a post office, several dormitories, a large dining hall, and the stone residence of superintendent Harry Firth, one of the original buildings still standing in 1990. General manager, "Captain" Kelly, a former Clifton saloon owner and employee of the Arizona Copper Company, supervised the work of two to three hundred part-time miners. Paying higher wages than other companies, the Aravaipa Mining Company attracted experienced miners like George Kingdon, who later became general manager of the United Verde Extension Mining Company of Jerome (Aravaipa file ABM).

The Aravaipa Mining Company sank the Arizona shaft to a depth of 580 feet, pumping water at the 500-foot level and not finding ore until they reached the bottom of the shaft. They drove the Orejana tunnel to 700 feet and the Number One shaft only a few hundred feet. Other workings on the company's property included a tunnel several hundred feet long on the Gordon, irregular tunnels on the Grand Central and Head Center, and tunnels and pits on the Iron Cap (Ross 1932: 96-98).

When the government demonetized silver during the mid-1890s, active work at the mines stopped. Harry Firth remained on the property as overseer for the Aravaipa Company while several different lessees operated the mines on a limited basis. He continued to reside in Aravaipa until his death in 1933 (*GGF* 8/21/25; *ADS* 1/27/42). Lessees did small amounts of development work during the first decade of the century. In 1916, John Gleeson of Cochise County and T. C. Parker leased the Number One claim, reportedly shipping lead carbonate ore worth $90,000.

The Aravaipa mines had a second phase of large-scale activity between 1925 and 1927, under the supervision of Lewis Douglas. The Douglas group leased the Aravaipa Mining Company's property and adjacent claims which belonged to Harry Firth. To pay for the leases, Douglas and his partner Frank Brophy used profits from a tailing recovery process which had been devised by their manager at Faribank, Harry Hendrickson, who later managed the Grand Reef Mine near Klondyke and the large molybdenum mines at Copper Creek. The partners formed a new Aravaipa Mining Company with Douglas as president. In 1925, Douglas moved to Aravaipa, built a small house at the Grand Reef Mine, and spent much of the next two years overseeing the operation (Browder 1986: 41). The famous mining man had high expectations and told local newspapers that Aravaipa had "more surface ore than he had ever seen" (*Miami News* 11/6/26). Douglas shipped large amounts of new equipment to the Cork siding on the Arizona Eastern Railroad, and then trucked it to Aravaipa. Raw ore from the mines was hauled to the railroad at Glenbar for shipment to the smelter at El Paso. In 1926 the company installed a modern seventy-five ton flotation mill at Aravaipa, and for the remainder of the operation they shipped concentrates. By 1927, it was clear that large percentages of zinc in the lead concentrates were making the venture unprofitable, and the company suspended operations, putting approximately fifty men out of work, and costing the company shareholders, mainly friends and relatives, approximately $250,000 (Browder 1986: 41). The Douglas group continued small amounts of development work on the property until they sold their interests to Eagle Picher Lead and Zinc Company (C. Turnbull 1990).

During the first two periods of activity at the Aravaipa mines, between 1895 and the mid 1920s, several other small mines were worked within a few miles of the Aravaipa townsite. The Bullis group of nine patented and nineteen unpatented claims centered around Imperial Hill, some only a mile southeast of Aravaipa on the opposite side of Tule Canyon. Reported to have been located during the 1870s, the claims received little attention until General J. L. Bullis, former Indian agent at San Carlos, purchased them in 1906. He did assessment work for several years but shipped little ore. After his death the Aravaipa Leasing Company did some development work. During the 1920s, E. H. Bachman of Globe and his associates purchased the claims and planned to erect a cyanide mill with a twenty ton capacity, but never completed the project (Aravaipa file ABM).

Adjoining the Bullis property on the northwest, the Bullis-Landsman claims were owned in common by Mrs. Bullis and Frank Landsman, a colorful German prospector who lived a hermit-like existence on his claim at Landsman Spring for many years. According to local Aravaipa lore, Landsman shared his cabin with a pet rattlesnake and several tame javelinas and called in hundreds of quail every day (Ross 1925; E. Claridge, 1989). Two miles east of the Aravaipa townsite in the Tule and Copper Bar gulches, the Royal Tinto group of twenty-two unpatented and ten patented claims was owned by the Royal Tinto Mining and Smelting Company of New York. In 1902, Frank Landsman leased the New York claim in this group and successfully developed the mine, shipping fifteen tons of chalcocite ore, which reportedly assayed twenty-nine percent copper (plus small amounts of gold and silver) per ton. The major development work on these properties consisted of the Sam Jones and Copper Bar tunnels and one shaft house. Charles A. Firth, son of the manager for the Douglas group, had four unpatented claims, two northwest and two south of the Royal Tinto property (Aravaipa file ABM). In 1926, two well-known Cochise County mining men, John Gleeson of Gleeson and Sam Frankenburg of Bisbee organized the Aravaipa Extension Mining Company to work claims adjoining those of the Aravaipa Mining Company. They sunk a shaft to 400 feet and made regular shipments of lead-silver ore, using a steam hoist in their operation (Aravaipa file ABM).

The third period of significant activity occurred between 1942 and 1957, when the Athletic Mining Company of Fort Smith, Arkansas, operated the mines at Aravaipa. The Athletic expanded their operations beyond the immediate area of the Aravaipa townsite to include the Bullis group and several other smaller near by claims. Raymond F. Orr of Fort Smith was president and chief engineer, Harvey L. Horton of Safford vice president and manager, Anthony Bennett of Klondyke mine foreman, and Charles A. Firth, director. The company, which employed approximately thirty men, shipped lead and zinc ore to their zinc smelter in Fort Smith. Between 1942 and 1949, they mined the existing shafts and tunnels at Aravaipa and developed the Iron Cap and Head Center mines, four miles northeast of Aravaipa, which became the company's biggest producers after the early 1950s. They also took over the Bullis claims and worked them extensively for the first time. While Athletic operated the mines, J. A. Gruwell and associates purchased the old tailing pile at Aravaipa and erected a pilot plant to recover zinc from the tailing. They treated the concentrate by roasting and hydro-chemical processes to produce zinc oxide (Aravaipa files ABM).

In 1948, the Athletic Mining Company rebuilt the flotation concentrator near Klondyke to have a capacity of 100 tons per day. The ball mill, crusher, and concentrator stood three miles west of Klondyke near the junction of the road to the Grand Reef Mine (at the 1990 site of the white frame Baptist church). The ore first went through a ball mill and then through four flotation machines, in which chemical reagents, including lime and cyanide, were used to separate lead from zinc. Operation of the mill required three men, a mill operator, a wiper, and a helper. The operator checked the reagents which formed froth and brought the minerals to the surface; the wiper wiped the froth (containing the values) off the top. The first flotation systems brought zinc to the surface. In a second system, lead was depressed and zinc rose. The metals were then sorted and placed into two separate ore bins for shipment. A large well at the site provided water for the mill. Water used in the flotation processes was pumped out, along with the sludge, directly into a big tailing pond adjacent to the mill. The Klondyke tailing pile was never retreated (C. Turnbull 1990).

South of the Aravaipa claims, the Grand Reef group of mines included seven patented and four unpatented claims in and near Laurel Canyon. The miners stoped out the dramatic looking orange-colored 360 feet high reef formation which cuts across Laurel Canyon. The Grand Reef group of mines, which produced mainly zinc and lead, proved to be the most profitable mines in the Aravaipa area. They include: the Grand Reef in Laurel Canyon; the Dog Water in Silver Cable Canyon, four-fifths of a mile south of the Grand Reef mine; and the Silver Cable mine, approximately 250 feet east of the Dog Water on the south side of the gulch. Located in 1893 and patented in 1899, the claims covered 1,000 feet along the outcrop.

During the 1890s, John W. Mackay of California purchased the mines from the locators. He sank the main shaft to a depth of 300 feet, attempting to develop the copper sulphide ore at the lower depths. According to newspaper accounts, Mackay, "one of the big Comstock lode men" (Mackay, Flood, & Fair), spent millions of dollars in development work. At the camp he erected a large number of frame buildings, which remained standing until the 1940s. The structures included three houses for management, a boarding house for miners, an office, store room, warehouse, assay office, power house, blacksmith shop, oil house, powder house and several tent houses. Mackay supplied the camp with the most up-to-date machinery, including a complete assay outfit, the first steam operated air drill in the state, and several steam boilers. He installed a steam-powered pumping plant on a well outside of Laurel Canyon and a four-inch pipe line from the plant to the Grand Reef Mine. Since Mackay hoped to develop the copper in the lower depths, he left the high-grade lead and silver ore in the upper levels for future shipment (Grand Reef file ABM; Ross 1925). Water for the steam-powered pump and hoist came from Laurel Canyon, which did not appear to have any specific spring but ran a steady stream of water eight or nine months a year. Fuelwood to operate the steam engine probably came from the mesquite flats on the Dowdle property which was close to the mine (C. Turnbull 1990).

On Mackay's death in 1903, the mine passed into the hands of his secretary, Richard V. Dey of New York, who leased the property to two separate groups of local lessees. Dr. L. E. Wrightsman, Dr. Ruff and Gust Chlarson leased the property until 1915, and Robert J. Anderson and J. S. Purdy leased it from 1915 to 1919. James Quinn, a Klondyke resident and owner of other local mines in his own right, acted as general superintendent for both groups of lessees. During this period of high copper prices, the local operators continued development, excavating to the depth of 600 feet and constructing 5,000 feet of interconnecting underground workings. The first group of lessees constructed a crude, inefficient concentrating plant at the mine. In 1916, the Anderson group installed the mine's first electric power, a fifty kilowatt generator with a ten horsepower motor, a separate three horsepower motor for the assay laboratory, a Quenner chain hammer pulverizing mill, and a concentrating plant invented by Anderson himself, which fed ore into the mill on conveyor belts at the rate of twenty tons per hour. The mine employed thirty men, working in two shifts. Concentrates were hauled in a wagon from the mines to Cottonwood Springs, where they were loaded onto trucks and taken to Fairview on the

Arizona Eastern Railroad for shipment to the smelter. The mining activity resulted in a settlement of about twenty people at Cottonwood, most of whom worked maintaining the road (Grand Reef file ABM).

Before Dey sold the Grand Reef, the property was involved in litigation several times. In 1919, Dey sold the mines to the Aravaipa Leasing Company, a subsidiary of American Lead and Zinc Company, for a reported price of $1,000,000, "spotcash." The new company immediately dewatered the mine, and constructed a new flotation concentrator with a ninety ton per day capacity. C. E. Minor, who produced a detailed study of the mine in 1921, became superintendent, overseeing the work of between sixty and 100 men. The company employed two engineers and operated its own assay office. This was the period of largest production for the mine and by the late 1920s, the Grand Reef was the second largest lead mine in Arizona (J. F. Teer in *Where the Waters Meet* 1988: 25-27; *GCG*, 6/1/20).

During the Depression, mining activity in Aravaipa decreased. In 1930, Harry Hendrickson closed down production at the Grand Reef. Shortly thereafter, a small family operation, run by Red and Harold Felsrud and the Turnbull family, took over the mine. Since they did not have dewatering equipment for the deeper levels, the Felsruds mined on the fifty foot level, extracting zinc and lead ore, which they shipped to El Paso while they processed other portions of the ore in the Klondyke ball mill (C. Turnbull 1990).

As World War II approached, mining resumed, and the Grand Reef produced lead and zinc throughout the war. After 1939, the Grand Reef Mining Corporation ran the mine, with J. A. Gruwell as superintendent and ten employees at the mill. In 1941, the Calistoga Mining and Development Company of Hollywood, California took over the mine and further rehabilitated the property, replacing the old mill with a larger one. During the war, the Grand Reef produced so much copper and lead ore that the mill could not process it all, and ore piled up in a big dump outside the mill. The tailing, which accumulated next to the mill, eventually became so substantial that Calistoga began milling it for mineral values, shipping twelve tons of concentrates every other day to the El Paso smelter. The tailing ran about five to six ounces in silver and five to six percent lead per ton. Frequently the ore was processed twice, the second product being of higher tenor. By December 1941, the company completed re-working the tailing and applied for a loan from the Reconstruction Finance Corporation to install additional power equipment for expansion of the plant. They installed a ball mill, a duplex classifier, a conditioner tank, four flotation cells and a concentrating table, all powered by a 160 horsepower hot-head driving a V belt-driven generator. The mine employed a crew of fourteen men under the direction of Robert Clarkson (*Arizona Republic* 12/13/41). During this phase of its operations, the Grand Reef used water pumped out of the mine to operate the mill. A big dirt tank near the mine stored the water (J. Rubal 1990). The water which was used for drilling inside the mine had to be hand pumped into thirty- or forty-gallon tanks which were hooked to an air pump for pressure. Additional water was pumped in through a four-inch pipe from the spring in Stowe Gulch. After the World War II boom, mining at Grand Reef ceased.

Other mines in the district were less productive. Most of them remained in the hands of small local operators and never received extensive development work. North of the Grand Reef were several shafts of the Blevin Claim, developed by Thomas Finnigan and the Aravaipa Leasing Company, one of which had a 400-foot tunnel as an extension of the Grand Reef, producing more iron and copper than lead-silver ore; four mines owned by G. N. Quinn, including the New Years claim, with an eighty foot shaft; the Copper Prince, with an eighty foot shaft which produced copper and lead-silver; the Homestake claim, with 100 foot adit which produced copper; the Ten-Strike claim, owned by G. N. Quinn and K. L. Hart, with 125 foot adit, and copper ores; the Christmas Gift, owned by Thomas Finnigan, with a 550-foot tunnel, producing copper ores; the Orinoco claim, owned by Thomas Finnigan, between the Grand Reef and the Bullis property; and the Bullis property (described above). South of the Grand Reef on the same ledge were the LaClede group of five claims, managed by James Quinn of Klondyke; and the Silver Coin group of six claims, with lead-silver and molybdates, owned by the Alabama and Arizona Development Company (Ross 1932).

2. STANLEY

Named for Lieutenant Stanley who served at Fort Grant during the 1880s, the small settlement near Stanley Butte became the population center for this short-lived mining district. Spanish or Mexican miners did the earliest mining work in the Stanley district at an undetermined period. When ore deposits were rediscovered during the early 1880s, prospectors found several glory holes in Godless Gulch and the remains of an old adobe smelter. The Stanley mining district is located within the San Carlos "Mineral Strip." For many years, miners and cattlemen contested with San Carlos Apaches for control of the area. Contested status became a major factor limiting the development of the district and contributed to its abandonment during the 1920s. However, the Apaches' dispute over land status did not deter non-Indian miners, and long before the area became open to claim in 1901, Anglo-American miners had done considerable development work. Between the 1890s and 1920s several small mining companies extracted ore and shipped it to stations on the railroad near San Carlos. Stanley had a post office from 1906 to 1926, and a population of 139 in 1910, which declined to fifty-four by 1920. By 1925, Stanley had only one resident, J. Flaherty, a veteran prospector who lived in Garden Gulch and whose success in raising vegetables in the rocky arroyo gave rise to the canyon's name.

Stanley is peripheral to the study area, since most of the district is outside the Aravaipa watershed, draining directly into the Gila River. The district was additionally separated from the Aravaipa area by lack of developed roadways, which limited contact between the human populations of the two mining districts. A road from San Carlos, fifteen miles north on the San Carlos Reservation, went to Stanley and continued on to the Princess Pat mines. However, no road was constructed to connect Stanley with Aravaipa and consequently San Carlos, rather than Klondyke or Aravaipa, became the supply point for the mining district and for ranchers on the San Carlos Mineral Strip.

Martin Flaherty, a former Stanley resident, gave much of the following historical information on the mines to geologist Clyde Ross of the USGS during the 1920s. The most significant mines in the district included: (1) the Starlight Mine on Kelly Gulch, eight miles south of San Carlos, developed by the Tribullion Smelting and Development Company of New York, with a tunnel approximately 1,900 feet long (1900-1910); (2) the Friend Mine, part of the Copper Range claims, on the north side of Little Stanley Butte above Garden Gulch, owned by the Stanley Butte Mining Company, discovered during the early 1880s by an Indian named Bob McIntosh (and his two partners, one of whom was white and the other Negro) with 2,000 feet of underground tunnels; (3) the Copper Reef group, on the southwest slope of Copper Reef Mountain three and a half miles northwest of Stanley, with 125 unpatented mining claims and a 600-acre mill site, owned by Copper Reef Consolidated Mines (incorporated in 1910) with little development work; (4) the Stanley Mine, on the northeast side of Little Stanley Butte, worked by Martin Davis; (5) the Silver Spar prospect, on the west side of Stanley Butte near the summit, owned by Joe Stewart, with a short tunnel and shallow shaft; (6) the Soldier prospect, on the west slope of Limestone Mountain, one mile east of Stanley, owned by the assistant postmaster of Stanley, with an inclined shaft and tunnel over 1,000 feet long; (7) the Copper Dike group of fourteen unpatented claims on the south slope of Stanley Butte, adjoining the Princess Pat group, with shallow underground work; (8) the Copper Belle Mine, west of Stanley, located in 1883; (9) the Cold Spring prospect, near the head of Garden Gulch, also located in 1883, owned by Martin Flaherty; (10) and the Princess Pat group of mines, four miles from the town of Stanley on Old Deer Creek south of Stanley Butte, with forty-four unpatented claims, located by members of the Allison family about 1900, and purchased by the Princess Pat Mining Company in 1916, with a tunnel almost 900 feet long. By the 1920s, when mining had ceased, water from the mine tunnel at the Cold Spring prospect was being used for watering cattle (Ross 1925: 105-112).

3. DEER CREEK

The Deer Creek district was also located within the contested area of the San Carlos Mineral Strip. The Deer Creek coal fields and the Christmas Mine, east of Mineral Creek, were the two major mining properties in the district. In 1881, Bob and David Anderson discovered coal in the upper end of the Deer Creek basin. Previous non-Indian miners had illegally extracted small amounts of coal from the deposits, and it is claimed that Lookout Mountain received its name because San Carlos Apache police were stationed there to prevent coal theft. The Anderson brothers, for whom Anderson Spring is named, lived near their name sake spring and reportedly sold coal to Stanley, Aravaipa, and other mining operations in the area as far away as Globe (W. Claridge 1990). The coal deposits were described in a United States Geological Survey study, and like other mining enterprises in Arizona received considerable publicity from promoters. However, the coal proved to be of such low quality that exploitation of the fields did not prove profitable.

The Christmas Mine, near Mineral Creek, was the second mining property of potential importance in the district. Dr. James Douglas, of Phelps Dodge, acquired the property in 1883 and organized the San Carlos Copper Company to exploit the mine. The following year, the company erected a small blast furnace but abandoned the project because of small production. In 1884, a government survey revealed that the mine's location was inside the boundary of the San Carlos Indian Reservation, and the company abandoned work on the mine altogether. Dr. Douglas attempted to have the "San Carlos Strip" section of the reservation, which contained the Deer Creek coal fields and the Christmas Mine, removed from reservation status. This was accomplished in 1902 through an executive order issued by President Theodore Roosevelt. The Chittendons, owners of both properties at the time, organized the Saddle Mountain Mining Company to exploit the copper outcroppings and develop the coal fields. The company constructed a Mitchell hot blast smelter with capacity of 225 tons per day at the Christmas Mine. However, they did little at the coal deposits.

By 1905, the Arizona Eastern Railroad line from Phoenix to the junction of the San Pedro River at Winkelman came within five miles of the Christmas Mine. The railroad's completion inspired considerable mining activity throughout the Mineral Strip. Prospectors shipped small quantities of lead-silver and copper, and several test shipments of coal from the "upper field" to Globe (Tenney 1927-1929: 109-11). However, Stanley and the Christmas Mine proved to be the only significant mineral-producing areas. After many years of contesting the status of the Mineral Strip, in 1973 the San Carlos Apache Tribe succeeded in having the area returned to reservation status.

4. TABLE MOUNTAIN

The Table Mountain group of mines in the Bunker Hill mining district are reported to have been discovered as early as 1875. The outcrop in the area shows evidence of having been worked for gold. The first known locator was John Scanlon, who sold his claim to Captain John D. Burgess and John R. Gilman in 1882. Burgess, a colorful and important early mining developer for whom "Virgus" Canyon was named, became the primary promoter of the Table Mountain Mines. A twice-wounded Civil War veteran and Andersonville prisoner, Burgess served as agency clerk and chief of scouts on the San Carlos Reservation during the 1870s. He came into contact with the Table Mountain deposits through his army experience, having scouted through the area during the concentration of Apaches on the reservation. In 1882, Burgess became manager of the Table Mountain Mine and in 1888 he went into partnership with Charles Drake and R. H. Paul of Pima County in order to expand production. In 1889, in partnership with George H. Sisson, Burgess promoted the construction of the Table Mountain Toll Road, from Table Mountain to "Red Rock Ranch" in the Aravaipa Valley. The company did a considerable amount of work on the seventy mile wagon road which connected Table Mountain with Willcox via Klondyke, but were only responsible for initiating the seven mile portion connecting Table Mountain to Four Mile Canyon. In 1897, the Table Mountain Copper Company, newly reorganized by George H. Sisson, purchased the mines at Table Mountain along with another group of claims at Copper Creek (Burgess file AHS).

The Table Mountain company constructed buildings at the camp, including an office and shop, dwellings, and a sixty-ton smelter. They completed over 2,000 feet of underground drifts and winzes, and hauled the extracted ore to Willcox by way of Klondyke. Water for the mines was available at a spring in Virgus (Burgess) Canyon just below the Bleak ranch. Mining activity was short-lived, and the company soon abandoned the property, leaving behind valuable equipment and hundreds of cords of neatly stacked wood intended to power the smelter. During the 1920s, the new owner, Mrs. Mattie Young of Mammoth, leased the mine to a company which employed four men to open the old tunnels and sample surface ore. At that time the road had deteriorated and the mine could only be reached by pack animals. The lessees' efforts proved unsuccessful and no further development took place. Differing estimates exist for the total tonnage of ore smelted during the mine's years of operation. One estimate claims 100 to 200 tons, and another claims that approximately 400 to 600 tons of fourteen percent copper ore were smelted (H. W. Nichols, 1950). The remains of boilers, smelting equipment, and building foundations can still be seen on the site.

The Bear Creek Mining Company did exploration drilling between Table Mountain and Turkey Creek between 1927 and 1929 under a federal potash or sodium prospecting permit. They located two mines between Horse Camp and Booger Canyon, where they unsuccessfully attempted to mine potassium nitrate (saltpeter). Most of their operation consisted of the sale of old deposits of bat guano from caves in the Turkey Creek area. The guano assayed high in nitrates. Several years earlier, the company had employed local goat rancher Rob Wootan and two Mexican goat herders to extract the guano and haul it out of the canyon on burros. In 1970, the Bear Creek group, by then a subsidiary of Kennecott Copper Corporation, resumed operations in the area west of Turkey Creek. They located claims and drilled numerous shallow holes, in a search for potassium nitrate. However, the findings amounted to only five percent magnetite, and the company stopped operations in 1971 (Table Mountain file ABM).

5. COPPER CREEK

Copper Creek, which rises in a basin on the southwestern flank of the the Galiuro Mountains, flows directly into the San Pedro River. Although outside the Aravaipa watershed, mining activities in this important district had considerable effect on the economic and social history of Aravaipa. The earliest mining activity in the area occurred in 1863 when prospectors extracted high grade silver-lead ore from the Yellow Bird claim. However, silver veins abruptly changed to copper just below the surface, disappointing the prospectors. The Bunker Hill mining district, in which the Copper Creek mines are located, was organized April 6, 1880, by E. A. Clark, John Scanlon, William Diehl, Thomas Lyons, Hank Perrera, Theodore H. Peters, Ely McDaniels and William Miller. E. A. Clark was a former Indian scout, and three of the other men had experience in Apache warfare. The prospectors joined forces, camping together for protection from Apaches, on an "Oak Flat where the old Government trail crossed ... about a mile and a half southeast of what is now the Sombrero Butte post office" (Miller file AHS). Clark and Scanlon had financial backing from Charlie Brown, the owner of a well-known saloon in Tucson. Brown had in his possession a gold nugget reportedly found by a soldier in Turkey Creek on the "Old Government Trail from the San Pedro to the Aravaipa." Brown instructed Clark and Scanlon to search for the site of a gold discovery made by the anonymous soldier in Turkey Creek. However, as William Miller remarked, "since there were three Turkey Creeks in the immediate area, they had plenty of latitude" in their search (Miller file AHS). Instead, the prospectors discovered the more important mines at Copper Creek.

During the early 1880s, prospectors filed more claims, but did little work because the district was so inaccessible. In 1897, George Sisson's Table Mountain Copper Company purchased a group of claims in the district and subsequently constructed the Toll Road which connected Copper Creek with Table Mountain and Willcox. The Sisson group installed a small water-jacketed furnace in 1898, but production remained small. In 1905, the Arizona Eastern Railroad completed its line from Phoenix to Winkelman, thirty-five miles away from Copper Creek, and production immediately increased.

In 1906, Frank and Roy Sibley of the Copper Creek Company purchased the Old Reliable and several other claims. The following year Roy Sibley, manager of the mine, constructed a road from Copper Creek to Mammoth. The Sibleys' conservative development of the mines changed abruptly in 1908 when they initiated a series of questionable stock manipulations and in 1910 they set up a holding company. For purposes of fund raising, they organized the Minnesota Arizona Mining Company in conjunction with Martin Tew, a promoter with eastern connections. Between 1908 and 1910, the Sibleys, who were active mine promoters and flamboyant entertainers, constructed a three-story native stone residence employing Indian labor. Complete with stained-glass windows, hardwood floors, fireplaces, balconies, and a patio with fruit trees, the house known as "Sibley's castle" became famous for its elaborate entertainments. Across the creek, the company built office buildings and a company store. They used a steam-electric power plant, erected a large dam in Copper Creek, constructed a mill, and put in two and a half miles of narrow-gauge railroad from the Old Reliable Mine to the mill (Copper Creek file AHS).

By 1910, the Sibleys turned over directorship of the company to Martin Tew who reorganized as sole owner under the name Copper State Mining Company. He prospected the American Eagle and other claims in the region. Between 1910 and 1914, production slowed but with the World War I demand for copper, and later for molybdenum, Copper State built a diesel-electric power plant, remodelled the mill and developed the Old Reliable and American Eagle mines, and began development of the molybdenum deposits at the Childs-Atwinkle claims. However, with the post-war price drop, production stopped (Copper Creek file AHS).

Copper Creek had sufficient population for the establishment of a post office by 1906. Belle Sibley acted as first postmistress. In that same year, the Calumet and Arizona Mining Company, which had recently completed construction of one of the world's largest copper smelters in Douglas, acquired the thirty-five Clark-Scanlon claims in Copper Creek and constructed extensive shafts, developing the Copper Giant, Superior, Globe, Copper Prince and other mines. With both companies engaged in active development, the population reached approximately 200.

Between 1917 and 1933, the only active mine in the district was the Blue Bird, owned by George Young and Albert Steinfeld and operated intermittently by Young or Sam and Frank Fields. Many of the mining properties were for sale, several claims were jumped, and prolonged law suits resulted (Copper Creek file AHS). George Young, an in-law of the Morgan family of Klondyke, continued to live in Copper Creek, two miles below his mine, and was able to make a living for himself operating on a small scale mine. Young believed that the

Blue Bird was the site of the original Spanish diggings in the area. He reported that he found small drill holes all along the vein he was working. Young built a Spanish-Mexican-style adobe furnace, approximately six feet square, in which he smelted the silver ore he extracted with charcoal which he manufactured at the smelter site (B. Avery 1990).

In 1933, W. C. Rigg organized the Arizona Molybdenum Corporation and began extensive operations at Copper Creek. Harry Hendrickson, who had formerly worked at the Grand Reef and at Aravaipa, moved to Copper Creek to oversee the molybdenum and copper mining. The new company used Copper State's mill and powerplant, until a power line from Mammoth reached Copper Creek in 1935. The Childs-Aldwinkle mine produced molybdenum ore at the rate of 300 tons a day, and the company milled it in a new 300-ton mill. The Sibleys' old dam on Copper Creek had silted in, so Hendrickson acquired the "Morgan spring," which had been homesteaded by Wiley Morgan of Klondyke in 1914, to provide a reliable water source for the expanded production. Production remained high throughout the war and ended during the late 1940s (*Where the Waters Meet* 1989; Kuhn 1988: 79-80, 101-102, 127-28).

MINING LABOR

Throughout Arizona, a dual wage scale for Anglo and Mexican labor existed until World War II. Early promotional literature stressed the inexpensive, abundant supply of Mexican labor available in Arizona. C. E. Minor's 1921 report on the Aravaipa district indicates that labor was more plentiful at Aravaipa than in other mining camps because of its proximity to a farming area. Minor reported that during World War I, the wage scale was five to six dollars per eight-hour day for Americans, and four to five dollars per eight-hour day for Mexicans. In his recommendations for mining development, Minor suggested that the Grand Reef camp be used for Americans and the Dog Water camp for Mexicans (Minor 1921). Elsewhere in Arizona, Mexican laborers were paid \$2.50 a day during the first two decades of the century, increasing to \$4.50 during the 1930s, while Anglos received approximately twice as much.

Former miners and mine laborers reported that Aravaipa area mines paid higher wages than other Arizona camps (V. Tapia 1989; J. Sanchez 1989). Most of the miners at Aravaipa area camps were originally from Mexico and many had come from Bisbee (A. M. Valenzuela 1990). Miners and laborers lived in dormitories or in tents of their own devising at the camps. Miners, muckers, hoist men, and laborers received pay scales according to type of work but according to informants, the common practice of a dual wage for Anglo and Mexican labor was never practiced in Aravaipa camps. However, management-level positions were filled by Anglos. There are no indications that unions made attempts to organize at any Aravaipa area camp and none of the former miners interviewed reported union membership. Working conditions appear to have been similar to those at other small Arizona camps. Miners were required to bring all their own equipment with them, had no helpers, and installed and removed their own air and water lines daily. There was no union, no nurse, doctor, medical insurance, or medical benefits (J. Rubal 1990). However, since the camps in Aravaipa were small and paid slightly above scale, there appear to have been few labor-management conflicts. In addition, mine work was convenient for Aravaipa homesteaders, who worked and lived at the mines for a portion of the year, and returned to their homes on weekends or as the agricultural season demanded (V. Tapia 1989; J. Sanchez 1989). Although pay was slightly higher than in other camps initially, it did not increase in proportion to other camps. As late as the 1940s, muckers working for the Athletic Mining Company made $4.00 a day (M. Valenzuela 1990).

PROMOTION AND TRANSPORTATION

A constant refrain in Aravaipa's mining history is that rugged terrain and inadequate, unpaved roads handicapped development and prevented easy marketing of ore. Newspaper articles and promotional pamphlets stressed the importance of Aravaipa area mines to the state economy, exaggerating expenditures of development capital, employee numbers and production expectations. The unrealistic expectations initiated dozens of schemes for real estate developments, road construction, and railroad building. Among the early transportation schemes was the Table Mountain Toll Road, which remained in operation only during the short life of the mine. In 1925, Lewis Douglas, whose group leased the Aravaipa mines in 1925, planned the construction of a new road to Fort Thomas on the Gila River, the closest depot to Aravaipa. Douglas announced to newspapers that "in the event that better transportation outlets were provided" his company would expand their fifty-ton concentrator (*GG* 3/12/1925).

Mining operations in the Aravaipa area shipped ore on three railroads which came within reasonable distance of their operations. The Southern Pacific was completed across southern Arizona in 1881 with the nearest stations in Benson and Willcox. On the east end of Aravaipa, the nearest connection was the Gila Valley, Globe and Northern Railroad which reached the Solomonville area in 1885; and on the west end, the Arizona Eastern was completed in 1905 connecting Winkelman with Globe (Myrick 1984).

Many other railroads had been planned for the area, several of which projected routes directly through Aravaipa Canyon. In 1867, the Kansas Pacific completed the first of several surveys to project a route through the canyon itself. In 1872, the Texas and Pacific planned a route which followed part of the present Southern Pacific track but turned northwest at Railroad Pass, near the Sulphur Springs Valley, and continued through Aravaipa Canyon to the San Pedro and Gila. George Wolcott's report for this survey estimated that fifteen bridges, 2,500 feet of tunnels, and many curves would be required to build the twenty-five mile section through Aravaipa Canyon (Myrick 1975: 168). In 1920, as soon as the Aravaipa Leasing Company took over the Grand Reef from American Lead and Zinc Company, they proposed a new railroad route from Klondyke to Willcox or Pima, stating that the long wagon haul to the railroad had eaten up all the former company's profits (Aravaipa Mine file ABM).

However, none of these schemes came to pass, and the mining companies continued to complain that inadequate transportation hampered their productivity. They did not stress the fact that an expanded transportation system would have been a prompt result of larger production. As late as 1921, C. E. Minor's report on the Aravaipa district remarks that,

> In time a railroad will come into the district even without mining, as the Aravaipa and Sulphur Spring Valleys are part of the railroad route surveyed for an eastern outlet from Winkelman and also the ranches in the valleys are rapidly being cut up into farms (Minor 1921; Aravaipa Mine files ABM).

According to Minor, the Southern Pacific and Santa Fe Railroads already had detailed figures on the route connecting Aravaipa to Willcox. He added that the road to Glenbar, although unsuitable for a railroad, would remain the major wagon and truck route because of its shorter distance (Minor 1921: 2-4). Railroad companies purchased lots near Klondyke as early as 1904. The Aravaipa Railroad owned considerable property, indicating that more than casual interest existed in the transportation schemes. In 1916, the Santa Fe and Pacific Railroad took large sections of land in lieu of lands they had relinquished on the Navaho and "Moqui" reservations. Some of the land was subsequently sold to Albert Steinfeld of Tucson, who had mining interests in Copper Creek (Safford Title Company deeds).

On the west end of Aravaipa, inadequate transportation also hampered mining development. Freighting costs consumed most of the potential profits at both Table Mountain and Copper Creek. William Miller's early experience with freighting problems was typical. During the summer of 1880, Miller and his partners packed four "horse loads" of ore from Copper Creek to the railroad at Benson, where the Southern Pacific wanted $100 a ton to ship it to assay offices at El Paso or in California. The prospectors, unable to pay the exorbitant rates, decided to abandon the ore on the Benson platform (Miller file AHS). When the Arizona Eastern Railroad completed its line between Phoenix and Winkelman in 1905, production at Copper Creek immediately increased. Had the El Paso and Southwestern constructed a line down the San Pedro from Benson to Winkelman, even further mining development would probably have taken place.

MINING AND THE ENVIRONMENT

Mining had a number of significant impacts, both direct and indirect, on the ecosystem of the Aravaipa area. Primary or direct impacts include: the removal of earth for the construction of mine tunnels, shafts, and adits; the frequent depositing of displaced earth directly into water courses; diversion of water from springs to serve mines; the construction of townsites at several mining camps; extensive fuelwood cutting to power both smelters and steam engines; the importation of large numbers of burros into mining areas for the transportation of ore and fuelwood; the presence of slag piles and sludge ponds at mill sites; the leaching of water from tailing piles and excavated ore bodies into underground water and directly into water courses; and the dewatering of mine shafts directly into creek beds. Secondary or indirect impacts include: destabilization of hillslopes and increased sediment from the construction of road systems; an increase in hunting and trapping near mining camps; change in local demography with the importation of large numbers of miners and workers engaged in subsidiary economic activities related to mining; and the development of substantial settlements in the Aravaipa area. The date of mining activity had a significant influence on the type and intensity of impacts produced by the mining operations. For example, prior to World War I, mines used steam engines and burros in their operations, and therefore mining had a heavier impact on woodlands and grasslands. During later periods, the availability of technologically sophisticated equipment enabled mining companies to displace larger quantities of earth, construct wider roads, and build dams. These types of impacts occurred less frequently during the earlier periods of Aravaipa mining.

Soil Displacement

Mine withdrawals significantly impacted six to ten watersheds. The Aravaipa Mining complex crossed the headwaters of Arizona Gulch (a tributary of Hell Hole Canyon). Its access road cut hillslopes and crossed creekbeds of Stowe Gulch. The Grand Reef Mining complex caused major changes in Laurel Canyon. The Deer Creek Mining complex may have impacted downstream areas (no cursory survey was done). The Stanley Butte mining took place in the headwaters of Hawk Canyon with extensive access roads in Squaw Canyon. The Copper Creek complex impacted Copper Creek headwaters and a few adjacent drainages. Without surveying and making soil cross-sections (beyond the scope of this project), it is impossible to state how much localized mining activity changed each watershed's "balance" between hillslope and channel processes. It is difficult to determine how far downstream from the headwater these impacts are visible.

The construction of mine tunnels, adits, and shafts created large piles of displaced earth at each of the mining camps. In order to estimate the cubic yardage of earth removed, it is necessary to know the length and area of cross section of all the tunnels. Estimates can also be made from the amount of ore hauled from the mines to the mills, or even from the percentage of ore values retrieved from the rock. In the absence of reliable production figures for the mines in the Aravaipa area, visual evidence indicates that the mines at Copper Creek, Grand Reef, and Aravaipa (in that order) had the most significant amounts of earth and rock removed.

Townsites

Each mining camp in the Aravaipa area initated a local population boom. During each camp's boom period, mining companies commonly constructed several structures including office buildings, assay offices, equipment sheds, dining halls, dormitories, and dwellings. At Table Mountain, several hundred men were briefly employed during the late 1880s, with another boom period coming during the late 1890s. Few descriptions of the camp survive, but from the remains of equipment on the site (too heavy to remove), it can be assumed that the company constructed several large buildings. At Aravaipa townsite, between the mid-1880s and the late 1930s, a small town developed, with settlement peaks during the 1890s, 1920s and 1940s. The town had a store and at least thirty structures. During the later period, a crusher and mill were in operation. A tailing pile is still visible, along with waste dumps from many shafts and adits. Grand Reef Mine, although developed during the early phase of mining, had approximately eight large structures, a three-mile road to the mine, and several subsidiary roads.

Klondyke grew up as a distribution center for the mining camps, as well as for local ranchers and homesteaders. At one point Klondyke supported two stores, a church, and a school. From 1925 to the mid-1950s, a stamp mill and flotation concentrator operated in Klondyke, employing a varying number of operators and truckers according to the current amount of mining activity. During Copper Creek's first period of activity between 1906 and 1912 most of the substantial stone buildings, the mine railroad and a large stone dam were built. During the molybdenum boom of the 1930s and 1940s, a town of approximately 300 grew up. Construction at this later period included many more temporary wooden buildings, accompanied by a large amount of terracing and extensive earth removal. Stanley had a more temporary mining camp with wooden structures, most of which were torn down and reassembled at ranches in the area. Since all of the activity at Stanley took place before the advent of bulldozers, less earth removal and road construction occurred than in other area camps.

Fuelwood Cutting

Although we do not have fuelwood statistics for any of the Aravaipa area mines, it is possible to extrapolate estimates through visual evidence of fuelwood cutting, and by comparison with statistics from other mines. Fuelwood constituted the major wood consumption in Aravaipa area mines, with a limited number of mine timbers imported from higher elevation forests. Mines and mining communities consumed wood for three separate purposes: charcoal, fuelwood for powering boilers, and fuelwood for domestic use.

Early smelters used charcoal, an expensive process in terms of fuel consumption and labor. Juniper appears to have been the preferred fuelwood for charcoal conversion, although it may have been the most frequently used wood because it was more available (B. Avery 1990). In the Aravaipa area the high price of coke, often amounting to half the expense of smelting, induced miners to use locally produced charcoal rather than imported coke. Fuelwood, converted into charcoal, fired adobe smelters at Stanley, Aravaipa, and Copper Creek. However, fuelwood impact from early smelting was not extensive because the primitive smelters were small and operated for a brief period of time. The only smelter operating after 1900 was that of George Young, who continued small-scale smelting of silver ore in an adobe furnace of the traditional Spanish and Mexican type at the Blue Bird mine near Copper Creek. In his youth, Ben Avery was a witness to Young's charcoal-making process. According to Avery, Young used juniper, placing twenty to thirty logs in a rectangular pit, approximately five by eight feet square and four feet deep. He set the logs on fire, partially covered the pit with dirt, and allowed them to smolder until the wood had been converted into charcoal (B. Avery 1990). Although Avery did not observe the quantity of charcoal required to smelt silver, it is widely recognized that charcoal conversion is a more consumptive use of wood than the direct use of cordwood in fireboxes of steam boilers.

William Miller, a pioneer prospector in both Tombstone and Copper Creek during the 1880s, penned an excellent description of the importance of fuelwood and charcoal to the mining companies. Between January and March 15, 1880, Miller and three other men produced 4,000 bushels of charcoal for the Tombstone mines. They cut the trees, burned the logs and packaged the charcoal in two-bushel grain sacks, realizing a net profit of $700 apiece (Miller file AHS). Professional woodcutters normally cut between four and seven cords of wood per week depending on the density of the woodstand, the terrain, and the length of "haul" and difficulty of transporting the wood. Although Miller was not explicit on the amount of wood cut, four men cutting between four and seven cords per week would have cut between 176 and 290 cords during the seven week period they worked. Allowing time for the reduction process, the men might reasonably have cut approximately 220 cords of wood, reducing it to the 4,000 bushels of charcoal.

Steam-engine boilers, powered by fuelwood, ran the stamp mills, pumps, hoists, crushers, air-compressors for rock-drills and all types of mining equipment in the early mining operations. In the Aravaipa area the first choice for fuelwood for steam boilers was oak, with mesquite, juniper and pinon (available only at higher elevations) as second choices. As was the case throughout southern Arizona, all of Aravaipa's major mining camps used fuelwood exclusively prior to 1890 (Bahre 1990: 185 ff.). Some camps, such as Aravaipa and Grand Reef, did not convert to oil generators or electric power and continued the use of fuelwood in steam boilers until the World War I period. The remains of old boilers can be seen at most of the abandoned mining camps near Aravaipa, although many local ranchers converted sheet-iron from some of the smaller boilers into fireplaces (M. Bleak Cosper), cookstoves, or water storage tanks.

The Table Mountain, Grand Reef, and Copper Creek areas sustained the heaviest impact from fuelwood cutting. Although Table Mountain Mine operated only briefly before 1900, its large boilers consumed greater quantities of wood than other boilers in the area. George Sanford observed stumps of very large oak and juniper trees in the Table Mountain area when working there during the 1890s (D. Sanford 1990). When the mine was abandoned, witnesses estimate that the owners left behind hundreds of neatly stacked ricks of oak and mesquite. The huge wood pile remained in place for over thirty years, with little damage from weather or termites, until the Table Mountain road became accessible to four-wheel drive vehicles (1970s) and visitors carried off the wood. At Table Mountain, oak was abundant and was the preferred fuelwood for its high caloric value. Mesquite and juniper were second choices (M. B. Cosper 1990, B. Salazar 1990). Fuelwood also powered steam boilers at the Aravaipa Mine Grand Reef, Copper Creek until World War I.

Long after mines acquired electricity, many miners continued to use fuelwood in their homes. Domestic fuelwood was consumed at the rate of slightly less than one cord per year per person (Bahre 1990: 195) or four cords per year per dwelling unit for cooking year-long and for heating during the winter. (See Chapters IV and IX for a more detailed discussion of domestic fuelwood consumption.) Thus the population of any mining community could be multiplied by one cord per person or four cords per household to extract an approximate estimate of the number of cords of wood consumed for domestic purposes per year for all of the larger camps in the area. In the area's smaller mines and prospects, miners frequently had no power equipment and fuelwood cutting was not limited to domestic use.

Geographers have engaged in considerable debate concerning the impact of fuelwood cutting for mining operations in the arid southwest. Conrad Bahre offers an excellent summary of southern Arizona's fuelwood cutting for mining prior to the turn of the century (Bahre 1990: 185-200; Bahre and Hutchinson 1985: 175-86). Bahre (1990: 205) maintains that fuelwood cutting around mining camps had a significant impact on nearby woodlands. However, he disagrees with previous opinions (Brand 1933: 45, 138-39; Sauer 1956: 63-64; Dobyns 1981) that woodcutters frequently consumed all the available woodland around mining camps causing irreversible destruction.

The extent of impacts from fuelwood cutting can be estimated by comparing early descriptions of local landscapes with observations of their present condition. When William Miller first saw Copper Creek in 1880, it was a well-watered area of rolling hills covered with oak, cedar and mesquite, with large sycamore and walnut trees on the creeks, and plenty of game, including deer, turkey, pigeons and sometimes bear (Miller file, AHS). Unfortunately, Miller does not mention whether he engaged in charcoal production in Copper Creek. Photographs of the area from later periods indicate that heavy fuelwood consumption took place and the hills became denuded of oak and cedar. However, large trees are still present in the riparian areas.

Additional information on fuelwood impacts can be gleaned from considerations of data from other nineteenth century mines. The pump which dewatered the 800-foot shaft at the Sutro Tunnel in the Comstock mines in Nevada was powered by a twelve-boiler steam engine which consumed thirty-three cords of wood a day. Fuel efficiency was low from the point of view of investment in operational maintenance, but high in terms of fuelwood harvesting (Young 1976: 157). An 1887 report by Alex Trippel stated that the ten-stamp mill, which operated on Queen Creek near the Silver King mine from 1885 to 1889, treated an average of 470 tons of ore a month and consumed 1,597 cords of wood per year (4.3 cords per day) at a cost of $6.00 a cord (Alex Tripple, 1887 Report, ABM). Both of these steam boilers for dewatering and milling consumed larger quantities of fuelwood than any mine in the Aravaipa area. However, it might be safe to guess that the larger steam boilers which operated in the Aravaipa area consumed up to one thousand cords of fuelwood per year.

The few large mining timbers used in Aravaipa area mines were probably imported from the Pinaleños (Graham Mountains), the Catalina Mountains, or other nearby forests with stands of taller timber. Although mine timber consumption could be significant, as is indicated by the United Verde Mine, which used 60,000 sixteen-foot timbers in its tunnels in one year (Surveyor General of Arizona Report, Annual Report of the GLO, 1900, 81-82, cited in Matheny, 1975: 205) Aravaipa's mines did not use many of these large supports.

C. E. Minor's 1921 report on the Grand Reef Mine for Aravaipa Leasing Company recommended that wood should not be considered as fuel for power since it had already become scarce, indicating that considerable amounts of fuelwood had already been harvested near Aravaipa. He recommended oil-burning engines for power and urged the investigation of the coal fields fifteen miles northwest of the Grand Reef at Deer Creek. Although electric power was available at Winkelman during the 1920s and was soon to be developed at the large hydro-electric plant (Coolidge Dam), electricity did not reach the Aravaipa area until the late 1950s, necessitating privately owned generators for power sources at the mines (C. Turnbull 1990).

The Burro

Inevitable companion of early prospectors and fuelwood cutters, burros produced significant secondary impacts on the Aravaipa area. Prospectors used burros to carry their ore to ore-buyers at assay offices, and woodcutters used hundreds of burros, each woodcutter normally having a herd of ten to twenty animals. Known as good foragers, burros were customarily allowed to live entirely off the country, no matter how barren the terrain might be. Herds of burros were commonly turned out at night to feed, while an older jenny wearing a neck bell assumed responsibility for selecting the feeding and bedding ground (Young 1976: 167-69). When no longer needed by woodcutters, burros were allowed to go wild on the open range. Grazing impacts from burros and goats might be confused. Although burros and goats have an extensive dietary overlap, burros prefer lower, flatter areas, while goats are more willing to browse higher terrain. In the Aravaipa area, the largest numbers of wild burros were found near abandoned mining camps. During the feral livestock removal program of the early 1930s, hundreds of wild burros were gathered on the slopes of the Santa Teresas near Stanley and near Copper Creek. (See Chapter VI for a more detailed discussion of wild burros.)

Water Supply, Slag Piles and Dewatering

At different periods of their operation, almost all of the mines in the Aravaipa area were dewatered directly into adjacent water courses. Mines which required large amounts of dewatering include the Grand Reef, the Head Center, and the mines at Aravaipa. The Grand Reef mine was dewatered directly into Laurel Canyon. In 1919 when Aravaipa Leasing Company took over, they pumped excess water from the shafts directly into the arroyo bed of Laurel Canyon. After 1921, C. E. Minor recommended digging a new well to the depth of sixty feet at Grand Reef for domestic uses to replace the one which had been installed by Mackay. It is not clear whether the previous shallower well had become contaminated, or simply had inadequate production. During later phases of its operations, the Grand Reef used water pumped out of the mine to run its mill. A big dirt tank near the Grand Reef mine stored water for mining and processing purposes during the later years of its operation (J. Rubal 1990). At Aravaipa, in spite of having the use of a well near the manager's house, the townsite had a water shortage problem. During the early phases of the mines' operation, water had to be trucked into the area, usually from the mill site in Klondyke (J. Sanchez 1990). In later years, water which accumulated inside the mine was used for drilling and had to be hand pumped into thirty- to forty-gallon tanks which were hooked to an air pump for pressure. After the Athletic Mining Company took over, they developed a water supply at the Stowe Gulch springs, pumping water to the camp in a four-inch pipe line (J. Sanchez 1989).

Slag which accumulated in tailing piles at the area's smelters, and tailing piles at the ball mills and flotation concentrators were deposited directly onto the ground adjacent to mill sites. The remains of tailing piles can still be seen at Aravaipa, Grand Reef, Klondyke, Table Mountain, and Copper Creek. Klondyke, which had the largest mill and flotation concentrator in the area, shipping fifteen tons of zinc-lead concentrates daily while the Athletic Mining Company was in operation, had the only settling pond for the water from the flotation process. Prior to the 1930s, water used in the mill and concentrator was discharged by gravity directly onto the ground (C. Turnbull 1990).

In the absence of detailed records, a comparison to other mill sites gives some indication of the minerals which might have been leached by rainfall or groundwater from slag piles, tunnels, adits, or other tailings (see: "Hell Hole Canyon" in Chapter XII). The stamp mill on Queen Creek treated 470 tons of ore per month by the pan-amalgamation method, during the 1880s. The pans were charged with 3,000 pounds of ore, ten pounds of salt, three pounds of copper sulphate, and five-eighths of a pound of quicksilver (mercury) for each ton of ore (Alex Tripple, 1887 Report, ABM). The mill's slag pile would have accumulated significant amounts of salt, copper sulphates, and mercury. Slag piles in the Aravaipa area, particularly the one at Klondyke, might have accumulated the same minerals, and certainly lead was present in the lead tailing piles at the mills. The tailing pile at Aravaipa contained enough mineral residue to warrant reprocessing. However, the slag pile by the Klondyke concentrator has never been reprocessed (C. Turnbull 1990).

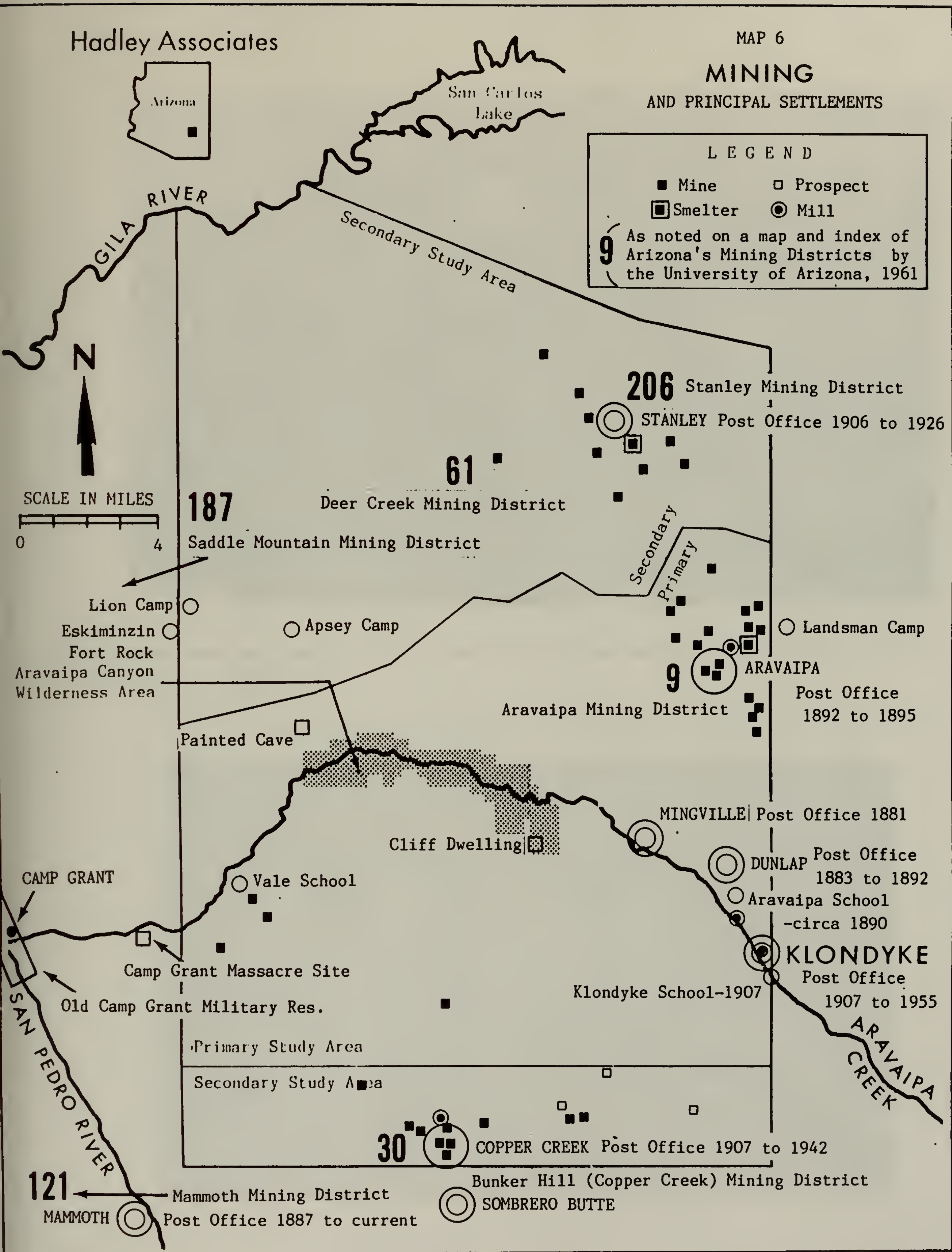
Demographic Influences

Mining activity in the Aravaipa area acted as a significant factor in maintaining rural population levels outside the actual mining camps. This was particularly true on the east end of Aravaipa Canyon, where the mining economy could be combined with subsistence agriculture and ranching. Prior to 1900, the townsite of Aravaipa was the primary population center while the Aravaipa Mining Company did its extensive development work. After 1900, the population and commercial center shifted to the Klondyke-Aravaipa Canyon area, which was more centrally located in the district and closer to the Grand Reef Mine. Klondyke was more accessible to the area's farmers and ranchers and had served as distribution center for the district even when the townsite of Aravaipa had a larger population. Mining provided a major stimulus to the rural agricultural economy. Because local subsistence farmers and small ranchers could obtain periodic or part-time employment at the mines, they remained in the area long after many other rural communities in Arizona had become ghost towns. Work as miners, muckers, as skilled laborers, mill operators, laborers on road crews, or ore-truck drivers often provided the only cash income available.

In Klondyke and Aravaipa, the mines and mills supported three stores, a saloon, a church, three schools, and a substantial amount of small-scale truck farming. Temporary setbacks in the mining economy produced a ripple effect on other sectors of the local economy. When the Douglas group suspended operations at Aravaipa in 1927, the mine closure had a severe economic impact, involving the closure of two stores in the Klondyke-Aravaipa area. The Adair Mercantile shipped eight truckloads of merchandise to Safford from its Klondyke store for sale to satisfy creditors. At the same time, the Aravaipa Mercantile Company at the Aravaipa townsite closed down (*Miami News* 12/3/27; Aravaipa file ABM). However, Klondyke continued to have a store at the junction of the Four Mile Canyon road, and for a few years, the Chambers Store operated at the junction of the road to the Grand Reef Mine.

Several tiny communities continued to exist at mining camps after the period of intense activity had terminated. At the Aravaipa townsite, for example, little settlements clustered around the Aravaipa Mine and the Iron Cap and Head Center mines until the 1950s. The settlements consisted of five or six miners who lived at the camps with their families. Each family occupied a lumber house, none of which was supplied with running water, and each family cut their own firewood for cooking on a wood stove. Initially, the miners used water from the well at the stamp mill in Klondyke, but during the later years their drinking water came from the spring at Stowe Gulch (J. Sanchez 1989).

Mining employment acted as a pull factor for many of the original settlers, particularly to a number of skilled hard-rock miners who immigrated from Sonora, like José Tapia, who quit work in Don Luís, near Bisbee and moved to Aravaipa for the reportedly higher wages paid at the Aravaipa mines. The mines provided a pull factor for the unskilled as well. The experience of José Sanchez demonstrates the way in which the mines sustained population centers and contributed to the longevity of the Aravaipa communities. As an orphan in Mexico, José had received no training in a trade. He arrived in the United States in 1920, and as a *mojado*, only the lowest paying jobs were open to him. José married into a second generation family in Aravaipa and began to work in mines in the area, including the Blue Bird, the Copper Peak and mines at Aravaipa. During most of his years in the mines, his wages were $3.50 to $4.00 a day. Starting as a mucker, he moved up to become a miner. Throughout World War II, he worked in Aravaipa at the Last Chance, Head Center and Iron Cap mines, staying in a tent dormitory during the week and returning to his farm on Aravaipa Creek on week-ends. Work in the mines, combined with subsistence farming, exchange labor, occasional day work for local ranchers, and small amounts of income from trapping, enabled José to raise his large family of children and step-children (J. Sanchez 1989). For the Sanchez family and many others, mine work allowed the sons and grandsons of the original generation of settlers to remain in the Aravaipa area. Without the mining economy, the close-knit community which developed on the east end of Aravaipa would not have retained its vitality or its longevity.

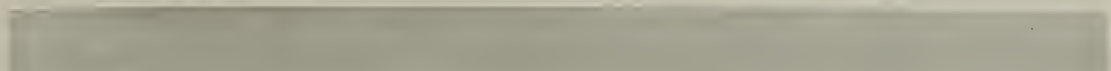

Hadley Associates
Arizona
MAP 6
MINING
AND PRINCIPAL SETTLEMENTS
LEGEND
Mine
Prospect
Smelter
Mill
9 As noted on a map and index of Arizona's Mining Districts by the University of Arizona, 1961
San Carlos Lake
GILA RIVER
Secondary Study Area
N
SCALE IN MILES
0
4
206 Stanley Mining District
STANLEY Post Office 1906 to 1926
61
Deer Creek Mining District
187
Saddle Mountain Mining District
Secondary
Primary
Lion Camp
Eskiminzin
Fort Rock
Aravaipa Canyon
Wilderness Area
Apsey Camp
Landsman Camp
9
ARAVAIPA
Post Office
1892 to 1895
Aravaipa Mining District
Painted Cave
MINGVILLE Post Office 1881
Cliff Dwelling
DUNLAP Post Office
1883 to 1892
Aravaipa School
-circa 1890
CAMP GRANT
Vale School
KLONDYKE
Post Office
1907 to 1955
Camp Grant Massacre Site
Klondyke School-1907
Old Camp Grant Military Res.
ARAVAIPA CREEK
SAN PEDRO RIVER
Primary Study Area
Secondary Study Area
30
COPPER CREEK Post Office 1907 to 1942
Bunker Hill (Copper Creek) Mining District
121
Mammoth Mining District
MAMMOTH
Post Office 1887 to current
SOMBRERO BUTTE

Aravaipa townsite, Aravaipa Mine behind the photographer, stone house is still standing, c. 1890s.

Aravaipa Camp, Aravaipa, Ariz.

1920s,

Members of the Quinn family taking equipment to the Quinn Mine, c. 1910 (Irene Kennedy Collection)



Early Ore Train. (Central Arizona College)

VI

CATTLE RANCHING

OVERVIEW

Cattle and horses were present in the Aravaipa area from at least the mid-eighteenth century. Although prior to this time it is possible that incidental "wild" cattle from Spanish herds strayed into the Aravaipa from adjacent open ranges, their presence is undocumented. Apaches regularly brought small herds of cattle and horses into the canyon. However, they did not practice stock raising. Early Anglo-American settlers imported extensive herds of livestock into the area, with the largest numbers of cattle grazing the essentially unrestricted public range between the late 1870s and 1934. During this period, three significant droughts impacted the area. In 1934, the Taylor Grazing Act limited stocking and initiated contemporary range management techniques. The environmental impacts of cattle ranching in the Aravaipa area result from the interplay of natural conditions (climate and weather), economic (market) factors, and cultural practices. Early Anglo-American ranchers, many of whom were recent arrivals from non-arid areas, had no knowledge of local climate, grassland regeneration, or carrying capacity. Their unfamiliarity with the Southwest combined with public domain policy initiated severe environmental damage to Aravaipa's grasslands. Since 1934, ranchers and governmental agencies have attempted to remedy past damages with the initiation of modern ranching techniques.

SPANISH AND MEXICAN CATTLE INDUSTRY

During the last quarter of the seventeenth century, Father Eusebio Kino introduced Andalusian cattle into the mission system of northern Sonora, where they spread rapidly throughout the lush ungrazed river valleys of the Pimería Alta. Since Spanish ranches operated according to an open range system, cattle strayed great distances from the home ranch. By the end of the seventeenth century, livestock had arrived in the southern part of the San Pedro Valley (Bolton 1949: vol. 1, 170-71). Farther south in Sonora, a general cattle explosion occurred to the extent that cattle prices suffered from devaluation (Treutlein 1949: 94). During the late eighteenth century, presidios at Tucson and Tubac had rapidly expanding herds and members of the Elías and Elías Gonzalez families, who played important roles in the history of Aravaipa's Apache relations, established ranches on the San Pedro, near the Sobaipuri villages where Father Kino had introduced cattle 100 years before (Aguirre 1975: 268; Mattison 1946: 285-89).

In many cases the introduction of European livestock and crops preceded Euroamerican contact. Prior to Euroamerican settlement, Spanish cattle may have migrated to the San Pedro-Aravaipa area, or have been introduced through trading networks among the Sobaipuris. Documented incidents during the eighteenth century indicate that Apaches took cattle to Aravaipa (see: Chapter II). Although cattle numbers are a matter of conjecture, by 1800, there were probably several thousand in the Santa Cruz and San Pedro valleys.

Large numbers of Anglo-Americans first entered northern Sonora at the end of the Mexican period (1821-54), when thousands of head of wild cattle, descendants of the cattle on the Spanish ranches, grazed the ranges that were soon to become southern Arizona. Eyewitness estimates of cattle numbers varied widely. Members of the Mormon Battalion (1846) and forty-niners on their way to California estimated that between 5,000 and 10,000 head ranged the San Bernardino and Sulphur Springs valleys. Boundary Commissioner Bartlett estimated 40,000 head on the Babocomari Ranch at the time of its abandonment (Christiansen 1988: 95). During the Mexican period, Apaches, Mexican ranchers, and Anglo-American gold seekers "harvested" the wild cattle, until by the time of the Gadsden Purchase (1854), the wild cattle were largely gone. However, wild horses from abandoned Spanish herds were still extensive on the upper San Pedro (Tevis 1954: 71-76). The most northerly documented sightings of wild cattle were near the Tres Alamos *empresario* (promoter) grant, several miles south of Aravaipa Creek on the San Pedro.

OPEN RANGE CATTLE RANCHING, TERRITORIAL PERIOD (1854-1912)

During the years between the 1854 Gadsden Purchase and the end of the Civil War, Apaches thwarted Mexican and American attempts to reestablish the cattle industry, and ranges remained largely unstocked. The largest impetus to the cattle business came from the U. S. Army, which established thirteen new posts in Arizona Territory between 1863 and 1870, creating a new demand for beef. In 1866, General Banning began to import California cattle into the territory for army consumption. Private contractors quickly took over the importation of cattle for the army, and in 1867 the Tucson firm of Hooker and Hines secured the army contract to bring Texas cattle into southern Arizona. From 1868 to 1871, "Colonel" Harry C. Hooker and associates brought an average of 15,000 head into the territory per year in droves of approximately 4,000. After the relocation of the Apache to San Carlos, Hooker supplied the reservation with beef cattle as well (Territorial Governors Report, 1896: 21).

By the early 1870s, former army beef contractors began to establish breeding herds. Early stock ranches operated according to an open range system, in which ranchers purchased or homesteaded small pieces of private land to acquire grazing access to the surrounding public domain. Under the open range system cattle "managed themselves," travelling at will to wherever the rain had fallen and the feed was best. By unspoken agreement, the rancher who controlled the water sources held the right to graze his cattle on the adjacent range. As early as 1884, ranchers had pre-empted "every permanent water spot" in southern Arizona (Barnes 1913: 82). Filings for water rights in the Arizona Department of Water Resources indicate that many springs in the Aravaipa area claimed priority use from before 1900. (A list of T-Rail water filings appears on page 144.)

During the open range period, ranchers focused on numbers rather than quality, selling cattle by the head rather than by the pound. Ranchers never sold calves, almost never sold yearlings, and frequently held steers over until three or four so they would range-fatten and bring the higher prices paid for cattle over 800 pounds. Cattlemen seldom built fences, only occasionally constructing "drift fences" to discourage cattle from moving into distant areas (L. Alverson AHS; H. Hooker file AHS). Twice a year all the ranches got together for big communal round-ups for branding and shipping, each ranch sending "reps" (cowboys) to assure that calves belonging to the mother cows of their ranch were branded accordingly (L. Alverson AHS).

In the Aravaipa area, many early cattle ranchers were former army beef contractors or army scouts. In 1872, Harry Hooker established the Sierra Bonita, the first Anglo-American ranch near Aravaipa. Between 1877 and 1882, several more large open range ranches were established in the Sulphur Springs-Aravaipa area: the Leitch brothers brought cattle to the Eureka Springs Ranch, a former government feeding station; Dan Ming started the ranch subsequently known as the T-Rail; Burt and Horace Dunlap established a ranch at the former army telegraph station at the head of Aravaipa Canyon; Welford C. Bridwell located the Garden Springs Ranch at a place he discovered while scouting Aravaipa; and army freighter James Kennedy established the MK Ranch which extended from the Eureka Springs area to the head of Aravaipa. Although some of the "home" ranches of the early cattle operations were as far as forty miles from the head of Aravaipa Canyon, the unobstructed cattle mingled on Aravaipa pastures when the feed was good.

The largest of these ranches were the Sierra Bonita and the Eureka Springs. Local ranchers estimated that the Sulphur Springs-Aravaipa area contained 50,000 head of cattle during the 1880s (Giffords 1901), a stocking rate of over fifty cows per section. Hooker alone had between 10,000 and 20,000 head, ranging on over 250,000 acres (McEuen 1987). Careful to keep stray cattle out of his water sources, he continually improved his operation, developing waters, planting alfalfa, importing registered stock, and maintaining separated grade and registered herds. As early as 1888, Hooker was able to sell 12,000 young steers to the San Francisco market (Hooker file AHS; Morrisey, 1950: 40; William Whelan, "Memoirs," AHS; Waggoner 1952: 49). The Eureka Springs Ranch, approximately sixteen miles north west of Fort Grant, was originally a government telegraph station and relay camp. Government contractors had stored feed at corrals by Eureka Springs while importing cattle into Arizona Territory. In 1873, future Graham County sheriff, George H. Stevens, purchased the station and converted it into a stock ranch and home (*Arizona Citizen* 11/15/73). During the 1880s and 1890s, Colonel P. Leitch and his brother owned the ranch. Subsequent owners of the Eureka had cattle which ranged from Dos Cabezas to the Aravaipa (C. Whelan 1990).

The initiation of the cattle industry in Aravaipa was part of Arizona's general cattle boom of the late nineteenth century. Importation of breeding stock to ranches in Graham and Pinal counties began in the 1870s and continued unabated through the 1880s despite the onset of a severe drought. Although reporting was notoriously unreliable, records indicate that cattle numbers peaked during the 1890s (Table VI. A). Long before the peak, newspapers had noted indications of overgrazing with discrepancies between numbers reported and numbers shipped out of the territory (*ADS* 12/5/1885). In 1891 Graham County reported 66,730 head and Pinal County 48,565 (*Report of the Governor of Arizona Territory*, 1891: 4). By 1891, Arizona Territory recorded 721,000 head of cattle on the tax rolls, almost all on open range, and very few on irrigated pasture. Underreporting continued and many knowledgeable individuals estimated that twice the number of cattle reported were actually grazing the territory's unregulated ranges (Haskett 1935: 41-42), with up to a million and a half head of cattle unofficially in the territory by 1891 (*Arizona Agricultural Statistics 1867-1895* 1966). In 1896, even the Territorial Governor's Report admitted that although fewer cattle were reported, Graham County alone probably had 100,000 head. Under the open range system, overgrazing was clearly rampant. The estimated carrying capacity for Graham County during the mid-1960s was thirteen head per section (Snow 1969: 64). If 100,000 (unofficial) head were in the county in 1896, Graham County was actually carrying approximately twenty-two head per section in that year.

Promoters, along with the absence of lease payment or stocking restrictions on unapportioned federal land, encouraged ranchers to run large numbers of cattle on their range, particularly *corrientes*, the less expensive Mexican cattle. By the 1880s, newspaper articles began to promote the advantages of purebreds, and a law passed in 1885 required each rancher to provide one good "American" bull for every twenty-five cows, or pay a fine of $50 to $100. However, few early cattlemen perceived the advantages of higher quality cattle and conservative range stocking. Most cattlemen saw only the advantages of free feed on the open range (Morrisey 1950).

OPEN RANGE CATTLE RANCHES IN ARAVAIPA (1872-1934)

During the late 1870s, the first ranches with headquarters in the Aravaipa Valley and Aravaipa Canyon were established, several by former military men who had their first view of Aravaipa while pursuing the Apache. Sometime before 1877, Daniel Houston Ming and his partner Elias A. Jones established their headquarters at "Mingville," just below the headwaters of Aravaipa Creek. Surveyors' reports indicate that prior to 1877, a wagon road had already been constructed to the head of Aravaipa Canyon, probably by the army, and that buildings stood on the Ming ranch (Surveyor's Notes 1877). Ming, who had served as a government scout and chief of Apache police at San Carlos, became familiar with Aravaipa while chasing Apache renegades during the 1874 battle in Aravaipa which left the scattered bones and skulls of many dead Indians at the foot of Matanza (Killing) Canyon, near his ranch (V. Tapia 1989; Ming file AHS). During the late 1870s, army scout Welford C. Bridwell (also known as Clay Beauford) established the Garden Springs Ranch near the mouth of Rattlesnake Canyon. Bridwell, who had served in the army since 1872 as chief of scouts and chief of Apache police at San Carlos, had also scouted through Aravaipa many times.

In 1882, James Kennedy, a former teamster for the army stationed at Fort Thomas, established the MK Ranch which extended from west of Eureka Springs to the mouth of Aravaipa Canyon. By 1920, the Kennedys had acquired 10,000 acres of patented land in addition to government range extending from Rattlesnake Canyon to High Creek, an area of approximately twenty-five miles (I. Hancock Kennedy 1990). Burt Dunlap, who arrived in Arizona in 1882 with Colonel Leitch of the Eureka Ranch, started a ranch at "Dunlap," the point where the Aravaipa Valley narrows into Aravaipa Canyon. Burt and his brother Horace E. Dunlap, later editor of Willcox's *Arizona Range News*, ran a large herd of cattle from their headquarters at the former army telegraph station, filling beef contracts to mining companies (*GG* 12/29/23). Before 1880, Bill Johnson and John Casey operated a ranch at the head of Aravaipa, although the exact location of the ranch is unknown. Bill Johnson, who had a second ranch at "Black Rock," was killed by Indians in 1881 (Bachelder file AHS).

Ranchers were attracted to the Sulphur Springs-Aravaipa area by the protection, market and job-opportunity offered by Fort Grant, relocated to its present site in 1873. Several local ranchers supplied the fort directly. During the late 1870s, Judge Miles L. Wood settled at Bonita, where he cut wild hay for the fort and later operated a store (Wood file AHS). Beginning in the late 1870s Paddy Lynch, who worked at Fort Grant for many years, operated a ranch at the head of the Aravaipa Valley, near Paddy's River on the Eureka Ranch. Lynch was murdered at his ranch (Bachelder file AHS).

The Arizona Livestock Sanitary Board brand book indicates that before 1900 the cattlemen who had ranches with large herds on the east end of Aravaipa included Burt and Horace Dunlap of the Western Reserve Stock Company, G. A. Bryce, the Eureka Spring Stock Farm, J. S. and D. T. Dowdle, D. H. Ming, J. M. Porter, George H. Stevens, and George A. Olney. In addition, a number of homesteaders ran small herds, including early Aravaipa settlers Laureano Moraga and Epimenio Salazar.

By the time of World War I, the number of ranchers active near Klondyke had increased to more than thirty and included: the T-Rail; several ranches owned by members of the Wootan family; the Rex family ranch; the Dan Roten ranch, later owned by the Mattice family; the Gregory Haby ranch; the Wyley Morgan ranch; the Four Mile Canyon ranch, originally owned by the Allaires and later sold to the Lackner family; several substantial ranches owned by George Claridge and his sons; and several ranches between Turkey Creek and Table Mountain which ran both cattle and goats owned by members of the Bleak family. Henry J. Dowdle purchased the Dunlap ranch in 1914 with all of Dunlap's horses and cattle. Henry Dowdle and his sons and daughter, Mae Davidson, operated the ranch for many years (J. Dowdle 1990). The Jake Weathersby family had a large ranch east of Klondyke on which they originally ran goats, gradually including cattle in the operation after the 1920s (N. Weathersby 1990).

In 1914, ranchers met at the new Forest Reserve Ranger Station on the Klondyke road to organize the Aravaipa Cattle Growers Association. The thirty-plus charter members represented most of the ranchers who had cattle on the open range near Klondyke. Several charter members listed residences in other parts of Graham County, indicating that they had cattle interests in addition to those in the Klondyke-Aravaipa area. Using the county assessment rolls, the Association charged members three cents per head to cover operating expenses (McEuen 1987: 11-12). By 1916, membership in the Association had grown to eighty-one and in 1917, the Aravaipa organization merged with that of Cochise County to become the Cochise Graham Cattle Growers Association (McEuen 1987: 8-9). The Aravaipa cattlegrowers group focused on land use issues including new leases on Forest Reserves (1914) and, after 1916, leases on state land (E. Claridge 1989: 55-56).

On the west end of Aravaipa, the area's early open range cattle ranching was dominated by the Severo Zapata family, William Miller, and the Mercer family. A few smaller ranches operated directly out of Aravaipa Canyon, where James Brandenburg and the Buzan family had small herds. The Pinal County Cattle Growers organized in June 1917 with twenty-two charter members. Several of the original members ranched on the San Pedro near the mouth of Aravaipa, including Severo Zapata, Charles Swingle, H. H. Young, and J. H. Zellweger

(*Arizona Cattle Grower's Outlook* 5/1977). The organization later became inactive but was revived in 1936 (*American Cattle Producer* 2/1936). Like their counterpart on the east end of Aravaipa, the Pinal County organization became an advocacy group for Aravaipa area cattlemen.

The open range ranchers on the east end of Aravaipa cooperated on communal roundups. Since Aravaipa was known to be "good spring country," producing excellent spring feed after the winter rains, most ranchers sold their yearlings during the late spring and annual shipping drives took place at that time. Aravaipa area ranchers cooperated on drives to Willcox, which took approximately five days. Each ranch sent at least two cowboys and the larger ranches provided one or more chuck wagons. The cowboys divided the cattle just before arriving in Willcox, and distributed them to separate pens for shipping. Willcox, for a time the largest cattle shipping point in the United States, handled so many cattle that herds were occasionally backed up in front of the railroad pens where they had to wait for several days for vacant cars (L. Alverson AHS; C. Whelan 1990). Occasionally, Aravaipa ranchers shipped from railheads north of the area on the Arizona Eastern line. The trip north to Fort Thomas or Geronimo was considerably shorter than the trip to Willcox, taking only three days. However, buyers preferred the Willcox route because the cattle subsequently spent less time in railroad cars. During the 1920s, the Dowdles, Jim Hinton, Marion Lee, W. A. Wolsey, William Ellsworth, and most of the ranchers on the San Carlos Mineral Strip shipped out of Fort Thomas (*GG* 5/30/24).

On the west end of Aravaipa, ranchers drove their cattle into Tucson for shipment. The drive took between two and three days. Cowboys held the cattle up at Willow Springs, southwest of Oracle, and sometimes at the junction of the Santa Cruz and Rillito Rivers where water was available and corrals could be used. West end cattle drives were also made during the late spring (S. Neal 1989).

During the period between 1900 and 1929, one large open range ranch dominated the east end of Aravaipa. The T-Rail Ranch operated from headquarters homesteaded by Dan Ming and his half brother Elias Jones. A series of subsequent owners ran the ranch from the original headquarters, the old stone and adobe Ming-Jones house. At the height of its operation, during the mid-1920s, the T-Rail controlled an area extending from Klondyke to the San Pedro River, and from the Mineral Strip to the Galiuro Mountains. T-Rail range included the area near the Table Mountain Mine and extended almost as far as Copper Creek. Within the T-Rail domain were dozens of small homesteads, and many of the homesteaders worked for the T-Rail at least on a part-time basis. The T-Rail employed approximately fifteen to twenty permanent cowboys who lived in dozens of "camps" scattered throughout the ranch's territory. Most of the camps had one-room lumber bunk houses and a corral for branding. They were usually situated near a spring. Many of the cowboys who worked for the T-Rail remained in the area on small parcels of land they had homesteaded for themselves. Elmer Gardenheier, who homesteaded at the Dry Camp Ranch, was a T-Rail cowboy, as was Lupe Salazar. John Henry Thomas, the well-liked T-Rail cook for many years, homesteaded in what later became known as "Nigger" Henry Canyon (C. McNair 1990).

Estimates concerning the number of T-Rail cattle vary from 2,000 to 5,000 head. Numbers obviously fluctuated with the ranch's different owners, range conditions, and market prices. The farming operation near the T-Rail headquarters was one of the largest in the canyon. All the T-Rail cattle were Herefords. Their round-up started early in the spring and lasted until July or August. In one round-up during the mid-1920s, the T-Rail had 2,000 head of cattle in the creek (C. McNair 1990; D. Sanford 1990; C. Whelan 1990; B. Salazar 1990).

Between 1900 and 1929, the ranch had a series of owners, many of whom expanded the ranch holdings and made range improvements. Ming and Jones had sold out shortly after the turn of the century. The next owners were Joe Pencil and Bras Wootan in partnership with Safford banker and cattleman J. N. Porter. Subsequent owners included Owen and Drew Wilson, who started out with property at the Greenhouse Spring and later expanded their holdings to include the T-Rail. The Wilsons lost large numbers of cattle during the 1918-1921 drought and lost the ranch during the subsequent recession and slump in cattle prices (W. Claridge 1990). On October 17, 1925, C. C. Albright of Los Angeles purchased the T-Rail at a sheriff's sale. Since he bought only land, Albright restocked the ranch with local cattle using Sam White, his foreman, to make the purchases (*GG* 10/30/25; *GG* 12/25/25). Under Albright's ownership, the T-Rail expanded its farming operation and employed Charles Stillwell of the Imperial Valley to plant alfalfa (*GG* 3/5/26). In 1927, E. L. Campbell, an associate of Albright's, also from Los Angeles, bought the ranch (*GG* 5/13/27). During much of the 1920s, Bob Little worked as ranch manager.

The various T-Rail owners all filed claims on water rights. However, E. L. Campbell was particularly active in filing water claims. Claiming rights prior to 1905 or "from the time of first settlement," Campbell filed on a number of widely dispersed water sources including: Turkey Creek Spring, Warm Spring above Deer Creek, Anderson Springs, Boulder Spring near Black Canyon, Cottonwood Springs above Cottonwood Canyon, the Box Seep in Black Canyon above Deer Creek, Oak Spring, Juniper Spring, Black Butte Spring, and Cottonwood Seep northeast of Black Butte. By filing on the various water sources, he established the T-Rail right to use the adjacent range (Arizona Department of Water Resources).

In 1929, Campbell advertised in the newspaper that portions of the deeded land, lease and range right were for sale, "at a price that cattle or goat men should not overlook" (*GG* 4/12/1929). At the time of the T-Rail sale, foreman Sam White was placed in charge of gathering approximately 5,000 head of T-Rail cattle. Jay Cook bought the majority of the herd, and Lupe Salazar, who had worked for the T-Rail as a cowboy, purchased the remnant of ungathered cattle. The T-Rail land sale gave local Aravaipa ranchers the opportunity to buy larger land parcels, enabling many of them to stay in business for another forty years. Local ranchers held a meeting to determine the T-Rail division prior to the sale date, each rancher attempting to purchase the portion nearest his home ranch. The Sanfords bought Dry Camp; the Claridges bought the east end; Ed Haskins bought the west end, which eventually became Joe Flieger's Painted Cave Ranch; Fred Upshaw bought the north portion; Lupe Salazar the south end; and Wyley Morgan bought the portion in Four Mile Canyon. On May 4, 1929, Philip McNair bought the T-Rail headquarters, the "Wootan place," and the water rights at Warm Springs. The McNairs, who started with approximately 150 head of cattle, were able to expand the ranch to 1,000 head. Initially, they used the original Ming house for headquarters, but after it burned down during the 1940s, they constructed a new house, presently owned by The Nature Conservancy. The original barn was washed away by Aravaipa Creek (C. McNair 1990).

DROUGHT

During the period of open range ranching in Aravaipa, three episodes of drought (1885-1890s, 1918-21, 1933-34) had significant impact on the area's rangelands. In arid lands like Aravaipa, the overriding ecological risk to cattle and range is both chronic drought and seasonal drought. Because droughts are unpredictable, the environmental history of livestock in the area can be viewed as a 120-year attempt to reduce drought risks and to stabilize, if not increase, financial returns. From the environmental point of view, the first drought, which occurred intermittently from 1885 to 1903, had the most impact since cattle restocking via train kept the already damaged grasslands from recovery. Early Anglo-American ranchers, who had not experienced a southwestern drought, were unable to estimate proper stocking rates for the Aravaipa area. In addition, the legal and economic structure of the open range cattle industry was conducive to competitive and negligent overstocking. The second drought began in 1917 and lasted until 1921, with 1918 and 1920 the worst years. It was followed by a short postwar depression which put many ranchers out of business. The third drought in 1933 and 1934 hit ranchers during the worst years of the Great Depression. It led to significant changes in the organization of the cattle industry and brought the open range era to an end.

Anglo-Americans initially settled in the Sulphur Springs and Aravaipa valleys during two unusually wet years, obtaining an inaccurate impression of what they could expect from weather conditions. During 1873 and 1874, rains fell steadily during both winter and summer and several storms were of unusual intensity. On June 17, 1873, three separate rainstorms fell in a single day, followed by heavy rains during the entire summer. The following winter, heavy rains were interspersed with snowstorms through April, leaving the Sulphur Springs Valley impassable to teams for three months, and impassable to horses for six weeks (Bachelder file, AHS). During the winter of 1874, the Gila flooded, washing away substantial San Carlos Reservation farm land worked by the resettled Aravaipas. It was during this deceptively wet period that Hooker, Stevens, Leitch and Ming started importing large numbers of cattle.

In 1885, rains failed for the first time during the brief Anglo-American ranching experience. Although the subsequent drought was interspersed with sporadic downpours and occasional wet years (1887, 1896-97), the rains provided only temporary relief from dry conditions and brought about the importation of more cattle into the territory. The driest years accompanied by the greatest cattle losses occurred in 1885, 1892-93, and 1902 (Wagoner 1952; Alverson AHS). The most prolonged rainless period occurred during a seventy-six month period between September 1898 and December 1904 (Hastings and Turner 1965: 40-41; Cooke and Reeves 1976: 77).

During the most severe years of the drought, many ranchers throughout southern Arizona lost up to fifty percent of their cattle, with some losses as high as sixty to seventy percent. Descriptions of hundreds of dead cattle surrounding water holes were common. Ranchers believed that overstocking and the drying of many springs which had formerly been considered permanent were the principal causes of their heavy stock losses (Alverson AHS; Hancock AHS).

Drought reports accompanied by suggestions for drought amelioration appeared frequently in southern Arizona newspapers. In October, the *Florence Enterprise* stated that rainfall had averaged eleven to eleven-and-a-half inches over the past twelve years, but that since January only two inches had fallen, making 1885 the driest year ever known (*ADS* 10/3/1885). Suggestions for drought remedies included massive irrigation systems which would change Arizona's climate and the importation of drought-resistant grasses (*ADS* 5/1/1884, 7/24/1884). In September 1885, "the driest summer experienced for many years" inspired the famous prayer for rain, delivered by Aravaipa rancher Dan Ming at the annual meeting of the Cattle Growers Association in Willcox. When Ming requested rain, he specifically asked that it fall on the smaller ranchers, and not exclusively on Hooker and Leitch (*ADS* 9/30/1885).

Anglo-American ranchers quickly adopted some of the drought strategies which had been used for centuries by Mexican *rancheros*. More accustomed to periodic droughts, the *rancheros* had devised ingenious methods for coping with dry water holes and prolonged rainless periods. During droughts vaqueros supplemented feed by splitting open *bisnaga* (barrel cactus) and cutting down palo verde trees to obtain the *toji* (mistletoe). In the absence of windmills or catchment tanks, vaqueros carried *botas*, ten- to fifteen-gallon rawhide water bags, which could be lowered on a windlass into hand-dug wells to obtain water. Using a horse or burro to pull the *bota* out of the well, a waiting cowboy dumped the water into a drinking trough (Aguirre 1975: 273-74). Mexican ranchers used *malacates*, water wheels with series of vessels attached, to extract water from shallow wells. When conditions became severe, Mexican cattlemen resorted to extreme measures. They ordered their *caporales* (straw bosses) to kill all the newborn calves, knowing it was the only way to save the mother cows (Aguirre 1975: 275).

Most open range ranches survived the drought of the 1890s, but not without severe damage to the territory's rangeland. Even the persistently optimistic *Governor's Reports* admitted that the ranges had been overstocked for the past few years, and that dying cattle had severely damaged the range (*Governor's Report* 1896: 47). Concern focused on cattle production more than the productivity or preservation of the ranges. Passing references to environmental degradation credit overstocking as the principal cause of destruction of grazing lands. In 1893, the Governor's Report described the damage:

> ... owing to overstocking, many weeds have taken the place of the best grasses. In other places where ten years ago the end of the wet season would find a rich growth of grass, now it is of inferior quality, of less quantity, or does not exist at all. This injury to the range, however, is not regarded as permanent (*Governor's Report* 1893: 23).

The experience of the drought, particularly the losses of 1892-93, led cattlemen to modify their production methods to some degree. Ranchers began to build catchment tanks and construct rock and cement dams on streambeds; they installed windmills and surface wells, initiated irrigation canals and began to raise supplemental feed. Ranchers began to sell their cattle younger and purchase higher quality breeding stock. Some ranchers began to spay their heifers. Colonel Hooker hired Dr. D. Grey, a veterinarian who specialized in spaying cattle, to spay 2,000 heifers (*ADS* 9/21/1890). The focus shifted from numbers to quality, as the economic advantages of better cattle became apparent. As early as 1885 grade cattle from the San Pedro brought $25 a head, while the low-beef-producing Mexican cattle brought only $16 (*Weekley Arizona Citizen* 3/10/1885). Cattle numbers dropped approximately fifty percent by 1900, but then a steady increase began again. However, the range remained largely unfenced. The absence of any leasing procedure before 1916 tempted cattlemen to overstock, knowing that if their cattle did not get the grass, some other rancher's cattle would eat it (Barnes 1926).

Although there are only secondhand recollections of the drought of the 1880s and 1890s in the immediate area of Aravaipa, it can be assumed that conditions did not differ significantly from those described on surrounding ranches. Dan Ming's 1885 prayer at the convocation of the Cattle Growers' meeting in Willcox, indicates that his Aravaipa ranges were badly in need of rain. Arizona Department of Water Resources records indicate that during the long drought, Aravaipa ranchers increased their development of water sources and increased farm acreage in order to have an emergency supply of feed on hand (ADWR records).

By 1904, the drought broke. Children of the first generation of Aravaipa ranchers recall that their parents spoke of 1904-05 as an exceptionally wet year, comparing all other wet years to it (D. Sanford 1990; C. Whelan

1990). After 1904, the typical pattern of alternating wet and dry years resumed, with localized droughts like that in Pinal County in 1910-11 in which cattle again starved to death (*Arizona Blade Tribune* 3/26/1910 and 9/9/1911).

Between 1917 and 1921, rainfall was below average, with very dry years occurring in 1918 and 1920-21, and one wet year in 1919. Again in 1917, cattle starved on the range in Pinal County (*ABT* 3/5/17). Dr. R. H. Forbes, chariman of the World War I Food Commission of the Arizona Council of Defense, predicted the loss of 100,000 head in the state (*ABT* 5/14/17). However, by August, newspapers reported floods and arroyo cutting as major problems in sections of Pinal County (*ABT* 8/18/17). In 1917, the absence of range feed forced stockmen in Graham County to chop yucca for their cattle. Newspapers promoted yucca as a good emergency feed when converted by burning or shredding. Some areas yielded 200 tons per acre. Range specialists called for silos for grain storage, drift fences, and an increase in stock watering facilities. They stated that the failure to remove the carcasses of cattle which had died from disease (blackleg) or starvation spread contagion through crows and buzzards (*ABT* 5/4/17).

Many Aravaipa residents remember the 1918-21 drought as more severe than the highly publicized subsequent drought of 1934. George Claridge informed his sons that more springs dried up and more cattle died in 1918 than in 1934. Almost all the water sources on the Claridge ranch went dry except Anderson Spring, Warm Springs, Tule Springs, and Old Deer Creek Spring. Claridge lost only a few cattle in his Arizona Gulch pasture, his only fenced pasture at that time. However, he lost large numbers of cattle on other sections of his ranch (W. Claridge 1990). Other ranchers experienced the drying of springs: all of the springs on the Dry Camp portion of the T-Rail went dry (W. Claridge 1990). When all the feed had been consumed, ranchers again resorted to burning spines from prickly pears, chopping yucca and cottonwood limbs for feed, and like their *ranchero* predecessors, they shot their calves in an attempt to save the mother cows. During the drought of 1918, the Chiricahua Cattle Company, the Double Circle, the Bryce Mattice Cattle Company and many smaller ranchers were forced to shoot their calves (W. Mattice 1990).

The 1918-21 drought affected cattle owners severely because it was followed by the post World War I depression. In Aravaipa, in contrast to the previous drought, a number of ranchers were forced to sell out, mortgages were foreclosed, and several properties were leased. On the MK Ranch, Jim Kennedy attempted to save his starving cattle by chopping soapweed and buying cottonseed meal (at $60.00 a ton). But in spite of supplemental feeding, cattle died everywhere on his range, and the bank foreclosed (*Tucson Citizen* 8/7/1958). The drought was followed by a severe drop in cattle prices in 1925, which forced other Aravaipa ranchers out of business. Drew and Owen Wilson lost the T-Rail Ranch as a result of combined drought and low prices (W. Claridge 1990). Jim Hinton was forced to sell out, and the Bleaks suffered economically from the drought (W. Claridge 1990). Following the drought, a number of sheriff's sales occurred in the Aravaipa area, accompanied by several law-suits to recover mortgaged property. Rodeo Land and Water Company sued Thomas Bass and R. J. Adair of the Aravaipa Land and Cattle Company and recovered a substantial judgment which resulted in the sale of the defendant's ranch (*GG* 10/2/25). Graham County Cattle Company brought suit against Thad Adams, who had been living on 420 acres in Aravaipa claimed by the company. Adams lost the case and had to move off the land (*GG* 5/1/25).

After a few "normal" years in which rainfall averaged twelve to eighteen inches during the late 1920s, drought again hit southern Arizona. The rains failed in 1933. In March 1934, the state of Arizona declared a drought emergency to activate feed loans from the Farm Credit Administration. A number of the driest counties had already been declared "drought areas" (*ABT* 2/18/1925) and Graham County was one of the first three of thirteen Arizona counties to be declared a "disaster area." In 1934, although Aravaipa ranchers were somewhat better prepared to meet the drought with equipment for hauling water and distributing supplemental feed, they resorted to all the previous drought measures (prickly pear and yucca cutting). They remember cutting cottonwood limbs along Aravaipa Creek and other riparian areas for feed (W. Mattice 1990). The Weathersbys and many other ranchers were again forced to shoot calves, this time burning the carcasses (N. Weathersby 1990). When the drought hit, ranchers were already suffering from the low cattle prices which accompanied the Great Depression. In 1930, cattle in Klondyke brought only three cents a pound and prices remained low during the subsequent dry years (C. McNair 1990).

DROUGHT PROGRAMS

By early summer 1934, many cows were dying despite efforts to save them. Many ranchers lacked financial resources to purchase feed. In June, Arizona was allotted an initial $100,000 as part of the federal drought relief program to begin an emergency cattle purchase program. Under the program, state and federal agencies cooperated to rid the range of excess animals. The Bureau of Animal Industry determined whether cattle should be condemned or shipped. Initially, government agents purchased only condemned (starving) cattle; later in the program they purchased stronger cattle as well. The basis of payment was the approximate price of cattle as estimated by the Bureau of Agricultural Economics. Prices for two-year-olds and over were $12.00 to $20.00 a head; one- to two-year-olds, $10.00 to $15.00; calves under a year, $4.00 to $8.00 a head (*GG* 6/22/34).

Late in June, the first ten carloads of drought relief cattle were shipped from Safford to Phoenix, followed by twenty-nine more carloads in July (*GG* 7/20/34). The program continued through 1934 and was terminated in January 1935 after almost $96,000 had been paid to Graham County cattle growers (*GG* 1/4/35). Throughout the state of Arizona ranchers shipped for slaughter, or range-killed, slightly more than 100,000 head with 2,843 ranchers participating in the program at an average purchase of 18.7 percent of the sellers' herd (*GG* 2/15/35), a total cost of $1,448,175 (*GG* 2/22/35).

On the east end of Aravaipa, most ranchers participated in the program. Cattle too weak to ship were driven into box canyons and shot by the livestock inspectors. Many cattle were shot near the mouth of Turkey Creek, some at Dry Camp, and in convenient box canyons throughout the area. Some of the condemned cattle brought as little as $3.00 to $4.00 a head (McEuen 1987: 19). On the west end, ranchers were able to bring some of their starving cattle into Winkelman where they were sold to dog food and fertilizer companies for a slightly better price (D. Sanford 1990; C. Wood 1990). In Winkelman, a government corral was erected near the San Pedro bridge, where agents killed the stock. While the stock killing was going on, packs of coyotes loitered in the area, and the "sky was dark with buzzards and crows." Some cattle too weak to drive were shot where they were found. Bones were later gathered and shipped out to fertilizer companies (C. Wood 1990).

The majority of the cattle killed in the reduction program had been mortgaged. Little remuneration actually reached the producer from the government's "purchase payment." However, other benefits to both ranchers and range lands resulted from government programs. The Soil Conservation Range Benefit Program was established as part of the Agricultural Adjustment Administration in 1936 to encourage range improvements (Wagoner 1952). The Department of Agriculture's Conservation Committee gave assistance for the construction of dirt tanks and fences (*GG* 11/27/36). Non-grazing payments were made to Arizona ranchers for withholding range land from grazing for the period of June 1 to October 15 at thirty-five cents per month. The Soil Erosion Service, followed by the Soil Conservation Service, initiated a number of range preservation programs during the drought. To prevent erosion, several small tributaries to Aravaipa Creek above the emergence point received rip-rap reinforcement at this time (W. Claridge 1990).

The drought also provided the impetus to rid the range of other excess unproductive animals. Under a separate program, included in the Taylor Grazing Act, unclaimed wild horses and burros were removed from the range. Wild burros had been recognized as a significant range problem for many years. As early as 1917, agricultural economists had proposed plans to rid Arizona's ranges of excessive numbers of the destructive burros, even suggesting their conversion into bologna for human consumption (*ABT* 4/2/17). In August 1917, newspapers reported 100,000 wild burros in Arizona, 15,000 of which were on the Apache reservations. Some of these were sold to buyers from Mexico and California (*ABT* 8/18/17). However, these early attempts to rid the range of unproductive animals occurred during times of disaster and removal programs were usually not pursued when range conditions improved.

By the 1930s, wild burros were particularly numerous in the Aravaipa area. Left behind by miners and wood haulers when mines went out of business, herds of wild burros concentrated in the Copper Creek-Sombrero Butte area and north of Aravaipa along the San Pedro. In lesser numbers they inhabited the Deer Creek-Dry Camp area and the slopes of the Santa Teresas. Descendants of the burros used by miners and wood haulers multiplied and thrived. They traveled in small herds of twelve to fifteen, comprised of family groups with a stallion burro leading a herd of mares (V. Mercer 1990). The burros attempted to avoid contact with humans and only watered at night. They occasionally became vicious, killing calves or keeping cattle away from water. Older stud burros sometimes grabbed calves, bit them on the neck, and shook them until they were dead or severely injured (S. Neal 1989). Many ranchers in the area (Bidick and Eskiminzin ranches) killed them and jerked the meat for dog food. During the government programs of the 1930s horse catchers gathered burros along with horses and drove them to Winkelman to sell to feed companies (S. Neal 1989). Some of the wild burros were shot on the range, and grease from the burros was occasionally used to make lye soap, *jabon de burro* (C. Whelan 1990).

Aravaipa's wild horse herds evolved from the increase of range horses turned loose on the open range by big open range cattle companies. The horses ran in slightly larger herds than the burros, but herd composition was essentially the same: a dominant male with mares and colts. Perhaps 1,800 horses ranged in the area between the San Carlos Reservation and Mammoth, and other large groups were concentrated in the Aravaipa Valley. Some Mineral Strip ranchers benefitted from the wild horses. Fritz Wolf, in Garden Gulch near Stanley, had a herd of horses which ran with the wild horses, some with brands and some without. Bud Ming, who also ranched on the Mineral Strip, turned a good stud out with the wild mares and caught the better colts (W. Claridge 1990). Wild mules were occasionally seen running loose by themselves, but none of the informants ever observed spontaneous interbreeding of wild horses and wild burros.

After the Taylor Grazing Act went into effect, wild horse herds became unofficial property of the person who had filed for the grazing lease where they ranged. Government programs required their removal. During the drought, many Aravaipa ranchers, including Joe Flieger, Charlie Whelan, and Durward Sanford, participated in gathering the horses. Johnny Meadows and Bland Beauchamp made a living from catching the horses (D. Sanford 1990). The horse catchers drove the wild herds into the government corral in Winkelman or into the shipping yards at Willcox. Some of the horses were killed and left on the range when it was clear that they were too weak to reach the corrals. Many wild horses, which had begun to starve before the removal program started, caught distemper and died (C. Whelan 1990). During gathering, horses were occasionally killed accidentally, running into fences or trampling each other.

The Woods gathered 400 head of wild horses and drove them to Marana where the better horses were shipped as work-horses to Louisiana and Alabama, and the weaker ones sold to Chicago companies for chicken feed (C. Wood 1990). On the Claridge ranch there were approximately 100 to 150 head of wild horses in the area between Deer Creek, Anderson Springs and Hawk Canyon (W. Claridge 1990). In two years, Fred Upshaw

(1990) estimates that Johnny Meadows and George Upshaw took nearly 1,000 horses and burros from their ranch on Deer Creek to sell to the Arizona Tallow Company in Tempe. They were paid two cents a pound for the horsemeat. After Meadows left the Deer Creek Ranch, Fred Upshaw shot 102 more burros on the range (F. Upshaw 1990). Ranchers who participated in their removal estimate that approximately 1,000 wild burros and 2,000 wild horses were removed during the early 1930s. The successful program almost completely eliminated feral animals from the ranges near Aravaipa (C. Whelan 1990).

The burro catchers missed a few on the Weathersby ranch in the foothills of the Santa Teresas. During the 1930s, the Weathersby children ran the wild burros into the wire corral at the P M Bar to have their own rodeos, riding them as long as they could. When the children were thrown off, the burros bit and pawed them. After the drought ended, the Weathersbys began to shift from goats to cattle, increasing their cattle herd by purchasing remnants (usually wilder cattle which had not been gathered at sale time) from any of their neighbors who would sell. At the same time, the Weathersbys started taming wild burros, putting out cottonseed meal for them so they would come into the corral for an evening meal. Once the burros were accustomed to coming into the corral, they could be used to bring in wild cattle. Weathersby cowboys roped the wild cattle, left them tied to trees until they had "lost their fight," and then necked-roped them to one of the burros with a swivel. The burros, anxious for their evening cottonseed meal, brought their partners with them directly into the corral (N. Weathersby 1990).

APPROPRIATION OF LAND

During the open range period, cattlemen obtained access to grazing land through a number of homesteading acts: the 1862 Homestead Act, which provided free distribution of 160-acre farms; the Timber and Culture Act of 1873, which increased the amount of land in the homestead provided that the applicant planted and cultivated forty acres of timber over a ten-year period; and the Desert Land Act of 1877, which extended the number of acres to 640, a full section, with the requirement of irrigation within three years and the payment of twenty-five cents per acre. Of these, "Desert" entry was the most profitable to stockmen, since they could hold the land for three years at twenty-five cents an acre. In a later modification, the Enlarged Homestead Act of

1909 allowed for 320-acre entries. Not until 1916 did the Grazing Homestead Act recognize the need for larger grazing units in arid areas, allowing for 640-acre entries without irrigation requirements. Nevertheless, even with carrying capacities estimated at twenty to thirty head per section, the allowance was still too small to provide a livelihood for a family unit. Grazing land could also be obtained by filing on water rights, or staking a water claim. Through control of the available water, cattlemen obtained use of the open range around it (Wagoner 1952: 63-64, 67-68).

Under the open range system, no written law regulated grazing on unappropriated public domain. Instead, cattlemen followed a system of casual self-regulation, mutually recognizing range rights based on patented "home ranches," legal claims to water, the installation of improvements, or simple occupation of the range. However, the absence of fences led to problems and as early as the 1890s cattlemen and cattlegrowers organizations called for governmental regulation of grazing on the public domain (Wagoner 1952: 66, 69). In 1907, Arizona experienced its first regulated grazing when grazing fees were imposed on the recently established Forest Reserves (Wagoner 1952: 76). Lands belonging to the state consisted of "school sections" 16 and 36; sections 2 and 32 were added through the Enabling Act of 1910. Beginning in 1912, the Land Commission leased state land on request for a period of five years at a minimum price of three cents per acre (Wagoner 1952: 70-71). Although Forest Reserves and state lands issued formal leases and required fees, most of the cattle ranges contained in these areas remained unfenced and actual grazing regulation (i.e., the movement of cattle) was minimal. Under the unregulated open range system, ranchers often expressed the feeling that if they did not get access to rangeland, some other rancher's cattle would "get the grass first."

THE TAYLOR GRAZING ACT

The passage of the Taylor Grazing Act of June 28, 1934 ended the open range system of cattle raising. Providing for regulated control of the unappropriated grazing lands, the act was intended to "stop injury to the public grazing lands by preventing overgrazing and soil deterioration, to provide for their orderly use, improvement, and development, to stabilize the livestock industry dependent upon the public range...." The act provided for the establishment of grazing districts which would issue permits to stock owners, with a preference to contiguous owners of land or water rights. The General Land Office issued ten-year leases and set fees using a formula based on the estimated carrying capacity of grazing lands. Twenty-five percent of the lease fees were to be expended for range improvements, including wells, fences, stocktanks and dams. After 1939, the McCarron amendment provided for Advisory Boards of local stockmen (Wagoner 1952: 70-71).

Arizona also increased the regulation of land use on state lands at the time of the Taylor Act and numerous exchanges of federal and state land occurred during the mid-1930s. The State Land Board of the Land Commission recognized priority use of property and installation of improvements, including payment to the developer for the improvements when state land was converted to "higher use" (McEuen 1987: 20). The state increased leases from a period of five years to ten years in 1940. Both state agencies and grazing associations cooperated with federal agencies in conservation and soil erosion programs (McEuen 1987: 19-20).

In Aravaipa, where some fencing was already underway, changes initiated by the act were less radical than in other areas of the state. Prior to public hearings on the leases, government agents went from ranch to ranch asking operators how many and which sections of land they wanted to lease. Sometimes agents made suggestions concerning the number of sections a rancher should include in his application, or the number of cattle he should request in the permit. In general, the agents are remembered as having been helpful (C. Turnbull 1990). In Aravaipa, comparatively few disagreements occurred concerning the new leases. In most cases, grazing areas had long been established by usage, water filings, the nature of the terrain in the area, natural barriers, proximity to the home ranch, and even by existing fences. Nevertheless, the grazing act inspired a flurry of homestead and water filings, since established usage was not always enough to provide proof that the individual rancher's grazing application was valid.

Within a few years of leasing requirements, ranchers expressed a preference for grazing their cattle on land leased from the state of Arizona. The state land department developed the reputation for interfering less than federal agencies in their operations. When the state had control of the land, no time limits on fencing were imposed. However, the state provided no monetary or physical assistance with fencing. State leases were approximately three cents per acre, with a rarely enforced limit of one section per rancher (Wagoner 1952: 71).

In Aravaipa, by the late 1930s, the state land department had the reputation for laxity in monitoring cattle numbers or rangeland conditions, and for being "easy to deal with" (J. Flieger 1990).

On the west end, grazing meetings were held in Winkelman. The Fliegers, Buzans, Woods, Millers, Upshaws, Smiths, Reeces, Mercers, Sharkseys and Lopezes all attended. Prior to the meetings, an inspector from Phoenix had visited most of the area's ranchers and there was little discussion over where fence lines would go. Some new fences had to be constructed, and neighboring ranchers usually cooperated on their construction. On Aravaipa's east end, government agents visited ranchers to discuss allotment size and fencing, and arrangements were similarly pacific. In contrast to the Aravaipa area, in Oracle meetings were heated and almost reached the point of a "big fist fight," with accusations of cattle theft and threats that people would be "run out of the country" (C. Wood 1990).

Informants disagree on the exact changes effected by the Taylor Act. It was clear that the act created smaller units with greater control of cattle and rangeland. However, after the leases were assigned, inspections were infrequent, and many people were impressed that the act had little effect. One ranch on Deer Creek was actually given a larger permit than the ranchers considered necessary (F. Upshaw 1990). Cowboys remarked on the changes, noting that before fences they had to ride much farther, looking for cattle five or six miles away from the home ranch. Although the big communal roundups and much of the other excitement of open range ranching had ended, cowboys agreed that the work was easier (C. Whelan 1990).

One major effect of the Taylor Grazing Act, probably unanticipated by its designers, was the elimination of small-scale ranches in Aravaipa and elsewhere. Sam Baker, on the west end, found that when he went to file for a lease, his "bigger" neighbors with larger pieces of patented land, or patented land that was situated closer to the desired lease parcels, were favored by the government. When he realized that he would not have enough lease land to run his cattle, he sold his little ranch (S. Baker 1990). Clay Turnbull, on the east end of Aravaipa, had a similar experience. When Turnbull told the government agent how large a grazing permit he intended to apply for, the agent suggested that it was too small. Turnbull later regretted not having taken the agent's advice to apply for a larger parcel (C. Turnbull 1990).

Before the 1930s, it was a common arrangement for large cattle companies to give their steady cowboys a house on the ranch and to allow them to run a small herd of cattle on company-controlled land. The cattle owned by employees intermingled with the owner's cattle, but were branded with a separate brand, or at least given a different ear-mark, to distinguish them from company cattle. After the Taylor Grazing Act went into effect, many cowboys who had run small herds on their employer's land found themselves unable to keep their cattle or to continue to reside in the houses given them by the ranch. Several cowboys who worked for the Eureka Ranch in the Aravaipa Valley were reluctant to file homestead claims or applications for grazing leases. Many of them became landless, cattleless, and unemployed within months of the application of the Taylor Act (M. Ramírez 1990).

Although the Taylor Grazing Act put small holders at a disadvantage, non-English-speaking immigrants from Mexico were at a particular disadvantage. Many recent immigrants had fled the violence of the Mexican Revolution (1910-1920), distrusted government officials, and avoided state regulations on principle. Without papers, adequate English, or full comprehension of filing procedures, many Mexican immigrants who thought they had squatters' rights, or pre-emptive possession of water for their small herds of cattle or goats, found themselves suddenly restricted from using the land. They perceived that the Taylor Act pushed them off the land. "There was not enough room for everyone, and we had to leave" (M. Ramírez 1990). The experience of Marcellino Ramírez and his brothers illustrates the problem. As new citizens when the Taylor Act was passed, they did not understand the procedures for applying for lease land and did not obtain any. Other Mexican immigrants had been in the United States for a longer time, but having lived in a rural Hispanic community, they had not needed to learn English, take out citizenship papers, or participate in the government process. "They settled in the country near a water source, put up a little house, worked for a ranch and made a nice life for themselves" (M. Ramírez 1990). The Ramírezes and many like them did not believe that the government would put them off their land. Julio Ramírez had goats as long as the range was open. After the Taylor Act, the government made him remove his goats (M. Ramírez 1990; R. Valenzuela 1990).

"MODERN" RANCHING BEGINS

The drought and cattle crisis of the early 1930s provided the impetus for a complete reorganization of the cattle industry. However, even before the drought, during the 1920s gradual changes had been taking place which contributed to the birth of modern ranching. The conversion from sale by the head to sale by the pound had become the general practice by the 1920s, ultimately leading to an upgrading of herds and reduction in numbers. English breeds gradually replaced the Mexican *corrientes* of the early open range period, and with sale by the pound, the lower-grade cattle became rare. During the 1920s, ranchers began to develop drought-insurance strategies, growing supplemental feed wherever possible, assuring that they would be able to purchase and store extra hay or cottonseed meal should the need arise. By the early 1930s, some Aravaipa ranchers began trucking their cattle to sales, and the five-day drives to Willcox took place less frequently. In 1936, a California "moving picture" company filmed the removal of the Double Circle cattle from the San Carlos Reservation. Fifteen cowboys drove the cattle to the rail head where they filled eighty cattle cars. The big open range round-up was already viewed as part of history.

The full restructuring of the cattle industry set forth in the Taylor Grazing Act centered around the requirements to formally lease land, fence the allotments, and limit the number of cattle which could be grazed. Within a year, the open range era of cattle ranching had ended. Fencing of the open range, with the focus on range preservation and improvement, was the real beginning of modern ranching in Aravaipa and the rest of Arizona (C. Whelan 1990). The grazing districts set up by the Taylor Grazing Act in the Aravaipa area initially limited cattle to approximately fourteen to sixteen head (mother cows) per section. In later years, grazing permits were reduced to twelve or thirteen per section, and in some areas to ten. The reduction in numbers proved to be the most significant change in cattle ranching. At Dry Camp Ranch, for example, before the fences were put in, the ranch ran possibly 1000 head. After fencing, the lease permit allowed 250 head (D. Sanford 1990). Similar reductions occurred throughout the Aravaipa area.

It is difficult to estimate cattle numbers for the study area prior to 1934, since numbers fluctuated with range and market conditions and government agency. Fairly sophisticated guesses have been ventured by old-timers, many of whom knew the Aravaipa area as young cowboys working for the big open range cattle companies and later as ranchers themselves. Before the 1930s, the rangelands contained in the study area may have supported as many as 8,000 to 10,000 head of cattle at different periods, depending on market and range conditions. The cattle grazed along with numerous herds of goats, wild horses, and wild burros. During most of the years since 1934 there have probably not been more than 6,000 at any time.

A second effect of the act was the increase in range improvements. Once the fencing began, ranchers found it necessary to increase the number of stock waters in each pasture, and soon began to install dirt stock tanks, windmills, rock and cement dams below springs, and to pipe water from springs to water troughs in distant sections of the range. During the 1930s, government agencies cooperated with ranchers on range improvements. After the Forest Service began to charge lease fees, they supplied some materials for range improvements. The Taylor Grazing Act contained a provision that part of the grazing fees would be returned to ranchers for assistance with range improvements. Ranchers quickly took advantage of these opportunities. Charlie Prude, at the Deer Creek Ranch in the Galiuros, for example, built twenty-two small rock and cement dams on his Forest Service allotment, packing in the cement to the dam sites (C. Prude 1989). The Forest Service paid for cement, plastic pipe and bentonite (Claridge 1989:15). The development of these additional water sources tended to reduce concentrations of cattle around existing springs, arroyos, and creekbeds. With cattle spread out more evenly over the range, less overgrazing of specific areas occurred. Although considerable development of stock water sources had begun during the earliest years of settlement, the period of greatest increase in construction occurred when bulldozers and modern earth-moving equipment became available after World War II.

After fences divided rangeland into separate pastures, ranchers employed pasture rotation. East-end ranchers with access to Aravaipa Creek frequently ran their cattle in pastures near or on the creek during the summer. In this way, cattle could utilize the stubble from valley-bottom hay fields after the periodic cuttings and take advantage of riparian forage, including cottonwood and sycamore seedlings. This pattern allowed the pastures on the tablelands to rest during the growing season (C. McNair 1990).

Contrary to the practice in many other parts of southern Arizona, ranchers in Aravaipa sold their cattle during the late spring, having taken advantage of the spring feed to sell calves at a higher weight. After the turn of the century, the introduction of filaree and red brome, two European spring annuals, reinforced the spring sales pattern. Informants maintain that prior to the 1960s summer rains began earlier. With better early feed, cows bred back sooner and calves were born earlier in the year (W. Claridge 1990). In a good year, with a good crop of filaree, calves could be delivered at 350 to 400 pounds and yearlings at 500 to 600 pounds (C. McNair 1990). In Aravaipa, many ranchers sold only yearlings, holding calves over for sale the following spring. The Claridges, for example, shipped their cattle when they were a full year to sixteen months old (W. Claridge 1990).

Until the early 1940s, many Aravaipa ranchers drove their cattle into Willcox, substituting a pickup truck full of hot food for the chuck wagon of open-range days. On the drives, cattle were separated into two groups: yearlings traveled together and old mother cows traveled with their calves. Occasionally the cattle stampeded on the way into Willcox. Only once did east end ranchers deliver their cattle to Winkelman. In 1933, during the worst part of the depression and drought, the McNairs and the Dowdles drove their cattle together directly down Aravaipa Creek. The McNairs' cattle brought three-and-a-half cents per pound and the Dowdles' three cents (C. McNair 1990). After the mid-1940s cattle trucks arrived at shipping corrals throughout the area to pick up stock. Although ranchers north of Klondyke and on the Mineral Strip sometimes shipped their cattle from Fort Thomas, Willcox was the most common market point. Buyers preferred Willcox because it was on a direct railroad line. The branch line at Fort Thomas caused shipping delays, forcing buyers to wait for delivery and causing unnecessary stress on the cattle.

ENVIRONMENTAL IMPACTS OF CATTLE

RANGE CONDITIONS

Among the earliest observations of range conditions was that of Lieutenant John G. Parke who passed through the Aravaipa area during the 1854-56 survey for a railroad route. He noted that the area had a striking resemblance to the coastal ranges of California, with a "luxuriant growth of grama grass" on the slopes of the Calitro (Galiuro) Mountains (Parke, 1857:26). Slightly more than thirty years later, during and after the drought of the 1880s and 1890s, a chorus of laments concerning the deterioration of southern Arizona's ranges had begun. The most severe impacts from cattle probably occurred during the 1880s and 1890s, when Anglo-American cattlemen, unfamiliar with Arizona climate patterns and livestock management in arid lands, continued importing cattle into the drought-stricken territory. Many of the Anglo-American ranchers had access to substantial capital and after 1881 were able to transport livestock into the area on the Southern Pacific Railroad. In spite of numerous drought strategies, rangeland suffered severely. Not until the Taylor Grazing Act was a widespred strategy of drought offtake, by killing and sale, employed. The former practice of allowing cattle to starve on the range contributed more than any other factor to rangeland deterioration. In general, the taller grasses were the first to be damaged, and during the 1880s and 1890s, many tall bunchgrass perennials were largely eliminated or greatly diminished (Griffiths 1901; Thornber 1910).

During the open range period, ranchers themselves concurred in the opinion that rangelands had suffered permanent damage from overstocking. In 1901, Colonel Hooker responded to a questionnaire devised by D. A. Griffiths of the Department of Agriculture which attempted to measure changes in range conditions. Hooker, familiar with the rangeland in the Sulphur Springs and Aravaipa valleys for thirty-five years, attributed their unproductive condition in 1901 entirely to overstocking. He commented that during the time he had been in the area, available feed had decreased by half and local ranges supported half as many animals as formerly. He noted that in 1890 there were 50,000 head of cattle on the Sulphur Springs-Aravaipa valley ranges. By 1900, the area only supported half that number and they "were doing poorly." During the drought, cattle dying of starvation had eaten the roots of grasses to such an extent that, in his opinion, the grass could not regenerate (Griffiths 1901: 11-14).

In describing the San Pedro Valley, Hooker made comments which may provide an analog to the Aravaipa area. He noted that the formerly abundant willow, cottonwood, sycamore and mesquite, the large beds of sacaton and grama grasses, and the luxuriant vegetation along the river bed had all disappeared. The mesas had been cut by trails from thousands of cattle and horses going to feed and water. Browse on the hillsides had been eaten off or destroyed by fire. He noted that many new waterways had been incised between the hills and the river bed, with nothing to stop the great currents of water from reaching the river bed. The river, he stated, had downcut between ten and forty feet (Griffiths 1901: 11-14; Bahre 1990).

In 1910, J. J. Thornber's *The Grazing Ranges of Arizona* was one of the first technical studies to take the open range grazing system to task for its role in rangeland destruction. Thornber estimated that 250,000 of more than 800,000 head of cattle had starved to death on the range between 1891 and 1894. He credited irresponsible overstocking with destruction of plant cover on the ranges, replacement of bunch grasses by "worthless weeds," and increase in runoff which led to unprecedented erosion, particularly on cattle trails, draws, gulches, and other water courses, "worn wider and deeper with each recurring season" (Thornber 1910: 338). Thornber noted a marked decline in winter and summer annuals, with the exception of the introduced alfilaria (filaree). Overgrazing had converted sacaton meadows into dry sandy beds, weedy eroded areas, or mesquite bosques, and had led to severe erosion and permanent lowering of water tables (Thornber 1910: 340). Will C. Barnes, chief of grazing for the Forest Service, also held "reckless competition" engendered by the open range system responsible for extensive rangeland destruction.

> Nobody dared save an acre for future uses, knowing full well it would be sought out by some nomad with a hungry band of stock, and the feed eaten off to the grass roots in spite of the protests of the party of the first part (Barnes 1926: 8-9).

However, Barnes did not blame stockmen of the pioneer days for their range management, since they were unfamiliar with forage growth or plant requirements.

One of the practices which contributed to the deterioration of rangeland was the gathering of "wild hay." Before 1920, ranchers commonly cut wild hay during years which had above-normal precipitation. Geographer Conrad Bahre (1985) offers an excellent discussion of wild hay gathering, which practice has been substantiated for the Aravaipa area by several informants (C. Whelan 1990; N. Weathersby 1990; J. Wootan 1989). Throughout the nineteenth century groups of Indian and Mexican hay gatherers cut wild grass with hand scythes or hoes, stacking it for pick-up by wagons, or delivering it on foot to feeding points. Papago women were well known for their ability to carry enormous loads of hay in basket racks on their heads. In 1870-71, Apaches at "Old" Camp Grant cut 300,000 pounds of hay for Lieutenant Whitman during one season (Hastings 1959; J. Clum 1929). After the necessary equipment became available, ranchers hired mowing teams to cut wild hay on flat areas. The hay cutters operated between October and May, preferably after the summer rain growth spurt and after the grass had "cured" naturally. Hay gatherers preferred grama, galleta, sacaton, three-awn, millet, vine mesquite, and little bluestem (Bahre 1985).

Yields varied according to location, moisture, and grass type, but occasionally they were as high as 500 pounds per acre. The reported wild hay harvest in Arizona Territory for 1899 was 9,524 tons; 1909 8,168 tons, and 1919 7,802 tons. Bahre believes that wild hay harvesters gathered even more hay in earlier years before reporting began. Undoubtedly much hay harvesting, like livestock numbers, went unreported. In dry years, when the grass cover was "too spotty to use mowers," gatherers cut it with hoes. As early as 1873 personnel, at "New" Camp Grant became aware of the destructive effect that cutting grass with hoes had on renewed growth and suggested that it be prohibited on government land (Bahre 1985).

Ranchers continued to cut wild hay on their "home range" even during the prolonged drought of the late 1880s and early 1890s. After the range had recovered from the drought, the practice resumed full force. Miles Wood of Bonita had the wild hay contract for Fort Grant for many years (I. Kennedy 1990; Wood File AHS). During the 1920s and 1930s, ranchers were still cutting galleta grass on the Hooker Ranch, in all the bottomland throughout the Sulphur Springs Valley, and in the Winchester Mountains (C. Whelan 1990). Informants recall that during the 1920s galleta grass sometimes grew two or three feet high after particularly rainy summers. Ranchers used a horse-drawn hay mower to cut the grass, followed by a raker hooked to a second team. Some ranchers bailed it, others just stacked it, covering it with inferior grass or canvas to protect it from the weather. A large bailer at the McWiggen place in Bonita was used to bail wild grass, and the Hookers had a second bailer on the Sierra Bonita (C. Whelan 1990).

The practice of gathering wild hay in wet years continued after fencing of the range, but on a more limited scale. In wet years ranchers cut, gathered, and stacked wild Johnson grass and dry filaree. The Wootans and Weathersbys raked and gathered filaree when it was exceptionally abundant (J. Wootan 1989; N. Weathersby 1990). In 1926 or 1927, the Wootans put up two very large stacks of filaree, hauling it in a wagon to the home ranch (J. Wootan 1989). In 1927, William Whelan contracted to cut wild hay for the Hooker ranch. His son Charlie assisted, riding the rake. They hauled the hay in wagons and stacked it in huge dome-shaped stacks, covering the top with old weeds to protect it from the rain (C. Whelan 1990).

In dry years, less desirable plants were gathered for cattle feed. Several informants described the process of burning spines from prickly pear in order to prevent damage to the cows' digestive systems (B. Salazar 1990).

The Wootans chopped the plants and brought them to a single large fire, where they held them with a pitch fork just long enough to burn off the spines (J. Wootan 1989). The more common practice was to leave the prickly pear standing and build a small fire around it, allowing it to burn until singed. Many Aravaipa ranchers chopped soap weed yucca during dry years, noting that it made palatable feed with the outer leaves removed (C. Whelan 1990). One informant recalled that when cattle heard the sound of cowboys chopping yucca they would come running to eat the hearts (M. Cosper 1990). Bear grass was also chopped for cattle feed. During the droughts of the 1880s, 1921, and 1934 many head of Aravaipa cattle survived on these feeds.

Informants for this study, whose observations begin in approximately 1920, agree that a general decline in range conditions has continued in the Aravaipa area. They have observed a decline in all of the six-week grasses to the extent that in some places they are no longer present. Bare spots have appeared in places formerly covered by grasses (W. Claridge 1990). They particularly lament the decrease in filaree, which now grows as thick as in former years but not as high. Lupe Salazar observed that filaree did not come into the Aravaipa until after the goats had arrived. Its density and strength have declined since the removal of goats from the area (T. Salazar 1990). As the filaree moved out, it was replaced by "red-topped grass" (sic. red brome).

Informants noted a widespread increase in brush, and replacement of grassland by brush. Brush has taken over areas where only grasses grew formerly, growing in thickets three to four feet high (C. McNair 1990). Informants observed an increase in mesquite and catclaw, both of which make good cattle feed if grazed while young. Although brush has increased at higher elevation, it has become particularly thick in the lower country. Ridges throughout the Aravaipa area have more brush with thicker and taller mesquites than formerly (W. Claridge 1990). Informants describe certain areas which have become "brush jungles" (R. Whelan 1990), noticeably in Jackson Canyon above Turkey Creek, where dense brush has backed the water up over 100 yards at certain points. South of Parson's Grove is a particularly dense stand of catclaw (sic. mimosa), which has only been present for the past thirty years (T. Salazar 1990). The ridge north of Cottonwood Canyon was formerly covered with grass and had no bushes; it is now solid mesquite. Juniper and cedar are also more widespread, as are sheep loco and snakeweed. Burroweed spread rapidly during the last twenty years. Along with the unwanted plants, a few desirable invaders appeared spontaneously. Informants noted that clover arrived suddenly, possibly transported to the Aravaipa area in cattle droppings (C. Wood 1990). Some individual plant species have appeared or disappeared with surprising rapidity. Between the 1930s and 1950s, Bear Canyon, for example, had a prickly pear ridge which subsequently died.

Many informants attribute both grass deterioration and the increase in brush to changes in weather patterns. They note that the summer rainy season, which prior to the 1950s began early in July, now often begins in late August, with the biggest rains frequently coming in September. In addition, since 1960 summer rains have not fallen regularly and have been spaced in a way which is not conducive to the regeneration of grassland (W. Claridge 1990). During the last twenty years (1970-1990), many residents of the Aravaipa area have observed a change from wet summers and drier winters to wet warm winters accompanied by drier summers. (See Chapter XII for fuller discussion of weather changes.)

Over the years, both governmental agencies and private individuals have made efforts to improve range conditions, including the sporadic spreading of both native and exotic grass seed. In years when the grass or filaree yield was high, some ranchers gathered sacks of seed to distribute in places where they believed it would do well. Filaree was successfully transplanted from Aravaipa to areas as far away as Eagle Creek. Ranchers also sacked filaree seed and distributed it to friends in other parts of the state. Some informants reported bringing exotics into the area, which they had purchased or gathered while on trips outside the area. Fred Wood distributed seed which he brought back from trips abroad, from places as far away as Europe. However, he found that the introduced non-native species did not take well (F. Wood 1989).

SUMMARY OF CATTLE IMPACT

The Aravaipa area experienced five distinct periods of cattle grazing for which dates are approximate and overlapping:

(1) Prior to 1885, during the early portion of the open range period, Aravaipa had few cattle, the majority of which were hardy, drought-resistant Mexican *corrientes,* able to graze the steeper slopes and consume more browse.

(2) Between 1885 and 1905, Aravaipa ranges and riparian areas were intensely overstocked and experienced the most dramatic impacts from overgrazing. A major drought in which thousands of head of cattle

starved to death on the range did not deter continued importation of cattle by railroad. Anglo-American ranchers adopted Mexican drought strategies. Open range policy and sale by the head encouraged destructive range management. Absence of water development and fencing prevented rotation and caused intense concentration of cattle around water sources and on cattle trails. This period experienced the most intense loss of bunch grass perennials. Cutting of wild hay was a common practice.

(3) From 1905 through the early 1930s, ranches in Aravaipa were stocked with mixed herds of goats and cattle. Dual stocking utilized all the available food niches. A second major drought occurred during this period in which cattle starved to death on the range. Although increased water development had taken place, water sources were heavily impacted during the 1918-21 drought and by the dual stocking system. A gradual shift from sale by head to sale by the pound encouraged stock reduction. Increased farmland provided additional forage and drought insurance.

(4) Between 1934 and the late 1960s, "modern" ranching was initiated by the Taylor Grazing Act, with fencing, rotation of pastures, deferred grazing strategies, greatly increased water development, and subsidies for range improvements. During the 1933-34 drought, the first drought offtake strategies for cattle were practiced. Feral livestock were removed from the range, and by the 1940s, goats were eliminated. Stocking rates were reduced by more than fifty percent. Cattle drives to markets ended completely during the early part of this period.

(5) The conservation and multiple-use period began during the late 1960s and continued beyond the time of this report. During this time attempts were made to restore grassland and riparian plant communities with limitation or elimination of livestock as a major strategy.

Several unique features of the Aravaipa area have led to distinctive patterns of grazing. In the Aravaipa area, cattle clustered in what is now the desert grassland/semi-desert scrub, especially the jojoba, juniper, mesquite, blue grama, scrub oak and the yucca grassland associations. They also concentrated in mesquite bosques, riparian washes, and riparian mixed deciduous woodlands. Cattle movements were limited by heat stress and the need for daily water and level slopes. They met these needs by grazing at night within a few miles of water on mesa tops, rolling hills, or near watering holes; they spent the hot days in canopied washes and creek bottoms. The presence of Aravaipa Creek, a perennial stream, at the center of the large area of rangeland provided a permanent supply of water during even the most severe droughts. Although the narrow floodplain of the creek has high quality grasses, it does not provide much grazing area, forcing cattle to graze tablelands outside the canyon and then to descend for water. Aravaipa also has a large number of "permanent" springs, some of which temporarily dried during droughts. In general, cattle impact on the rangeland surrounding water sources is greater than elsewhere and is intense during droughts.

The environmental impacts which resulted from these patterns included the intense use of the plant associations mentioned above. Impacts also featured heavily overgrazed areas near water sources (including both Aravaipa Creek and the perennial springs found on the tablelands), trampled trails between water sources, and trampling of grassland near corrals. The use of Aravaipa Creek and some of its tributaries as exclusive water sources led to overgrazing in areas like the confluence of Turkey Creek and Oak Grove Canyon, where cattle crowded around their only water source in the canyon bottom. It also created a number of trails leading from the creek to the tablelands above. Indirect impacts included: agricultural land clearing and water use for irrigated feed crops, reduced impact from fire as a result of grazing, and secondary impacts from soil erosion and channel damage.

Another unusual feature of the Aravaipa area was the availability of two distinct grazing zones which could be used during different seasons. The rotation pattern which put cattle on the creek bed during the summers had considerable impact on riparian vegetation, reducing cottonwood regeneration and preventing sycamores from crown-sprouting. There is some possibility that this practice impacted the creek bed, leading to the change from a relatively smooth channel to one which became cobbly and full of boulders.

Nothing is known of specific impacts of "wild" cattle in Aravaipa before the 1880s. In general, throughout the West, cattle displaced other grazers/browsers, particularly rabbits, prairie dogs, and antelope. Cattle diet partially overlapped with bighorn and deer as well as some of the smaller animals such as javelina. The North American grasslands were extremely vulnerable to specialized (large rumen) grazers, absent from the continent for thousands of years. Once Eurasian cattle entered the Southwest, it was inevitable that the landscape would irreversibly change. Exotic grasses have, in part, done so well because of their longer history with grazers in the Old World.

The Aravaipa area contains a large extent of steep hilly country with numerous bluffs. During the early open range period, Mexican cattle, known as *corrientes*, grazed the Aravaipa area. The Mexican cattle were well adapted to rough terrain and were more adept at browsing steeper slopes. Gradually Mexican cattle were replaced by higher quality English breeds, less adapted to reaching feed in the rougher, higher country. The introduction of English breeds led to a general reduction in cattle numbers, since individual animals brought a higher price on the cattle market and ranchers could reduce total numbers. The higher quality cattle tended to concentrate on the flatter tablelands, opening up the "steep-slope/browse" grazing niche. However, as the Mexican cattle were disappearing, Aravaipa ranchers introduced herds of goats, which quickly reoccupied the steep-slope/browse grazing areas. This situation continued until the 1930s when the goats were removed from Aravaipa and the steep slope/browse niche returned to deer, javelina, and the few remaining bighorn sheep.

Over the last century, each of the five periods has demonstrated an increasing attempt to determine and achieve the ideal stocking rate, the most efficient seasonal use pattern, the best grazing frequency for forage plants, and the most efficient distribution of animals. These concerns were accelerated by drought crises (1880s and 1934) because the immediate welfare of the cattle was put into jeopardy. The environmental impact of cattle occurred most intensely during the severe droughts. Heavy restocking during and after the droughts of the 1880s and 1890s prevented the long-term recovery of the range even with adequate rainfall. By 1919, ranchers knew enough to rapidly destock by killing calves to save their cows. By the 1934 drought, the federal government paid ranchers to destock.

Stocking rate has remained the most crucial and controversial aspect of land management from the point of view of maintaining high quality grass. In recent years there has been concern for recreating a semblance of the pre-Euroamerican plant associations. Stocking rates on rangelands have never been as intense as they were during the 1880s and 1890s, in part because the grasslands have never recovered either to the ranchers' desired range quality or to the ecologists' vision of the "original" plant communities.

Ranchers, of course, do not wish to reduce stock. In the Aravaipa area, they have changed breeds, supplemented grazing with forage crops (or imports like cottonseed meal), increased irrigated pasture, improved nutrition (salts and minerals), and introduced more reliable and more productive grasses, including filaree and red brome. Because English breeds are less adapted to drought, their replacement of Mexican cattle reduced grazing and browse pressure on the steeper slopes and increased it in lower, more level, shaded areas closer to water. However, until the 1930s, goats replaced the Mexican cattle in the steeper-slope/browse niche. Aravaipa ranchers and government agencies concentrated on spreading the cattle by increasing waters and improving the seasonal use of forage plants through deferred grazing and pasture rotation. Intense trampling around and between watering areas (characteristic of the nineteenth century) has been reduced. However, it is not clear that spreading cattle out, without reductions in stocking rates, has improved the quality or abundance of grass. Grazing pressure accelerated the conversion from pre-Euroamerican grasslands and riparian communities to a cattle-maintained community, with grazing-induced grassland disclimaxes. Arguments on the importance of weather patterns in this conversion have not been resolved and are not a subject of this report. However, it is clear that a misunderstanding of weather patterns by early ranchers was influential in range deterioration. (See Chapter XII for a fuller discussion of weather.)

Over fifty non-native plants have been introduced into Aravaipa, perhaps a dozen of them by ranchers or government agencies in an attempt to improve seasonal forage quality and abundance. These introductions have greatly modified the pre-Euroamerican plant communities. Brush control by fire, machines, or chemicals has not occurred in Aravaipa. No particular soil conservation measures were taken until the 1970s. No fertilization of the rangeland nor large-scale range-seeding has occurred. In this sense, Aravaipa range management has been less intrusive than range management in other parts of Arizona.

Grazing practices during the 1880s and 1890s caused damage which is possibly irreversible to both plant communities and the soil which supports them. Today, the desert-scrub and yucca grassland communities on level slope remain in worse condition than in the ungrazed areas (Dodd 1987). Where cattle have grazed, perennials have decreased, the annuals and forbs have increased, and the amount of bare ground has increased over twenty-seven percent relative to ungrazed areas. Compared to other desert grasslands in Arizona, Aravaipa has a huge percentage of forbs (fifty-three percent of the ground cover compared to zero to five percent in other places).

Cattle cluster on level areas, avoiding steeper slopes except in dry or drought years. Changes in other associations like the rock terrace chaparral, the canyon slope desert scrub, and the butte slope scrub can best be traced to goats, burros, *corrientes*, and bighorn sheep. The amount of exposed soil has greatly increased the possibility of raindrop erosion and sheet erosion. No studies have been done on how extensive or how serious this loss of soil has been, or how much it prevents recovery of the grassland. H. C. Hooker's 1901 description of the Aravaipa Valley area confirms that sheet erosion and some gullying was common by the turn of the century. The impact of cattle on the riparian community and Aravaipa Creek will be discussed in Chapter XII.

The shrubs and cacti on grazed versus ungrazed plots have identical compositions, though shrub diversity goes up on ungrazed slopes. From comparing photographs of locations in Aravaipa before and after fencing, it appears that shrubs established themselves before fencing isolated the ungrazed plots.

TABLE VI.A
NUMBER OF CATTLE IN THE COUNTIES OF SOUTHERN ARIZONA
1880-1940

Year	Graham	Pinal
1880[a]	-----	4,024
1881[b]	12,500	5,000
1883	10,088	14,281
1884	17,167	21,513
1885	22,086	28,383
1886	29,217	28,566
1887	37,089	34,386
1888	45,541	31,460
1889	36,855	39,347
1890	55,623	40,032
1891	66,730	48,565
1892	68,526	35,102
1893	64,800	27,002
1894	50,237	21,245
1895	67,992	25,625
1896	85,091	24,164
1897	67,273	34,007
1898	64,825	26,274
1899	57,076	23,213
1900	36,392	21,961
1900[c]	86,278	42,957
1901	47,166	19,017
1902	45,621	15,984
1903	-----	14,976
1904	40,857	12,105
1905	41,430	13,445
1910[d]	99,997	42,526
1920[e]	50,939	46,000
1930[f]	39,676	20,007
1935[f]	52,352	43,137
1940[f]	34,961	55,536

[a] "Report on Production of Agriculture," *Tenth Census of the United States*, 1880, Table IX, p. 142.

[b] See *Report of the Governor to the Secretary of Interior,* 1888, *et. seq.* The report of 1893 gives a compilation of the number of cattle assessed from 1883 through 1893. The statistics given are for comparative purposes only since, according to the estimate of Governor F. A. Tritle in 1885, at least fifty per cent could be safely added to the returns of the county assessors.

[c] *Twelfth Census of the United States,* 1900: *Agriculture,* V, pt. 1, Table 35, p. 418.

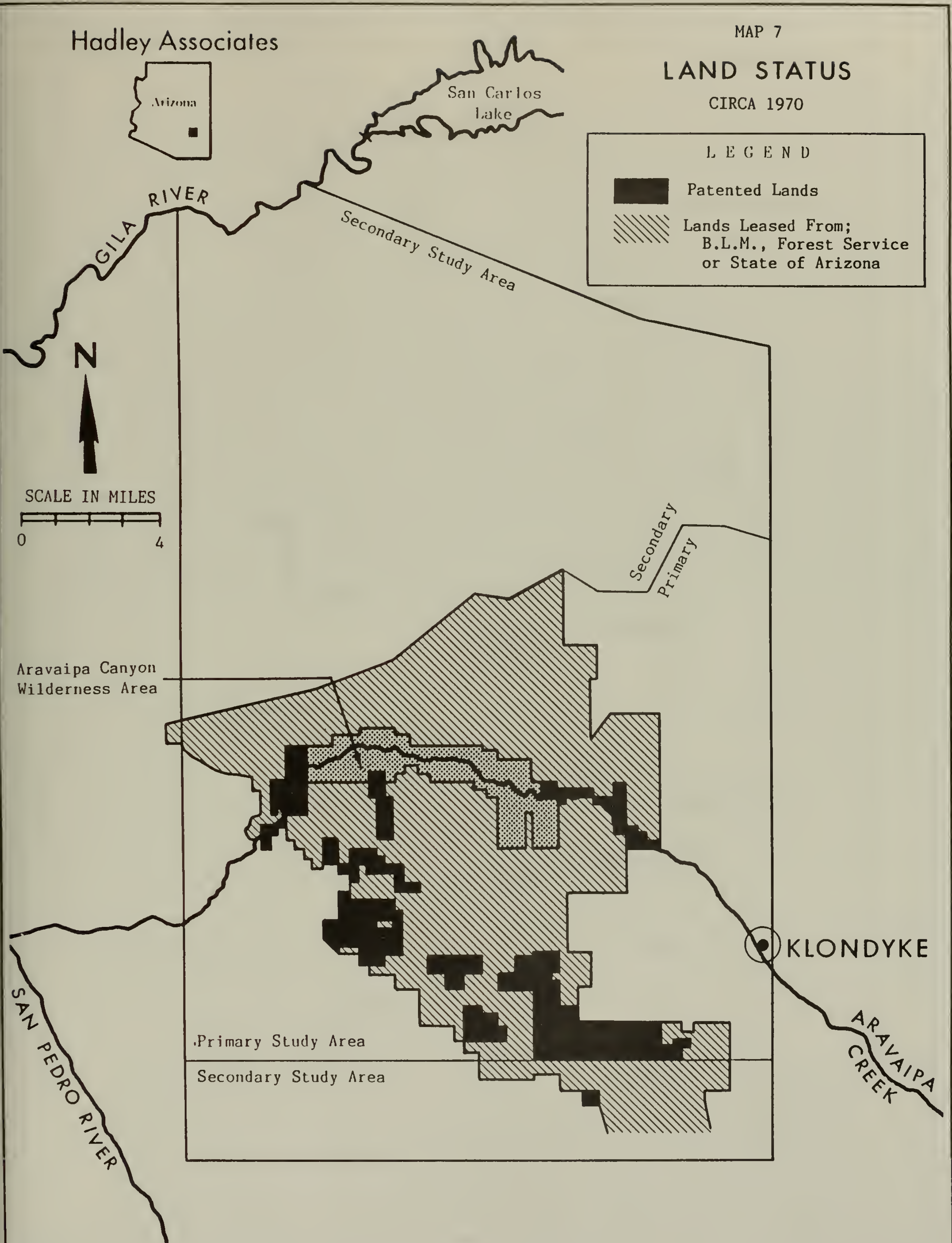
[d] *Thirteenth Census of the United States,* 1910: *Agriculture,* VI, Table I, p. 70.

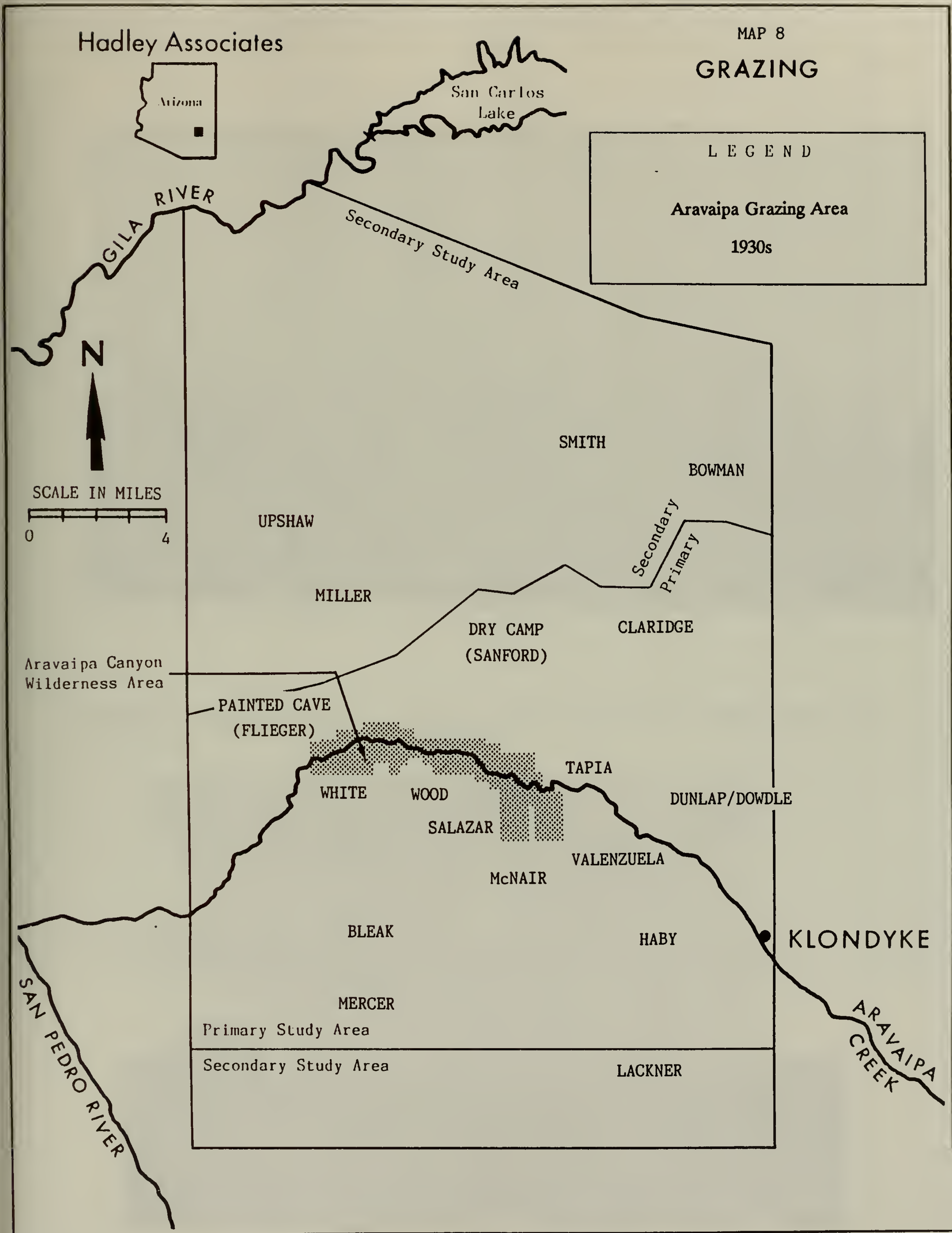
[e] *Fourteenth Census of the United States,* 1920: *Agriculture,* VI, pt. 3, County Table II, pp. 234-235.

[f] *Sixteenth Census of the United States,* 1940: *Agriculture,* I, pt. 6, County Table IV, pp. 404-405.

TABLE VI.B
CHARTER MEMBERS
ARAVAIPA CATTLE GROWERS' ASSOCIATION

A. L. Alexander	W. M. Morgan
J. B. Cook	P. P. Page
H. J. Dowdle	Z. C. Prina
Burt Dunlap	T. J. Rex
C. A. Firth	Dan Roten
Howard Graham	John Roten
J. F. Greenwood	J. T. Sanford
Gregory Haby	H. E. Smith
R. C. Haby	J. A. Terrell
C. C. Hays	D. A. Upchurch
J. B. Hinton, Jr.	A. G. Walker
H. L. Johnson	J. P. Weatherby
T. J. Johnson	John Wight
J. H. Kennedy	Will Wight
J. J. Kennedy	D. W. Wilson
A. O. Lamorfaux	J. J. Woolsey
Marion Lee	J. F. Wootan
W. P. McGulgan	J. R. Wootan, Jr.
Geo. P. Morgan	R. H. Wootan
H. A. Morgan	T. K. Wootan
Sam Morgan	W. L. Wootan


Hadley Associates
Arizona
MAP 7
LAND STATUS
CIRCA 1970
LEGEND
Patented Lands
Lands Leased From;
B.L.M., Forest Service
or State of Arizona
San Carlos
Lake
GILA RIVER
Secondary Study Area
N
SCALE IN MILES
0
4
Secondary
Primary
Aravaipa Canyon
Wilderness Area
KLONDYKE
ARAVAIPA
CREEK
SAN PEDRO RIVER
Primary Study Area
Secondary Study Area


Hadley Associates
Arizona
MAP 8
GRAZING
LEGEND
Aravaipa Grazing Area
1930s
San Carlos Lake
GILA RIVER
Secondary Study Area
N
SCALE IN MILES
0
4
SMITH
BOWMAN
UPSHAW
Secondary
Primary
MILLER
DRY CAMP
(SANFORD)
CLARIDGE
Aravaipa Canyon Wilderness Area
PAINTED CAVE
(FLIEGER)
TAPIA
WHITE
WOOD
DUNLAP/DOWDLE
SALAZAR
VALENZUELA
McNAIR
BLEAK
HABY
KLONDYKE
MERCER
Primary Study Area
Secondary Study Area
LACKNER
SAN PEDRO RIVER
ARAVAIPA CREEK

Gathering bones of dead cattle from the range in Aravaipa Valley, during the late 1880s and 1890s. (State of Arizona Archives)

Eureka Springs Ranch. Date unknown, probably before 1900. (State of Arizona Archives)

Gathering cattle in pasture between Aravaipa Canyon and Trail's End Ranch on the road toward Painted Cave Ranch, c. 1960. (Note: Aravaipa Canyon in distance at left of photo.) (Joe Flieger Collection)

VII

GOAT RANCHING

OVERVIEW

Shortly before 1900, Aravaipa settlers began to run herds of mohair-producing Angora goats. The abundance of browse and excellent spring feed in Aravaipa attracted goat ranchers from Texas and New Mexico, many of whom brought their goat herds with them. Goat numbers gradually increased, reaching their peak by 1920, with "a herd of goats on practically every permanent water in the Aravaipa" and on the San Carlos Mineral Strip (J. White 1990). Changing social conditions, a decrease in the demand for mohair, and declining market prices induced most Aravaipa goat ranchers to sell their herds by the late 1930s. By the mid-1940s, with the exception of the Weathersby herd, the Angora industry in the Aravaipa had ended.

Many former goat ranchers have been exceptionally generous and helpful with information on the mohair industry in Aravaipa and without their assistance, this portion of Aravaipa's history could not have been recovered. Their information indicated that large numbers of goats browsed particular sections of the Aravaipa area during a thirty- to forty-year period. The goats exerted a significant influence on plant composition, distribution and abundance. Their presence had a major, if temporary, impact on predator populations and may have influenced the survival of bighorn sheep in the area. Goat herds had specific impacts on soil erosion, limited to particular areas of intensive use. Long term alterations in Aravaipa's plant communities and permanent soil erosion remain controversial and/or poorly documented issues. They are further discussed in the final chapter.

ADVANTAGES AND DISADVANTAGES OF GOATS IN ARAVAIPA

Goats offered certain advantages over cattle. Since they were less capital intensive than cattle, an individual with no funds could acquire goats on a share basis, exchanging his labor for a portion of the clip and the kids. Goats are hardy, drought-resistant animals that thrive in areas without abundant grass. They can walk long distances and forage well in rough, rocky terrain, and can maintain themselves in dry years when cattle decline. They are agile, excellent climbers of bluffs and mountainsides, and can reach feed which is inaccessible to cattle. During much of the first quarter of the twentieth century, the market for mohair held steadier than the beef market. In addition, in years when mohair prices were low, goat ranchers had the advantage of an alternative market, culling their herds with sales of mutton. Goat raisers considered Aravaipa to be excellent goat terrain because of the area's abundance of spring feed and browse, and because many areas were too rough for cattle.

The Angora goat business had its disadvantages as well. Foremost was the labor-intensive nature of goat herding. Goats required the attention of a herder at all times, penning at night, and constant vigilance against predators. Shearing and kidding were labor-intensive procedures. Although goat herding was a highly specialized skill, it was not recognized as such and became a generally denigrated occupation. Herding provided a lonely life, and by the 1930s it became difficult to find herders willing to live in isolated goat camps. Angoras, unable to tolerate cold or damp weather, were susceptible to cold snaps and to Aravaipa's late spring storms. Goats acquired a reputation for destruction of rangelands, and some pressure was exerted to have them removed from public lands. By the mid-1930s synthetic materials began to replace mohair, and prices declined.

EARLY HISTORY

East of the Aravaipa area, immigrants from Mexico who settled on the Gila River during the late 1860s and early 1870s brought goats with them from northern Mexico (P. Subia 1985). However, there is no documentation that they took their herds as far as the Aravaipa area. The first Angoras on the west end of Aravaipa may have been those of Severo Zapata, who had a large open range ranch and a farm on the San Pedro River near Mammoth, with additional property on Aravaipa Creek near Brandenburg Mountain. Agricultural agencies and territorial boosters promoted the mohair business and shortly after 1900, newspaper articles and technical bulletins began to recommend the importation of Angoras into Arizona, noting the steadily rising price of mohair and the large increase in goat numbers and clip quality throughout the western United States (*GG* 2/21/1908).

Encouraged by high market prices for mohair, the Aravaipa goat industry expanded rapidly between 1900 and 1920, with prices reaching an all-time high during World War I. In 1920, a large number of new goat ranchers came to Aravaipa from Texas (the Browns and Whites). Others came from New Mexico, pushed west by drought and newly established forest reserves (the Bakers). Several of the new settlers herded their goats the entire distance from New Mexico. New settlers who did not bring their own goats frequently started in the business by herding on a share basis, for a portion of the clip and the kids. Working for established goat ranchers, they acquired their own herds in this way. Many Aravaipa ranchers maintained herds of both cattle and goats, the relative numbers fluctuating according to market changes. With the high mohair prices of the 1920s, the number of goats in the Aravaipa area may have doubled. Preference for cattle or goats appears to have been quite individual, and the ranchers who ran both perceived no competition between the two (N. Weathersby 1990; J. White 1990).

NUMBERS, LOCATION AND DURATION

Exact goat numbers for the Aravaipa area are difficult to determine. Both individual counties and the territory (later the state) assembled agricultural statistics. However, livestock reporting was notoriously unreliable, particularly during the period prior to the Taylor Grazing Act (1934). Since official statistics represented information assembled by the county assessor's office, they frequently erred on the low side. Newspapers, conversely, were apt to reflect the aspirations of local promoters and often exaggerated livestock numbers. Since herders lived a migratory existence, frequently changing goat camps and residing in temporary habitations for considerable portions of the year, it was particularly easy for goat ranchers to under-report or to avoid reporting entirely. Determining the duration of stay at any particular location is also difficult, since herders had to move goats to areas with fresh feed several times a year.

In 1910, the Bureau of the Census reported that Arizona Territory had a total of 246,617 goats on 911 separate goat ranches, with an average value of $2.25 per goat. Of these, 57,415 were in Graham County and

9,194 in Pinal (*U. S. Census 1910, Supplement for Arizona, Statistics of Agriculture* 1912: 607). By 1925, the Arizona Wool Growers Association estimated that the state had over 100,000 goats. In October 1926, *The Graham Guardian* (10/1/1926) reported that three carloads of mohair had been shipped from Safford, representing the clip of 17,500 animals. By the mid-1920s a number of ranchers were running very large herds of goats. North of Aravaipa, on the western end of the Mineral Strip and on the Gila River, Dillard Shartzer ran at least seven herds of goats, estimated to have numbered 25,000 head. During the late 1920s his mohair shipment filled an entire railroad car (Schaus 1967; C. Wood 1990; F. Upshaw 1990).

It is possible to estimate the number of goats in the Aravaipa area by multiplying the number of known goat ranchers by minimum and maximum herd sizes. The economics of goat raising indicate that a herd of fewer than 1,000 to 1,200 animals does not render the operation worthwhile. A herder cannot efficiently care for many more than 1,500 to 1,800 goats. Therefore, economics and practicality dictate that most herds were in the range between 1,000 to 1,800 animals. The following attempt to list goat herds in the Aravaipa area between 1910 and the late 1920s relies on oral information rather than written record and is, therefore, only an estimate. Determining the length of time which the owners kept their herds in the Aravaipa area is even more difficult. However, most of the individuals listed below maintained their herds for a minimum of three to five years.

On the west end of Aravaipa, the earliest (c. 1900) herds included those of: Severo Zapata, 8,000 head in Zapata Canyon to the San Pedro and Brandenburg Mountain area; Sam Satethite, 4,000 head in Satethite Canyon area; and Alvie Henderson, 2,500, who operated with Satethite. After the 1920 influx of goats occurred, new goat ranchers on the west end included: Martin Wood, 3,000 head on the Wood Ranch; Abe White, 4,000 in the Rimrock and Stone Canyon area; Nealy Brown, 5,000 in Oak Springs and Virgus Canyon; Geanie Brown, 2,000 head below the Rimrock; Bill Smith, 2,000 near the Bill Smith Hills and in Virgus Canyon; Will Parker and Pink Stewart, 1,500 on lower Aravaipa, near the Haunted House area; Sam Baker, 1,200 near Mining Mountain and on Brandenburg Mountain; Les Whitaker, 2,000 head, near the confluence with the San Pedro. W. B. Young and several others had herds of undetermined size (F. Upshaw 1990; J. White 1990; C. Wood 1990).

North of Aravaipa on the San Carlos Mineral Strip goat herds included those of: George Upshaw, 1,000 to 3,500 head between Rock Creek and Deer Creek (Schaus 1970); Charles Upshaw and Dee Upshaw 1,000 to 3,000 head, with the goats frequently out on shares to Aravaipa goat ranchers; E. N. Shepherd, 25,000 head near

Stanley Butte, with some out on shares in other areas (Schaus 1964); and Oscar Webster (later replaced by his daughter and son-in-law Zola and Mark Claridge), 7,000 to 10,000 in Hawk Canyon (Claridge 1975: 415, 423-24); Samuel Tenney (Schaus 1971), one herd on Deer Creek; and Les Whitaker and the Whitwright family, several herds on the extreme west end of the Mineral Strip (F. Upshaw 1990).

On the east and west sides of Table Mountain goat ranchers, with herds of up to 1,800 head, included: Dick Moffatt, near "Dry Camp" on the Miller ranch; Arthur Wootan, near Mud Springs; Dick Wootan, at the Fig Tree; Jed Bleak and Joe Bleak, near Bleak Springs; their father James Bleak, between Table Mountain and Virgus Canyon; Robert Reece, west of Table Mountain, near the San Pedro: Jack English, on Holy Joe Peak and Rulon Moody (J. White 1990; C. Wood 1990; F. Upshaw 1990). In Turkey Creek, and in the area between Turkey Creek and Table Mountain, the earliest goat ranchers with herds up to 1,800 included Will Allbritton, Rube Wootan, and Sam Brown. At a slightly later date, the Osbornes, John Ditmer, and Rob Wootan ran goats in the same area (M. Bleak Cosper 1990; J. Wootan 1989; A. B. Wootan 1989).

Farther east, on both sides of Aravaipa Creek and into the foothills of the Santa Teresas, Gregory Haby, the Copes, Jake Weathersbys, Dr. Hy Parker, Julian Ramírez, the Dominguezes, and Frederico Sanchez had goat herds. Jake Weathersby had the largest herds in this area, with numbers fluctuating between 7,000 and 15,000; Gregory Haby had several thousand; the rest were smaller herds. A number of individuals ran goats on shares, including Thad Adams, Link Ferguson and three Gutierrez brothers. During the period before the Taylor Grazing Act, many goat herders squatted on open range. Two McPeters brothers, Charlie and Tom, squatted with their goat herds north of the Sanford's Dry Camp Ranch, and later moved their goats to the Painted Cave Ranch (D. Sanford 1990; N. Weathersby 1990; M. Haby 1989). Dozens of other individuals ran small herds of goats for brief periods of time and have been overlooked in this record.

Goat herding gave many individuals a start in the livestock business. Although some of the ranchers mentioned in the preceding list were primarily goat ranchers, only Jake Westhersby and the Browns ran goats exclusively. The majority of Aravaipa's goat ranchers also had cattle. Some individuals, like Dillard Shartzer, switched entirely to cattle during the 1927 drop in the mohair market. Goat ranchers often formed small companies, and the share procedure gave the opportunity for stockless herders to become livestock owners. In

1909, Alex Hunt and Hyrum Claridge sold their goat herds and ranches to Dr. W. E. Platt and James T. Owens, who formed a new company with J. D. Lee as range foreman (*GG* 1/1/1909). Several years later, Lee appears in the record as owner of his own company, Lee and Ramírez, contesting the raising of his assessment from 900 to 1,000 goats (*GG* 1/22/1928).

Between 1890 and 1930, goat herds were concentrated in the Turkey Creek-Oak Grove area, on Table Mountain, in the Stone Cabin-Rimrock area, the south-facing slopes of the Santa Teresas on the Weathersby Ranch east of Klondyke, and on the San Carlos Mineral Strip, particularly in Deer Creek, Stanley Butte and Hawk Canyon. It is reasonable to estimate that twenty-five to thirty ranchers maintained herds of a minimum of 1,000 goats for a period of five years, with several individuals having much larger herds. Between Turkey Creek and the San Pedro River, there may have been as many as 25,000 goats, with another 15,000 to 20,000 in the area north of Klondyke and in the Aravaipa Valley. Thus, the total number of goats in the entire study area, between the San Carlos Mineral Strip and Copper Creek, and between the San Pedro and the Aravaipa Valley, may have been as high as 40,000.

Although goat numbers remained relatively steady through the 1920s, they began to decline during the 1930s. Neither the drought nor the Depression of the 1930s had as devastating an effect on the goat business as on the cattle industry. Mohair prices remained higher throughout the Depression than cattle prices (N. Weathersby 1990; J. White 1990), but with the replacement of mohair by synthetics, the market fell and Aravaipa ranchers began to sell their herds. The policy of government agencies exerted some effect on the goat industry as well. Goats were eliminated from Forest Service ranges during the early 1920s (Wilson 1987: 345). The Taylor Grazing Act had the effect of squeezing out some of the smaller goat ranchers, particularly those who had squatted on public land. Abe White sold the last goats from the west end of Aravaipa in 1942, and on the east end, Neuel Weathersby sold the last of his herd in 1951 (N. Weathersby 1990; J. White 1990).

CARING FOR GOATS

The availability of feed, the breeding cycle, and weather determined a distinct pattern of goat herding in the Aravaipa area. The presence of a large variety of select goat feeds, which appeared at different times of year, gave Aravaipa its reputation as good goat habitat. As browsers, goats consume brush and dried grass, although they prefer young green grass when it is available. Near Aravaipa Creek, they consumed oak brush, buck brush, and mountain mahogany, and during the spring they ate filaree. On the Mineral Strip, jojoba provided excellent feed. Feed determined to a considerable degree the quality and weight of an Angora's fleece (*GG* 9/16/1904). A rotation system emerged in which goats followed the available feed, with herders moving their base camp into higher elevations during the spring and summer and returning to lower elevations during cold weather.

Large goat ranches maintained several separate herds of goats, with nannies, billies, and wethers frequently kept apart for most of the year. Each herd required the constant presence of a herder, particularly in the bluffy canyon terrain of Aravaipa, which offers good habitat to predators. An individual herder can comfortably care for 1,500 goats; a top herder can care for 1,800 to 2,000 (N. Weathersby 1990). Ranchers who owned more than this number of goats had to hire additional herders or put the excess goats out on shares. Billies, kept in a separate pasture most of the year, ran with the nannies for only one month during the fall. One billy can efficiently service seventy to eighty nannies, and gender ratios in the herds were proportioned accordingly. Many goat ranchers purchased or leased registered bucks to improve herd quality. Inferior bucks were castrated and either kept as mohair producing wethers or sold as chevlons or muttons. Some of the larger goat ranches maintained a registered herd separate from the grade herd. Goat ranchers directed their breeding program to maximize hardiness, length and thickness of hair, and weight of the fleeces.

The herder, the key factor in the success of the goat operation, had a solitary life, frequently living in a cave, tent, or makeshift house at the goat camp for months at a time. He was responsible for both the well-being of the goat herd and the maintenance of an adequate feed supply in the pasture. Many experienced herders came from Mexico. Most herders received $1.00 a day and two muttons a month. Ideally, the herder moved the goats every day to obtain a fresh variety of feed, taking the goats to different areas, and passing over new routes whenever possible. Herders selected feeding areas according to rains, feed quality and the previous location of the herd. The herder brought the goats back to the base camp every night and closed them in a special corral. Constructed of rock, posts, or wire, the pens frequently contained an internal shelter and kid boxes. The remains of abandoned goat pens can be seen at many places in Aravaipa.

Although a travelling goat herd can cover ten miles or more a day, during the normal feeding day goats do better if they go no more than three to four miles away from base camp. During the feeding day, goats should be taken to water at least once. Therefore, the number of waters and the number of pens in any particular pasture limited the potential rotation system of the herd. A diameter of six to eight miles around each pen, or base camp, constituted the normal range. At some camps, goats could stay close to the pens, at others they were required to travel the full four miles on a daily basis. Herders rotated base camps, moving to an entirely new area when the feed diminished. In years when feed was plentiful, herders might remain in one base camp for a full six months, staying until they went to the home ranch for dipping or shearing (N. Weathersby 1990).

Kidding time presented the critical period in the goat cycle. The kidding started in late March or early April. Whenever possible the herder took the nannies to lower elevations for kidding, as baby goats are susceptible to late spring storms. In contrast to other livestock, nannies are notoriously deficient in the ability to recognize their offspring, and refuse to accept an orphan or a kid about which they have any doubt. Therefore, during the first few weeks of the kid's life, the herder had to assure that each nanny recognized her offspring. Newborn kids were commonly raised in two ways. According to the first method, the herder constructed a series of small pens. He kept a few kids in each pen and marked the nannies that belonged with the kids of that pen. When he brought the nannies back to camp in the evening, he turned them into the proper kid pens. In the second method, the herder staked out the kids on leather toggle straps which limited their movements. Each kid remained in the same spot for up to two weeks so that the mother knew where to find it when she returned from grazing. If the kids were not raised in one of these two ways, the nannies would not recognize or claim their babies (S. Baker 1990).

When none of the mothers would own a kid, the herder had to tie the nanny down or put her on a stake so she would allow the orphan to suckle. Disowned kids, called *bums*, were always sold, since orphans never made good goats when grown. In spite of the care taken with the kids, many goat herders found it necessary to have a "bum pen," where the disowned babies were bottle fed or were put on a tied nanny to suckle. Since nannies never acquiesced to suckling the orphaned kids, caring for the bums became a daily struggle between the herder and the unwilling foster mothers (S. Baker 1990; A. B. Wootan 1990).

Shearing time, which occurred twice a year in the fall and the late spring, was the other critical period in the goat cycle. Shearing an entire herd of goats took from one to three weeks. In most cases, herders brought all the goats into the home ranch for shearing, although occasionally it was done in the camps. After shearing, the naked goats were vulnerable to changes in the weather. Many goat ranchers reported terrible incidents in which freshly sheared goats were caught by surprise storms, and either perished from extremes of cold or trampled each other in an attempt to get back to the shelter of the goat pen (S. Baker 1990; A. B. Wootan 1990).

In the days before mechanization, shearers either hand-clipped the goats or used shears attached to hand cranked generators (J. White 1990). A good shearer could handle approximately 150 goats a day, a top shearer, up to 200. After mechanization, speed increased with the use of shears attached to a gas powered one-cylinder engine, usually a Fairbanks Morse. On the west end, groups of shearers traveled throughout the area, contracting to shear entire herds. During the early 1920s, the Wood brothers sheared for many of their neighbors. On the east end, the Weathersbys constructed a shearing pen near the Klondyke road where they did their own shearing and contracted to shear for some of their neighbors. The pen had a big motor with cross shafts connected to the shears, enabling four shearers to work at once. During the 1920s and 1930s, ranchers paid shearers two- and-a-half to three cents a head for shearing, or $3.00 per 100 head. During the 1940s, members of the Sanchez family worked as a team, shearing up to 300 goats a day, for $.05 per goat, earning approximately $15.00 a day (L. Sanchez 1990). Shearing, although known to be back-breaking work, provided a good occasion for a party, particularly on the larger ranches. The Zapatas frequently barbequed muttons on a spit, invited the neighbors and held a dance (C. Wood 1990).

Disease and predation constituted the biggest problems for goat ranchers. Hollow horn (oestrus ovis), the most prevalent goat disease, frequently killed infected goats. The disease was brought about by the eggs of flies laid in wounds in the goats' nostrils, caused by eating Spanish dagger or other sharp-edged feed. Bot grubs subsequently hatched, passed through the goat's head, and eventually lodged inside the horns, slowly consuming the interior of the horn. Infected goats were unable to fatten and became severely weak. Dying goats sought out cool dark places to die. The remains of goats (and bighorn sheep) have frequently been found in caves and mine shafts throughout Aravaipa (D. Sanford 1990).

Herders treated goats for hollow horn and several other common diseases. For hollow horn, herders drilled holes in the goats' horns and filled them with Black Leaf Forty, or coal oil, or dosed their nostrils with straight nicotine. Herders also inoculated against soremouth and brought the entire herd into a dipping vat twice a year to dip them for lice. Dipping, in a solution of Cooper's Sheep Dip or Kolodip, took place a few months after shearing when the hair had grown back to approximately half its full length. Herders flanked the goats and tossed them into a cement-floored dipping vat so that they were completely submerged. Using a long double hooked pole, they pulled them through the vat and turned them into a dripping pen to dry (N. Weathersby 1990). In addition to diseases, goats also sickened from eating certain harmful plants. Larkspur and loco weed poisoned goats fairly frequently, and milkweed sickened goats, their body heat converting the sap into a glue-like substance (S. Baker 1990).

In spite of the constant vigilance of the herder, coyotes and bobcats, and to a lesser degree mountain lions and bears, found goat meat an excellent substitute for venison. In general, mountain lions seemed to prefer calves and colts to goats, but once they began eating goats, they recognized the easiness of the prey and continued with a goat diet (N. Weathersby 1990). Herders stayed with the goats during the day and enclosed them in a pen at night, frequently with the protection of a dog which had been kept tied during the day. In spite of these precautions, predators occasionally attacked the goats. Although coyotes killed more goats than did bobcats, coyotes would not enter a goat pen at night, as bobcats were known to do (F. Upshaw 1990). The Weathersbys' worst single case of predation occurred in 1945 or 1946, when a mountain lion attacked penned goats at the Mariano Camp, killing ninety-seven head in one night. The lion had clearly been "playing with the goats," since he could not consume the meat (N. Weathersby 1990).

MOHAIR ECONOMICS

An Angora goat will give approximately five pounds of mohair in each clip (*GG* 9/16/1904), although fleeces are known to vary between four and ten pounds. The quality of the goat and the quality of its feed influenced the length, strength, and fineness of fiber in the fleece. After shearing, the mohair was stuffed into large gunnysacks. Regular quality mohair sacks weighed between 300 and 400 pounds each; high quality weighed up to 600 (N. Weathersby 1990). The softer "kid hair," produced during the first two shearings, was always kept separate because it brought a higher price. Kemp, the coarse bristly hair, was undesirable. Although buyers occasionally contracted the clip before shearing, the normal practice was to purchase mohair after it had been bagged. Buyers checked for quality, plugging the sacks and removing a small portion of the hair (S. Baker 1990).

During the early years of mohair production in Aravaipa, goat ranchers had several choices for marketing their product. Buyers representing east coast textile firms visited Aravaipa ranchers to contract the clip. Ranchers could sell directly to these company representatives or take the clip into the Qurelli Store in Winkelman for sale. They occasionally sold to the mohair market in San Angelo, Texas, or through the New Mexico Mohair Association, which purchased and marketed mohair for members (S. Baker 1990). Local people often acted as buyers for the out-of-state textile manufacturers. Oscar Webster, who ran goats on Hawk Canyon, was an important buyer and after his death, his daughter, Zola Webster Claridge took over his job. Cohen and Meyers were two well-known local buyers on the west end (J. Claridge 1975: 415, 423-24).

A small but steady market for mutton helped goat producers through bad years when they were required to cull herds. During the goat boom, the Weathersbys, for example, were able to sell 200 to 500 muttons a year for butchering, bringing $2.50 each during the 1930s. In later years, goat ranchers sold fewer muttons, but at prices up to $20.00 (N. Weathersby 1990; J. White 1990).

Demand for mohair determined the duration of goat ranching in Aravaipa. Shortly after 1900, articles in Florence and Safford newspapers and in territorial agricultural journals began promoting mohair production (*Southwestern Stockman* 1901; *GG* 9/16/1904). Shortly after 1910, the demand for mohair expanded from women's luxury garments and coats into a larger variety of products which included items as diverse as cartridge packing and airplane wing stuffing. Furniture manufacturers featured mohair "plushes" in upholstery. Car manufacturers used mohair for both seat covers and stuffing. By 1918, when mohair prices peaked, one article stated that fifteen-inch fibers had been known to sell for $8.00 to $10.00 per pound (*Coconino Sun* 1/25/1918).

With high demand, mohair prices were generally less susceptible to market fluctuations than cattle prices. During the depression and drought of the early 1920s mohair prices dropped from fifty to twenty cents a pound but recovered more quickly than cattle prices. By the late 1920s, grown mohair was bringing fifty to sixty cents a pound and kid hair seventy to eighty cents. However, mohair, like other agricultural products, suffered from occasional commodity-specific recessions. In 1927, mohair dropped briefly to ten cents a pound, causing several large producers like Dillard Shartzer to sell all their herds. During the depression of the 1930s, mohair again held steadier than cattle prices. At one point when the government was buying cattle for $10.00 to $11.00 a head, goat breeders could still sell billies (for breeding stock) for $25.00 (N. Weathersby 1990). However, by the mid-1930s prices fell drastically. At the low point goat ranchers were forced to sell the clip for as little as three cents for grown hair and five cents for kid hair (F. Upshaw 1990; N. Weathersby 1990).

THE ARIZONA MOHAIR GROWERS ASSOCIATION

Goat breeders did not have an organization which represented their interests exclusively until 1936. Prior to that time, many goat ranchers had been members of the Arizona Sheep Breeders and Wool Growers Association. Organized in October 1886, the Wool Growers had a heavy preponderance of sheep ranchers (Haskett 1936: 45). The Association estimated that approximately half of the goat ranchers in Arizona were members of the Wool Growers in 1925, with "fifty percent of the Angora goats" (not goat owners) in the state being "in the association." A membership list of ranchers from that year includes twenty-one individual members who ran goats exclusively, paying dues based on over 50,000 head of goats. There were additional members who had both sheep and goats. Although most of the organization's membership was from more northerly counties, Aravaipa area members included W. J. Satethite and W. B. Young (Embach 1965: 12).

By 1936, goat ranchers began to feel the need for an organization made up entirely of goat ranchers. A group assembled at Prescott and chartered The Arizona Mohair Growers Association (AMGA). Although many of the members were from the Kingman and Wickenburg areas, Aravaipa and the nearby San Pedro area were represented by the Whites, Dick Moffatt, Jack English, J. R. Reese, Anita Zapata, G. R. English, George Upshaw, and Thomas Qurelli on the west end. East end members included the Weathersbys, Claridges, and

Rulon Moody. The Mohair Growers organized just as the goat business became difficult. Statistics from the *United States Department of Agriculture, Wool Division Bulletin* indicate a ten percent decrease in the clip between 1933 and 1934, with another, slightly smaller decrease the following year. In addition, public opinion and pressures imposed by the recent New Deal agencies led some goat ranchers to sell their herds and switch to cattle (AMGA records).

The objectives of the Association were to form marketing agreements, lobby against high state assessments on goats, assure that the Biological Survey continued its predator control program, lobby the federal government to cede the land in the San Carlos Mineral Strip to its current lessees, promote new uses for mohair, advertise, and correct the "herder situation." One of the Association's prime concerns was to deal with misinformation about goats and unfavorable public sentiment regarding goats as users of public land. The Association promoted range-use surveys and expressed willingness to cooperate with the newly imposed range and grazing regulations.

During the late 1930s, the Mohair Growers continually lobbied against what they considered to be unfair assessments on goats. Mohair brought $0.51 a pound for aged hair and $0.61 for kid hair in 1936. However, in 1937 prices dropped to $0.27 and $0.37 per pound, with a slight increase in 1938 to $0.35 and $0.54. The Association successfully opposed the 1938 assessment of $1.00 a head, considering it out of line with the sharply decreased price of mohair, and succeeded in obtaining a reduction from the Tax Equalization Board.

Mohair growers also objected to the then current trend in which government agencies were taking over the loan business from private banks. During the radical price drops of 1937-38, the Association formed a committee to develop the market for goat meat from culled herds, producing recipe pamphlets and procuring goat meat advertisements from Bennett and Sons and other Phoenix butchers. However, by 1939 cull goats brought only $25.00 per hundred, and fat goats $2.00 a head. By 1940, the price for fat goats had dropped to $1.25 a head. The Association also promoted novel uses for mohair, including goat hair fillers for the newly invented air coolers which were "sweeping the southwest during the early 1940s" (AMGA records).

In 1939, the Association entered the long-standing debate between goat raisers and Arizona sportsmen who opposed state and federal predator control. Sportsmen preferred to organize hunts for mountain lions, bobcat, bear and even coyotes, and believed that predator control programs hurt their sporting activities and ruined the potentially lucrative business of guided hunts. In 1939, the Association requested that the federally funded Biological Survey match the state predator control appropriation of $20,000 for the two subsequent years. However, M. Mercer of the Biological Survey indicated that goat ranchers would have to bear half the expenses of any trapping done for their benefit (AMGA records).

END OF THE ARAVAIPA GOAT INDUSTRY

The decline in mohair prices had the most significant impact on the demise of Aravaipa's goat industry. The Arizona goat industry's total reported income varied according to market prices more than from absolute numbers of goats. Income from mohair was $221,000 in 1938, but jumped to $301,000 in 1939 reflecting pre-wartime high prices related to ammunition manufacturing (AMGA records). In 1940, the Mohair Growers Association went on record opposing the Utilities Commission's proposed increase on steamship rates for ships carrying mohair from Pacific coast ports to Atlantic coast manufacturers. The Association lobbied Washington for the removal of the fifty-two cent price ceilings which the War Price Board had placed on mohair. As the war continued, President Roosevelt revised tariff laws and allowed the importation of foreign mohair, creating a final blow to struggling domestic mohair growers (S. Baker 1989; J. White 1990; N. Wethersby 1990; A. B. Wootan 1989; AMGA records).

Other factors which contributed to the demise of goat ranching included government policy, herding problems and predation. Administrators of the Forest Reserves maintained that goats destroyed seedling trees, and by the early 1920s had required their gradual removal from National Forest land (Wilson 1987; S. Baker 1990). The Crook (later Coronado) National Forest, the last in the state to issue goat grazing permits, had a very limited number of goats until the early 1920s (Wilson 1987: 345). Although the Bureau of Land Management never imposed restrictions directed specifically against goats, general grazing regulations of the Taylor Grazing Act contributed to decline of goat numbers in an unanticipated way. Many of the smaller goat ranchers operated without any patented land, or from very small deeded parcels. When the Taylor Act required the issuance of leases based on contiguous private land, many small ranchers owned so little they could not acquire grazing leases. As was the case with marginal cattle operations, the small goat ranchers were squeezed out (S. Baker

1990; M. Ramírez 1990; Embach 1965: 13). Certain New Deal soil conservation policies hurt the mohair business as well, by increasing the unfavorable image of goats. During the New Deal, pressure on goat ranchers increased under policies established by the Soil Erosion Service (1933) and the Soil Conservation Service (1935). Part of the second Agricultural Adjustment Act of 1938 included marketing quotas for agricultural commodities (Fite 1981: 60), which additionally hurt mohair production.

Herder problems and increasing predation contributed to the end of goat ranching in Aravaipa. During World War II, it became very difficult to find qualified herders. The older generation of Anglo-American and Hispanic goat herders was dying out, and few young men were willing to live the rustic and lonely life of a goat herder. Many of those who might have done so were serving in the armed forces. In addition to the herder problem, many ranchers claimed that despite government predator control programs, predation increased during the 1940s and 1950s, just as goats were being eliminated from Aravaipa. Mountain lions began to move from the higher elevations into lower country and losses of both cattle and goats increased (T. Salazar 1990).

Many Aravaipa goat ranchers sold their herds with great reluctance. The last holdouts were the Whites on the west end and the Weathersbys on the east. Abe White, stuck with three clips of unsold mohair, sadly walked the remnant of his large herds to Winkleman in 1942 (J. White 1990). The Weathersbys sold the remainder of their herd in 1950 to a Texas pharmaceutical company, which used goat glands in medicine (N. Weathersby 1990). When the last goats were gathered for sale, the herders missed a few. Somehow they survived in Aravaipa for several years. Local residents occasionally saw them, wild unsheared goats with matted hair that reached the ground (T. Salazar 1990).

THE IMPACT OF GOATS

Aravaipa's former goat ranchers have expressed three broad opinions concerning the impact of goats on the environment. The first group of goat ranchers maintain that a carefully managed goat herd had less impact on the environment than a cattle operation. While cattle moved about pastures at their whim, the application of the herders' intelligence determined the movement of goats. This greater degree of control could be applied to lessen impact of goats, to avoid "close herding" and prevent overgrazing (N. Weathersby 1990). Another group of former goat ranchers disagree. They maintain that goats are innately more destructive to terrain than cattle because of their restlessness, constant movement, and the impact of their sharper, smaller hooves. Goat herds, they maintain, often trampled out the grass, walking it off even when it was unnecessary for them to be on the move. Their constant movement loosened the soil and initiated erosion (C. Wood 1990; A. B. Wootan 1989; M. B. Cosper 1990). Critics cite the existence of goat trails (particularly on the west end of Aravaipa) years after the goats had been removed as evidence of goat-induced land degradation. According to the critics, goats ruined the whole lower part of Aravaipa, particularly the area near the confluence of Aravaipa and the San Pedro, which was formerly covered with grasses, including a needle grass that grew to be two feet high. Close goat grazing practices killed the grass, initiated erosion, and allowed soil to wash away. Goats had less impact on other areas, Table Mountain for example, because of a briefer, less intense occupation and stronger feed (C. Wood 1990).

The third opinion group is more moderate, believing that goats are not inherently destructive but can have either a negative or a beneficial impact on the environment, according to their management. In Aravaipa, goats were allowed to damage certain areas because they were not moved frequently enough (F. Upshaw 1990). Well-managed goat grazing can improve forage through intentional consumption of undesirable plants or brush. When bunched and encouraged to close-graze in a restricted area for several days, goats will consume bark and kill shrubs, exerting a beneficial effect on grass. Ranchers observed that after goats were removed from the range, oak brush and jojoba returned in large quantities. This moderate group also maintains that limited impact from goats stirs up the ground, allowing for easier implantation of seeds (F. Upshaw 1990).

Conflicts between goat ranchers and other groups of Aravaipa residents centered on economic production rather than on the perception that goats exerted a permanent negative impact on the environment. Conflicts between goat and cattle ranchers were infrequent and many ranchers owned both goats and cattle. The Whites, Woods and Weathersbys are all examples of ranchers who split their operation between goats and cattle. However, some cattlemen like Bud Ming, who had a ranch on Deer Creek in the Mineral Strip during the 1920s, disliked goats. He always instructed his cowboys, "Have mercy, boys, don't shoot that coyote, he might kill a goat before nightfall" (F. Upshaw 1990). In a few cases, conflicts became heated. One argument erupted into violence in 1933, when "Clabber" Warner insisted that Sam Baker's goats stay out of his burro pasture on Brandenburg

Mountain. During the heated argument which ensued, Baker shot Warner twice. After Warner's recovery, the defense proved that Baker had not shot to kill and he was acquitted (S. Baker 1990).

Aravaipa farmers appear to have been more critical of goats than were cattlemen. Professor Frances Gillmor, a friend of the Buzan family, wrote a novel about Aravaipa which features a protracted struggle between goat herders and Aravaipa farmers who, in the novel, express an "environmentalist" point of view critical of goat herding (Gillmor 1940). Although the Buzan family did experience some conflict with goat ranchers (A. B. Matteson n.d.), disagreements among the community as a whole appear to have been limited to isolated incidents. Farmers on the west end, where Dr. Gillmor lived for several years, complained that their fences were breached by goats. Such invasions, however, were not limited to goats: cattle, domestic hogs, horses, burros, and herds of javelinas all broke into gardens and trampled crops, particularly in times of drought (M. Buzan 1990). Old-time residents now recall incidents of squashed melons and scattered pumpkins with laughter, but at the time, damage to commercial vegetable gardens appeared more serious.

Several scientific studies have been done to determine the impact of goats on rangeland. All agree that goats are primarily browsers, but ratios of browse to grass consumption varied according to species availability. A range management experiment conducted at Texas A&M University indicated that Angora goats preferred a diet of approximately fifty percent grass, although the percentage of forbs increased during spring (F. C. Bryant 1979: 415-16). Another study indicated a goat diet as high as eighty-three percent browse and forbs (Knipe 1982), with goats making better use of the vegetation as a whole and consuming a wider range of vegetation and available plants than either sheep or cattle. Proportion of browse in goat diets increased rapidly in the late fall and remained high until late spring (Knipe 1982: 411). When goats had the choice between available foods, they preferred mountain mahogany. Second in palatability was shrub live oak, followed by Wright silktassel, sugar sumac, skunkbush, manzanita, desert ceanothus, hollyleaf buckthorn, and cliffrose. A table of plants consumed by goats in recent years in Aravaipa appears in Table XII. C.

In addition, the range experiments found that the trampling of the earth by goats initiated "seed planting." The combination of reduction of shrubs through browsing and the seed-planting effect of the goats' hooves may have led to increased stands of grass. Thus goats' browsing may be of service, under carefully controlled conditions, in the reconversion of chaparral to grassland (Knipe 1982: 416). The results of these experiments support the contention of many former goat ranchers who maintain that goats can provide a service to the environment by eating out the underbrush (S. Baker 1990; N. Weathersby 1990).

Observations of goat-induced land change include a number of specific impacts. Goat trails still present fifty years after goat removal include the trail on the east side of Virgus Canyon which connects the old goat corrals at the mouth of Virgus Canyon (used by Bill Smith and "Old Man" German) with Stone Cabin (T. Salazar 1990). Another trail, visible until recently, led from Sam Baker's place below Mining Mountain on Aravaipa Creek toward Table Mountain. Several informants have observed that mesquite groves have grown up inside almost all of the abandoned goat corrals. Mesquites in abandoned corrals can be seen today in the following locations: the Wire Corral on the Salazar Ranch; Parson's Grove goat corral above the Parson's Grove house; the mouth of Jackson Canyon, where the Copes, Browns and Ditmers corralled their goats; the Upchurch goat camp where Garden Spring and Oak Grove join; Rulon Moody's goat camp at the mouth of "Nigger" Henry Canyon where it joins Sycamore Canyon; and La Trasquila (The Shares) goat corral, used by Hipolito Roman and Dolores and Chico Gutierrez, at the point where the Salazars' pipeline road joins the bottom of Aravaipa Canyon. Lupe Salazar, who was born in Aravaipa in 1894 before goats were brought into the area in large numbers, observed that prior to the arrival of many goat herds there was little or no filaree in the area. His son Tex observed that filaree has decreased over the years with the absence of goats (T. Salazar 1990). (See the "Turkey Creek" vignette in Chapter XII.)

The presence of goats appears to have had considerable impact on animal populations in Aravaipa. Results of the Texas A&M study indicated that a keen competition between deer and livestock (Angora and Spanish goats, and sheep) occurred when only small amounts of high quality grass were available. During late autumn, Angoras and deer also competed for the limited quantity of edible browse available (F. C. Bryant et al. 1979: 415-16). There has been some suggestion that goats competed with bighorn sheep, and that hollow horn or other diseases may have been transmitted to the wild sheep populations (J. White 1990). Goats certainly would have displaced bighorn sheep from certain sheltering areas and would have competed with them for food. In addition, the isolated goat herders widely dispersed throughout Aravaipa had a significant impact on predator numbers.

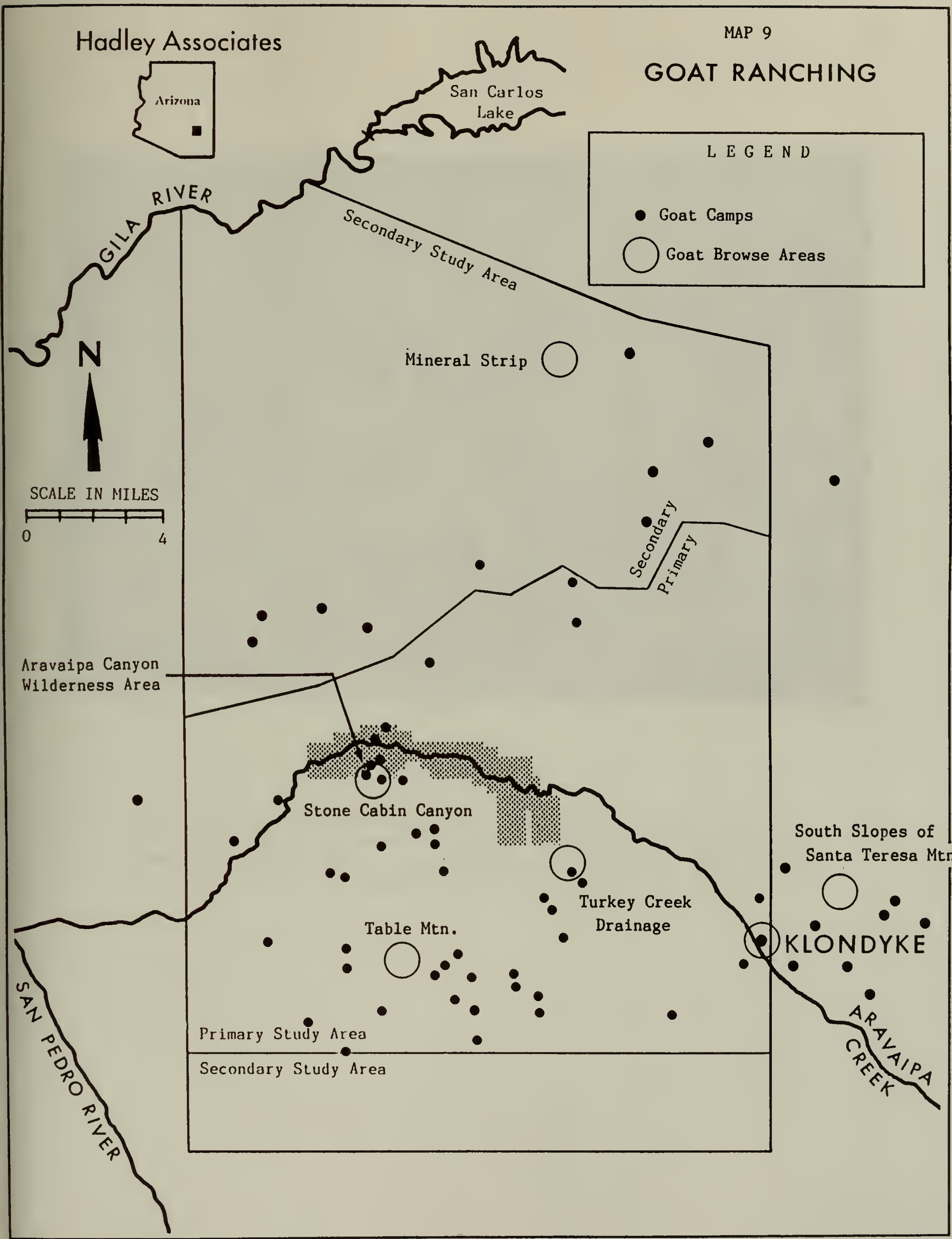
They were frequently the only residents of remote, mountainous areas like Holy Joe Peak or Table Mountain, which were prime habitat for predators. It was common practice for herders to carry strychnine with them and to lace any predator-killed carcasses they encountered with the poison. Herders also shot coyotes and bobcats whenever they saw them. After goat herding declined, human presence in many of the former goat camps was only occasional. Predators, particularly bobcats and coyotes, increased substantially after the removal of goats (F. Upshaw 1990).

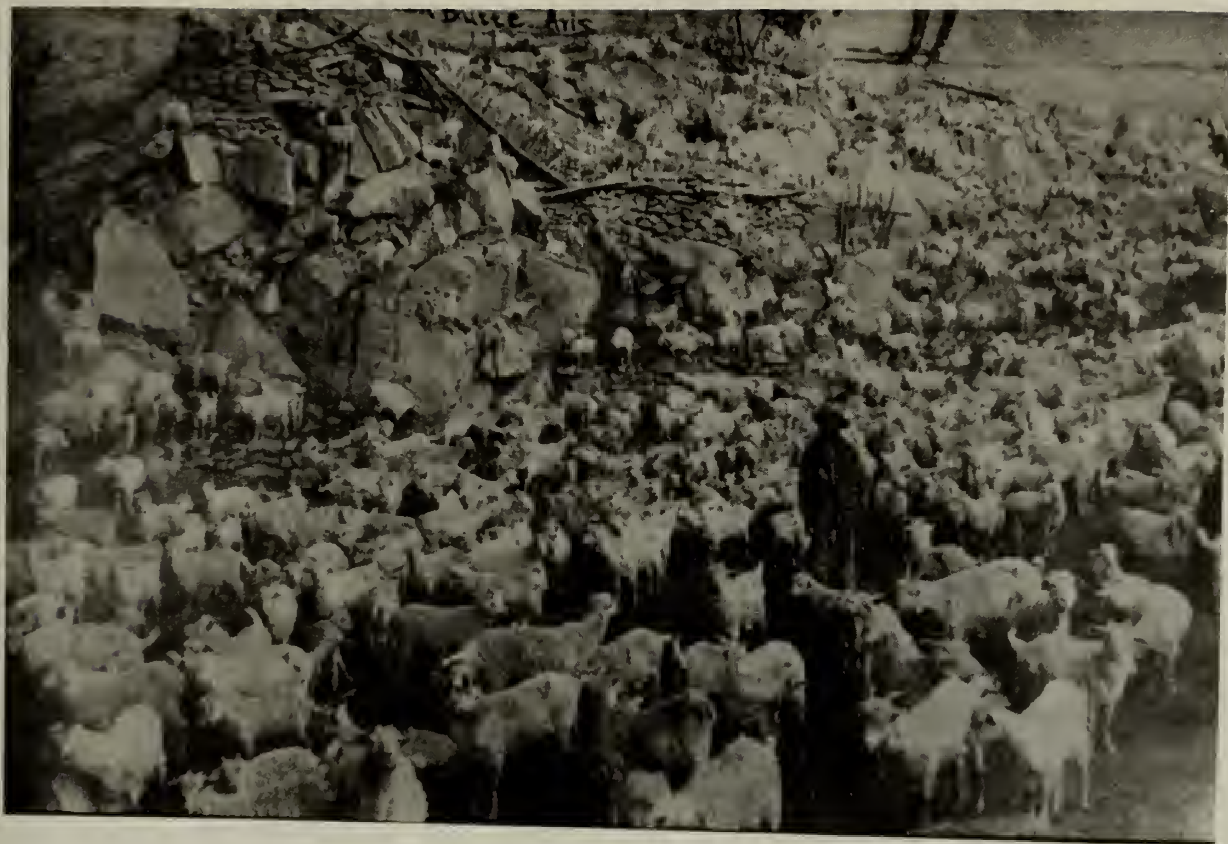
Residents and former residents of Aravaipa have speculated on a number of potential impacts. Although filaree was intentionally introduced at approximately the time that goats arrived in Aravaipa, goats may have contributed to its spread by carrying seeds in their hair. Filaree has declined since goat removal. There has been considerable speculation on the impact of goats on heavily overgrazed areas of Aravaipa, particularly on the west end of the canyon, in the area near the confluence with the San Pedro and on the tablelands north of Aravaipa Creek. Goats may be responsible for denuding certain portions of these areas and for the disappearance of the original grasses. Goats may have influenced the distribution and abundance of deer, bighorn sheep, and javelina through competition for feed, since feed plants in the diets of these species overlap with those of goats. In addition, goats may have had a major influence on bighorn sheep populations through displacement from their kidding and sheltering areas, and through the introduction of inter-species contagious diseases. These issues are further discussed in Chapters X and XII.

TABLE VII.A
MOHAIR PRODUCTION AND VALUE: Arizona, 1909-1944*

YEAR	GOATS CLIPPED	AVERAGE PRICE PER POUND
	Thou Head	Cts
1909	116	20
1910	116	23
1911	120	26
1912	124	26
1913	128	25
1914	132	23
1915	136	26
1916	144	38
1917	148	37
1918	148	49
1919	148	44
1920	145	21
1921	145	17
1922	152	35
1923	160	39
1924	165	50
1925	162	42
1926	165	46
1927	185	51
1928	190	45
1929	200	40
1930	225	25
1931	250	17
1932	237	8
1933	211	28
1934	203	18
1935	217	48
1936	217	40
1937	219	40
1938	213	32
1939	218	43
1940	220	45
1941	212	54
1942	210	48
1943	201	55
1944	164	57

*from *Arizona Agricultural Statistics* (1867-1965)
Arizona Crop and Livestock Reporting Service


Hadley Associates
Arizona
MAP 9
GOAT RANCHING
San Carlos Lake
LEGEND
Goat Camps
Goat Browse Areas
GILA RIVER
Secondary Study Area
Mineral Strip
N
SCALE IN MILES
0
4
Secondary
Primary
Aravaipa Canyon Wilderness Area
Stone Cabin Canyon
South Slopes of Santa Teresa Mtns.
Turkey Creek Drainage
Table Mtn.
KLONDYKE
Primary Study Area
Secondary Study Area
SAN PEDRO RIVER
ARAVAIPA CREEK



W. H. Allbritton's Goat Pens, near Black Butte, prior to 1904. Note the goats are recently sheared. Allbritton used a typical combination of stone and post fences to contain his goats in the side of a bluff. (Graham County Historical Society, Safford)

VIII

FARMING

OVERVIEW

Prior to the arrival of Euroamericans, Amerindians farmed in the vicinity of Aravaipa. Documentary evidence indicates that Upper Pimans (Sobaipuris) may have occupied Aravaipa Creek during the sixteenth and seventeenth centuries. It is possible that they farmed in Aravaipa. After Sobaipuri removal from the upper San Pedro Valley and Apache occupation of the Aravaipa area, Apaches practiced casual irrigated farming along Aravaipa Creek. William Bell, visiting the canyon in 1867, estimated that the "Valley of the Aravaipa contained 5,000 cultivatable acres" (Bell 1869: 80). Actual farming attained a far smaller scale. Euroamerican farming began during the late 1870s. Settlers practiced subsistence farming on small plots and a limited amount of commercial hay and fruit farming along Aravaipa Creek. Farming below the emergence point relied on diversions from the creek and was limited in scale by the narrow flood plain. Above the emergence point, the flood plain is much wider, allowing for larger farms. Water was obtained from shallow hand-dug wells and windmills or centrifugal pumps. During the late 1940s and early 1950s, these farmers expanded their operations with deeper wells and diesel pumps.

Irrigated farming has been practiced on Aravaipa Creek for 110 years, and casual, intermittent farming has been practiced for approximately 300 years. In Aravaipa, the impacts of the recent farming greatly outweigh the impacts of prehistoric and protohistoric Amerindian farming. Irrigated farming from deep wells has been intensive only since the 1950s. Farming has had significant environmental impact on the area, particularly on Aravaipa Creek. The impacts are discussed in Chapter XII in the "Aravaipa Bottomlands" vignette and will not be repeated in this chapter.

AMERINDIAN FARMING

Sobaipuri Farming

Juan Mateo Manje's description of his trip along the San Pedro River with Father Kino in 1697 indicates that Sobaipuris may have inhabited two auxiliary villages on Aravaipa Creek. Manje stated explicitly that the villages of Tubo and Busac were located above the large San Pedro village of Ojío, on a tributary "which flows from the east," a few leagues south of the Gila (Manje 1954: 83). His description fits the confluence of the Aravaipa and the San Pedro. He noted that Sobaipuris from these two upstream villages travelled to Ojío to greet Father Kino, indicating that they lived on the tributary some distance from the San Pedro. If the Sobaipuris from these auxiliary villages farmed, it is likely that they would have employed agricultural techniques similar to those at Ojío on a smaller scale.

Archaeologists agree that at some time during the protohistoric period, the Sobaipuris settled along permanent rivers where they practiced irrigated agriculture, depending on it for a portion of their subsistence (Doelle 1975; DiPeso 1953: 9; Bronitzky 1986: 233-34). The degree to which the Sobaipuris relied on agriculture, the approximate date at which irrigation was first employed, and the degree of Spanish influence in the expansion of Sobaipuri irrigation and crops are all matters of debate (Bronitzky 1986). Manje related that when Kino's party arrived at the villages on the lower San Pedro, the Spaniards found the Sobaipuris at Arivavia and Ojío practicing advanced agricultural technology with extensive irrigated fields of corn, beans, melons, pumpkins, and cotton. The agricultural abundance allowed the Sobaipuris to load down the Spaniards with more beans than they could carry away. Manje admired the Sobaipuri's high quality cotton garments. The Sobaipuris constructed reed and mat houses for their guests, indicating the presence of a marsh or cienega nearby (Manje 1954: 81-83). Manje's portrayal of the valley at that time gives the impression of a people living with a well developed agricultural technology in a state of comfort, if not abundance. Accounts of the Gila Pimas from the historic period reinforce the theory that the Sobaipuris depended considerably on irrigated agriculture. During the historic period, Pimas practiced irrigated agriculture in the rich Gila valley soil. Periodically renewed by deposits of silt from floods, crop rotation was unnecessary. They employed very large irrigation canals, flooding their fields repeatedly to wash out any deposits of alkali or silt which built up. Canals were dug with digging sticks, shovels and wooden hoes (Russell 1974: 86-88; Carstetter and Bell 1942).

Apache Farming

Apaches moved into the Aravaipa area some time after the Sobaipuri relocation of 1763 and farmed intermittently along the banks of Aravaipa Creek from the headwaters to the confluence with the San Pedro. Two anthropologists, Grenville Goodwin and Winfred Buskirk, assembled data describing traditional Apache agriculture. During the late 1930s Grenville Goodwin (1942: 27) recorded the oral history of the Aravaipa band. His elderly informants stated that their ancestors had come to Aravaipa from the north after they had used up most of the mescal (agave) in their former home. They moved several times, first to Wheat Fields, then to the Pinal Mountains. Finally, the band which came to be known as the Aravaipas selected three major farming sites which were also their main places of residence: Dick Springs Canyon on the Gila, the mouth of Aravaipa Creek, and *Tsé nan te lé* (Broad Slanting Rock) near Klondyke, which was their largest farming area. Goodwin speculated that this must have occurred during the middle of the eighteenth century about the time that the Sobaipuris gave up their settlements on the San Pedro (Goodwin 1942: 27-30).

Winfred Buskirk, who interviewed numerous Western Apache informants while doing his fieldwork in 1949, offered more detail on the techniques of Apache farming. Buskirk maintained that Apaches had practiced agriculture since at least 1750. According to Apache oral traditions, their people acquired corn from both friends and enemies, including Hopi, Zuni, Pima and Mexicans. Corn was the most important crop and, along with pumpkins, had the longest history of cultivation. Beans were a more recent addition. Although informants usually rated meat as more important in their diet than corn, opinions varied on the relative importance of corn and wild plants, probably reflecting individual experiences. Buskirk's informants indicated that "chiefs, rich men, or big men" were usually the "owners" of farmland. They further stated that contact with Angloamericans had not increased their reliance on farming, that conversely, during the period of conflict with the United States Army, agricultural activity declined (Buskirk 1986: 108-112).

Apaches had a clear farming cycle and employed a standard set of customary procedures and techniques. In March or April, Apache farmers returned to their fields, having hunted during the winter. They waited for the flowering of wild plants or the budding of certain trees as an indicator of planting time (Buskirk 1986: 26). They built small dams across dry arroyos before the rains started in order to catch water and divert it into their fields. On flowing streams, they constructed dykes and ditches to divert creek flow or runoff after rains (Buskirk 1986: 46). Apaches cleared fields with fire, burning brush and grass. They used digging sticks to pry roots and brush out of the ground but left the large trees standing. Similarly, they removed small stones from the fields but left large ones in place and planted around them.

Planting took place after the fields had been prepared. The majority of Apache farmers preferred blue corn, and the selection of "leader" seed was done ceremonially at harvest time. Corn fields were soaked before planting. On dry farms, they waited to plant until a heavy rain had soaked the ground. Several individuals cooperated to plant a field in a single day, placing six or more seeds in each hill, with hills sometimes arranged in regular rows. Apaches frequently planted corn, beans, and pumpkins in the same fields and harvested them together. Watermelons were planted in a separate field. Gourds were cultivated for vessels. Cotton was planted only sporadically. Apache farmers never used animal manures, holding them to be repugnant and harmful. Under this system of agriculture, the crop required little attention, and once the field had been planted, farmers were relatively free to leave the area. Fencing did not begin until after the introduction of the horse (Buskirk 1986: 60). Harvesting took place during August and September, after which the farmers pit-baked and dried the green ears for storage. They cleared the fields and burned the cornstalks on the edges of fields, but did not scatter ashes on the fields (Buskirk 1986: 25, 60, 66-77).

Apaches additionally semi-cultivated several crops, encouraging their independent growth in likely places convenient to their camps. They encouraged the growth of devil's claw, highly valued for basket making, by gathering wild seeds and throwing them into sandy places along nearby stream banks or washes. In some areas, large single-headed sunflowers were marginally cultivated. Tobacco was a valued commodity, often used in prayer, but it was not formally cultivated. Apaches gathered wild tobacco and sometimes planted wild tobacco seeds in plots that had been burned over (Buskirk 1986: 97).

Bell (1869) observed and Goodwin (1942) was told of Apache farming sites on the Aravaipa. Although the exact location of *Tsé nan te lé* is not known, it may be above Chimney Rock on the east end of Aravaipa Creek. In 1830, Capitan Antonio Comadurán surprised unaware Apache farmers burning their fields, in a location which was probably near the emergence point of Aravaipa Creek (Dobyns 1981). In 1857, Engineer N. H. Hutton noted that for a distance of five miles the area above the box "has been and now is cultivated by Indians, for a width of one-half or three-quarters of a mile along the stream; their ascequias and corn fields being visible at the time of exploration" (Hutton 1859:88). Ten years later in 1867, William Bell observed Apache irrigation ditches and fields below the headwaters above the Aravaipa box. "These Apaches had carried on agriculture to some extent in the cañon, for we passed the remains of a few small irrigating canals in places where the space between the walls left a sufficient extent of bottom-land for such a purpose" (Bell 1869: 68). Although to Bell the irrigation ditches appeared abandoned, from the above description of Apache agricultural techniques, it is entirely possible that the fields were still in use at the time of his visit.

Modern Apache Agriculture

When the families of Capitan Chiquito Bullis returned to Aravaipa during the late 1880s, Apache agriculture resumed in the canyon. During their approximate ten year residence on the San Carlos Reservation, the Apache had learned Euroamerican agricultural techniques and had abandoned traditional methods. Heavily influenced by reservation practices, Apache farmers began to employ plows and modern irrigation methods and added European grains and crops to their traditional foods. Agricultural products assumed a greater importance in the diet than gathered wild foods, which probably constituted only a small portion of the Apache diet after 1900. Both Eskiminzin on the San Pedro, and Chiquito Bullis on the Aravaipa, experienced considerable success with small-scale commercial agriculture. Newspapers reported their farms with a tone of both curiosity and pride. During the 1880s, Eskiminzin was able to sell large quantities of corn, pumpkins, and grain. In 1888, when angry white settlers came to harass Eskiminzin, newspapers reported that they took 513 sacks of corn, wheat and barley, destroyed 523 pumpkins and scattered thirty-two head of cattle (*Tucson Citizen*, 1888), indicating that Eskiminzin's farm was quite productive. Chiquito Bullis, an equally successful farmer, was particularly well known for his fruit orchard. Like Eskiminzin, his tenure as a farmer was interrupted during 1890, when territorial officials searched for him in connection with depredations by the Apache Kid (*ABT* 9/15/1890).

Informants reported that Capitan Chiquito Bullis farmed on his allotment land until his death during the 1920s. The former Aravaipa leader developed an extensive system of irrigation ditches, with diversions from the creek. He irrigated several acres of fruit trees, mostly peaches and figs, and had large fields of corn, beans, pumpkins, melons, and vegetables. He grew a small amount of alfalfa as well. An enormous fig tree, quite famous in the area, was located above his farm on the trail toward Table Mountain. Capitan Chiquito raised horses, which he mainly used for his wagons, and kept few head of cattle. His wives reportedly hauled the produce, particularly fruit, into Mammoth and other nearby towns for sale. In order to reserve the better bottom land for farming, each of Capitan Chiquito's six wives erected her own "Apache style" house on the ridge above the creek. After his death, several descendants continued to farm on the Aravaipa until the early 1930s when they moved to San Carlos (W. Johnson 1990; L. Bullis 1990).

EAST END FARMING: 1880 to 1920

This discussion of Euroamerican farming will begin with farms located on the extreme eastern end of the study area and will follow Aravaipa Valley and Creek downstream.

Almost all the early settlers planted at least a "house" garden and a few fruit trees as soon as they arrived, and many had small farms. In the selection of homesites, adequate water was a prime factor, and whenever possible, homesteaders selected a location next to a permanent spring or on Aravaipa Creek. The three earliest ranchers on the east end of Aravaipa, Dan Ming, Welford Bridwell and Burt Dunlap, had farms to supplement their cattle operations. They planted both vegetables and feed crops. "Colonel" Bridwell, who selected his ranch site because of the existence of "Garden Spring," planted an orchard and an extensive vegetable garden. After his retirement from the military, his army friends vacationed at "the Bridwell Place," and the former scout supplied them with fruit and vegetables. Burt Dunlap put in an extensive irrigated farm. Both Bridwell and Dunlap farmed above the emergence point, using water from springs or from wells with windmills which were later replaced by gasoline motors.

Shortly after 1900 several more farms were put into cultivation. Gregory Haby planted an orchard of several acres. Members of the Wootan family had a small farm. Dan Roten cleared approximately sixteen acres of farmland, which was later enlarged by the Mattice family (W. Mattice 1990). José Rubal dry-farmed approximately ten acres of beans across from the Chambers Store near the Grand Reef road. He had no spring or irrigation system on his land since he was located above the headwaters. However, when Aravaipa Creek was running above the emergence point, he turned water into his fields. He frequently waited to plant until after he had soaked his fields (J. Rubal 1990). With the exception of the Rubal farm, all of these farms were operated by individuals whose main livelihood came from cattle or goat ranching. The farms were not primary economic enterprises. Ranchers grew limited amounts of supplemental feed crops, including alfalfa and barley, for consumption by their livestock, although some feed crops were sold to outside ranches.

Farther downstream, below the emergence point of Aravaipa Creek, Dan Ming had forty-five acres under irrigated cultivation at his ranch during the 1880s (Ming file, AHS). Ming had a contract to supply hay to the army at Fort Thomas as early as 1881, although it is not clear whether he supplied wild or domestic hay. He also planted an extensive orchard against the bluff behind his homestead, where one of his fig trees still stands today (1990), near the ruins of his house.

A dozen or more homesteaders and squatters settled on the banks of Aravaipa Creek, mostly below Ming's ranch headquarters. Many had emigrated before 1900 from farming valleys in Sonora, similar to Aravaipa. Most of these settlers were familiar with traditional Mexican irrigated floodplain agriculture and were accomplished farmers. The majority of them were able to supply most of the food needs of their large families. Early farmers in the canyon included Epimenio Salazar, Laureano Moraga, Rube Wootan, Juan Martínez, the Munozes, the Vindiolas, the Quintanas, and the Quijadas. Farms averaged between three and five acres. All depended entirely on irrigation from the creek, and wells supplied domestic water only. As needed, farmers constructed small temporary dams across the creek and turned water into their irrigation ditches, flooding their fields. Several settlers had larger farms which produced excess for sale. Epimenio Salazar, Laureano Moraga, and Juan Martínez grew crops on five acres or more. They raised corn and beans for sale to local ranchers and miners, and sold excess fruit as well. Through the 1920s, farmers took wagon loads of produce to Safford and Willcox for sale. They occasionally took produce in wagons to Winkelman and Mammoth, passing through the canyon to the west end (V. Tapia 1989).

Clearing the land was the most difficult task in the early farming operation. Crews of laborers cut out the trees and pulled stumps with a stump-puller attached to a team. The land was then leveled with a horse-drawn fresno. Subsequent generations of farmers complained that fields from these earliest farms had not been well leveled, and required releveling with modern equipment and the construction of larger berms. Both the Bridwell and Dunlap farms were situated in former mesquite bosques, which required extensive clearing. The Bridwell homestead had one of the oldest and largest mesquite bosques on Aravaipa Creek, where selective mesquite cutting is still practiced today (1990). Later residents of the Bridwell Place noted the presence of "enormous" mesquite stumps in the fields, left when Bridwell cut the trees but failed to pull the stumps. Bridwell, like traditional Apache farmers, evidently farmed around the stumps (H. Claridge 1990; W. Mattice 1990).

On the east end of Aravaipa, few of the farms had enough acreage to be classified as commercial ventures. The Dunlap, Bridwell and Ming ranches were the only ranches which had substantial irrigated pastures before 1900. The following estimate of cultivated acreage relies largely on secondhand oral information, since no farming records for the period prior to 1920 have been uncovered. The farm on the Bridwell place was approximately twenty-five to thirty acres. Burt Dunlap may have had up to forty acres, the Gregory Haby orchard was approximately ten acres, and the Roten farm was approximately sixteen acres. Below the emergence point, Dan Ming had the largest farm, with forty-five acres under cultivation (Ming file AHS). Epimenio Salazar had the largest subsistence farm, with approximately five to ten acres under cultivation at different times. The acreage of all other subsistence farmers may have totaled twenty to thirty acres. During the period preceding the introduction of modern earth-moving machinery, total east-end farm acreage was probably about 150 acres.

During and after World War I, several cooperative marketing organizations were formed in Graham County. The Gila Valley Farmers' Exchange, based on England's Rochdale plan, the Farmers' Improvement Association, and the American Farm Bureau Federation all organized in the Gila Valley and statewide (*GG* 2/2/1918, 1/28/1921). However, with ready markets in the local area, few Aravaipa farmers found a need for these organizations.

EAST END FARMING BETWEEN 1920 AND 1950

Above the headwaters of Aravaipa Creek several farms expanded production. The Mattices increased Dan Roten's sixteen acre farm on the north side of the creek when they took over his property during the early 1930s. They cleared an additional twenty to twenty-five acres on the south side of the creek, removing mostly small mesquites. They dug a well forty feet deep and installed a ten-inch pump which pumped 1,000 gallons a minute, leveled, put in berms, and succeeded in getting two tons of alfalfa to the acre in four or five cuttings a year (W. Mattice 1990). Quite a few years later, at the former Burt Dunlap/Henry Dowdle Ranch, Mae Dowdle Davidson cleared thirty to forty acres of farm land on the north side of the creek, removing huge cottonwoods by means of chains and cables attached to bulldozers. The farm was planted with permanent pasture of rye, fescue, and Sudan grass (W. Mattice 1990). On the Haby Ranch, Carl Bott expanded the farm to a total of thirty to forty acres.

During the 1920s and 1930s, approximately 100 acres were under cultivation in the canyon below the emergence point. The Valenzuela sisters and their children farmed across the creek from Mae Davidson's place. They had a well with a centrifugal pump and raised corn and other crops on five to ten acres. Below them, Sam Turner had a ten- to fifteen-acre orchard near the second Aravaipa School. The Neisighs had a three-acre apple and peach orchard, later taken over by Clay Turnbull, with additional irrigated pasture planted in feed crops. The McNairs farmed the largest amount of land with approximately fifty acres under cultivation in separate plots along the creek. The Claridges had another forty acres planted in feed crops. Epimenio Salazar's farm, still the most substantial of the homestead farms, was increased to about ten acres, adding feed crops to the vegetables and fruit. By the late 1920s, a one-ton Ford truck had replaced the wagon, and Salazar made weekly trips into Willcox and Safford to deliver produce to local grocery stores. His apples were particularly well known and received considerable notice in the "Aravaipa News" section of the Safford newspaper (*GG* 9/18/25). Rube Wootan farmed approximately five or six acres across from Bear Canyon at the former "Santa Cruz place." The Scarboroughs also had a small farm during the 1920s (B. Salazar 1990; C. McNair 1990; C. Turnbull 1990). Pete Gonzalez, Epimenio Salazar's son-in-law, had a three-acre farm. Andrés Vasquez (and later at the same place the Quijada and Sanchez families) farmed approximately three acres. Jesus Vindiola farmed three acres, and Manuel Quintana farmed another two to three acres.

Phil McNair, who bought the headquarters portion of the T-Rail Ranch (Dan Ming's original homestead) in 1929, continued to farm the forty-plus acres which had previously been under cultivation. The McNairs raised corn and alfalfa, using some on their ranch and selling the rest locally. They got five cuttings and one clipping a year, cutting every three to four weeks from May to October. The McNairs cleared additional land, including a sixteen-acre field and an eighteen-acre field below the headquarters. They cultivated a twenty-acre "bermuda patch" and four or five additional acres at Rube Wootan's former place. Clearing the new farmland required the removal of *batamote*, small mesquites, small black walnuts and ashes. They did not remove any large trees. All of the new farm plots were irrigated from the creek and were planted in bermuda grass and burr clover (C. McNair 1990).

In the east end of Aravaipa, the creek has approximately a fifty-foot fall per mile, creating a fast flow of water. To irrigate, farmers built temporary sand dams diverting all or a portion of the creek water into their irrigation ditches. Each ditch had a wooden headgate approximately three-by-six feet in size, which was opened as soon as the water was diverted. If the entire creek was diverted the water ran quickly through the irrigation ditches, at the speed of a person walking. After the entire system of fields had been flooded, the runoff water went back into the creek. In June it was necessary to water every week to get a cutting every three to four weeks. When the summer rains began, less irrigation was required. All the creek water could be shut off at the McNair Ranch, but the McNairs' usual procedure was to divert only a portion of the creek. They frequently had as many as seven small streams of water running all the time. The irrigation system required only a few berms within each field, and once in place, the system required little maintenance. The McNair's irrigation system remained in place until an exceptional summer downpour in Klondyke in 1963 washed out all the berms and ditches (C. McNair 1990).

Cutting and baling the hay required the work of six or seven men, using a horse-drawn baler. The team cut the hay, raked it into windrows, stacked it and loaded it onto wagons to take to the baler. Three men worked at the baler: one fed the hay, another punched it into the machine, and a third man tied it. Two more men drove the wagons, while another threw the hay from the wagon into the feeder. Until the end of the 1930s, daily wages for farm workers averaged $1.50 to $2.00. However, some of the local hay-makers preferred to work for hay rather than wages. Through the 1950s, the McNairs sold hay to other local ranchers (Sanfords and Dowdles) for $7.50 to $10.00 a ton. The McNairs purchased their first automatic baler in 1949. The automatic baler reduced the work force from eight to four and increased output by 100 to 200 bales per day (C. McNair 1990).

A short distance east of the McNair farm, the Claridge brothers farmed a slightly larger area. The Claridges purchased their farm from the Kennedys (MK Ranch) during the early 1920s, adding ten acres to the twenty acres which were already under cultivation. George Claridge removed the orchard which had been planted by Ming and Jones, since the trees were in bad condition. The Claridge fields required more irrigation than those of the McNairs, and the Claridges diverted the entire creek for three days and nights (W. Claridge 1990). They planted mainly alfalfa and other grain crops; their cattle consumed all of the hay they raised, and the Claridges did not sell any of it locally (C. McNair 1990).

A limited amount of sharecropping was practiced in Aravaipa. During the early period, the Moragas, the Vindiolas, the Garcías, and the Quintanas all farmed for the McNairs for half of the crop. Lee Rhea started working on shares for the McNairs in 1936. The McNairs furnished the land and equipment and Rhea planted the alfalfa and corn for half the crop. During the early 1930s, Dillard Rutledge raised four or five acres of cotton on shares on the McNair farms. The cotton had to be hauled to Safford for ginning and proved to be unprofitable. Lyle Sanchez raised cotton on the Claridge farm above the emergence point during the 1950s, also on a share basis.

The Vindiola family raised alfalfa for the McNairs during the early 1930s. They had one of the largest farms operated on a share basis. After arriving in Aravaipa in 1908 or 1909, Jesus Vindiola of Imuris, Sonora moved into a house across from the T-Rail and married Teresa Martínez, whose parents, Juan and Lola Martínez, were among the earliest residents of Aravaipa. He farmed a plot of land on a share basis for the T-Rail, leasing approximately twenty acres which he planted with alfalfa, and paying for the lease land with half of the hay crop. The Vindiolas cut alfalfa every month for six months. With help from his sons, he baled the alfalfa with a horse-powered baler at the rate of six to seven tons per day. In addition, Vindiola had a number of acres planted in corn and garden vegetables. He sold chili, corn, and squash locally and some hay to the Dowdles, the Eureka Ranch, the Kennedys and to the ranchers at Four Mile Canyon. With the corn, Vindiola raised between forty and fifty hogs a year which he butchered and delivered to meat markets in Safford and Willcox. The butchering took place early in the morning. In the absence of refrigerator trucks, the carcasses were wrapped in tarps and delivered as quickly as possible. Vindiola raised his hogs in a one-acre pen enclosed with hog wire; they were not allowed to run free to prevent damage to his corn fields (N. Vindiola and J. Vindiola 1990).

Two other small areas were under cultivation in the east end some distance away from Aravaipa Creek. Several miles south of the Klondyke road on Four Mile Canyon, a small area of three acres had been planted in feed crops since the 1920s. The fields were developed by members of the Allaire family who operated a ranch from headquarters in Four Mile Canyon. In later years, members of the Lackner family expanded the acreage in feed crops considerably. Water came from the spring in Four Mile Canyon (E. Lackner 1989). In Turkey Creek, above the confluence with Oak Grove Canyon, early settlers had planted an orchard and small gardens. The cultivated acreage was probably not much more than an acre. Water was obtained from Turkey Creek and from Oak Grove Canyon. Members of the Brown family and the Allbritton family probably developed the first gardens and orchards at the site, and in later years Bland Beauchamp expanded the farmed area (C. Turnbull 1990).

EAST END FARMING: 1950 to 1970

Above the emergence point of Aravaipa Creek, where the flood plain is wide, farming technology played an important role in east end Aravaipa farming. The availability of technology largely determined the extent of farming in this portion of Aravaipa. With each new technological advance, the quantity of acreage under cultivation expanded. From the earliest period, many farms had hand-dug wells with windmills. By 1910, many of these had been replaced by centrifugal pumps run by gasoline motors. Some of the centrifugal pumps had substantial pulling power but technology still limited the acreage farmed. During the early 1940s, the availability of tractors and bulldozers brought about a radical alteration in Aravaipa farming, allowing farmers to expand the amount of land under cultivation. Fast, efficient clearing was a major component of expansion. It also changed the structure of farms, allowing for larger, permanent dikes and bank protection, stream channel straightening, and the rapid clearing of many more acres. The advent of the bulldozer and large modern pumps probably affected land change and the extent of farming in Aravaipa more than any other factor.

During the 1950s, above the headwaters, farmers drilled several big wells along the creek. After the Weathersbys sold their goats in 1951, they purchased a TD-9 International Harvester Crawler. The Weathersbys had not done much land clearing before 1950, but with the new bulldozer Neuel Weathersby was able to clear 100 acres in several weeks, knocking down a number of large mesquites. Some of the second-growth mesquites which had been cut or trimmed at a previous time were particularly difficult to remove. The additions to the Weathersby farm brought their land in cultivation up to 165 acres (N. Weathersby 1990). Two wells drilled near the creek bed during the 1950s were approximately 150 feet deep, although drillers reached water at eighty-five feet. The two wells pulled 1,260 and 1,245 gallons a minute (respectively) and were left running on a year-long basis. The Weathersbys raised alfalfa, beardless barley, milo maize, sudex, and several acres of permanent pasture. The Weathersby farm had an average production of 350 to 400 tons of hay a year and eighty tons of grain (N. Weathersby 1990). Standard amounts of fertilizers for the period were used on the fields.

At approximately the same time, Walt Buhl expanded the cultivated acres on the former Oscar Blair farm from twenty to 100 acres. Mae Davidson expanded her farm to approximately 100 acres, and Frederico Sanchez operated a farm of twenty to twenty-five acres. The other cultivated fields which had been put in at an earlier time continued to be farmed. The expansions brought the total acreage above the headwaters to approximately 230 acres. Above the emergence point, between seven and nine pumps were in operation, two on the Weathersby farm, two on Mae Davidson's farm, one on the Mattice place, two on the Haby Ranch operated by Carl Bott, one on Rattlesnake Canyon, and one near Aravaipa Creek (N. Weathersby 1990).

WEST END FARMS: 1880 to 1970

The U.S. Army developed the earliest Euroamerican farms on the west end of Aravaipa. When farming proved unsuccessful in the marshy area immediately surrounding Camp Grant, farms belonging to Joe Felmer and Israel and Kennedy, who farmed a few miles downstream on the San Pedro, supplied the fort (Bourke 1971: 15-27). Shortly after 1880, settlers began clearing land and planting crops below the Aravaipa box. No records describing the clearing procedures or types of vegetation removed have been uncovered for these earliest farms. However, it can be assumed that the creek banks contained vegetation not unlike that on the creek banks in upper Aravaipa. Beginning in the 1880s, west end settlers operated "truck" farms producing fruit, vegetables and citrus, rather than feed crops for cattle. Irrigated farming was practiced in a manner similar to upper Aravaipa, with diversion dams constructed in the creek, complete flooding of fields, and return of excess water to the creek. The climate on the west end was well suited to citrus, and the orchards in Aravaipa produced well. Pinal County newspapers proudly announced the appearance of each new crop from Aravaipa orchards. Farmers hauled fruit into Winkelman, Mammoth, and Oracle in wagons. Wholesale buyers sometimes came from Tucson, and Aravaipa orchards supplied many of the greengrocers there. Figs were an important item in Aravaipa, and one fig tree on James Brandenburg's homestead was reported in *Ripley's Records* as being the largest in the world (C. Wood 1990, M. Buzan 1990).

During the 1880s, the largest farms on Aravaipa's west end included those of Alexander Vail, Emil Kielburg and James Brandenburg. Alexander Vail is reputed to have had the first farm on the lower Aravaipa (1880). His farm is now part of the Trail's End Ranch and is still the west end farm farthest upstream from the confluence. Vail was well known for the introduction of new types of grapes and for his citrus orchard. He sold fruit in Mammoth and Winkelman from his wagon. Vail, whose large house was made from logs twenty feet long and four or five feet around, protected his fields with a rock retaining wall constructed with stones which weighed 800 to 2,000 pounds. Vail who supposedly did all of this heavy construction work alone, used a water wheel connected to one of his irrigation ditches to power the saw and a hoist to put the rocks in place. An elderly bachelor and something of a hermit, Vail was murdered shortly after 1900. He left his property to his neighbors, the Chauncey Buzan family, who continued farming on the site. The Buzans constructed a larger house incorporating the old Vail home, but after floods entered house and fields frequently, later owners moved to higher ground (M. Buzan 1990; C. Wood 1990; Aravaipa file AHS).

During the 1880s, Emil Kielburg planted a large orchard which contained 1,000 peach trees in addition to apple, apricot, quince and pear trees, and a half-acre of blackberries (*ABT* 4/25/08). His neighbor, James Brandenburg, also settled in Aravaipa during the mid-1880s. Originally from Arkansas, Brandenburg came to Arizona from California in 1878 and worked in the freighting business for several years before settling in Aravaipa. Brandenburg had two homesteads, both on Aravaipa Creek. He planted 1,300 fruit trees and constructed an eight-room two-story stone house, which was washed away in a flood in 1941. Brandenburg was primarily a farmer, although he did have a few cattle and over 150 head of hogs which he allowed to run loose, much to his neighbor's distress (Callie Borden Brandenburg file, AHS; C. Wood 1990; F. Wood 1989).

Shortly after 1900, the Mendozas and Ortegas established substantial farms and fruit orchards. The Buzans expanded the Vail farm and orchard. The Buzans used irrigation water from the creek exclusively. The irrigation ditches had to be cleaned three or four times each summer. For bank stabilization along the creek, they planted willows, cottonwoods, and box elder, placing cuttings in the ground during the spring. All the farming was done by horse-drawn plow. A major problem for the Buzans was keeping their neighbors' livestock out of the fields. During the drought of the 1930s, goats and cattle were "starving to death and would just hang around the fences of the farm" (M. Buzan 1990).

By the first decade of the twentieth century, lower Aravaipa had twenty families, most of whom were active farmers. Newspapers advertised the area as an ideal, inexpensive summer resort. "Fruit, vegetables, butter, milk, eggs and chickens can be bought from the ranchers at small cost..." Peaches sold for two cents a pound, blackberries for four. Only twenty-two miles from the railroad, travelers could continue up the canyon on an excellent wagon road to within five miles of the "end of the canyon" (*Arizona Blade and Florence Tribune* 4/25/08). In 1909, a typical Aravaipa fruit ranch was advertised for sale. It contained 117 acres of patented land with forty acres in cultivation and twenty-five more ready for cultivation, all under wire fence. The farm had a five-room "modern" house and one good adobe; 1,500 bearing trees including oranges, apples, apricots, peaches, pears, plums and figs; and several acres in grapes. In 1908, the farm had sold $1,500 worth of fruit. The asking price for the farm was $1,000 (*Arizona Blade Tribune* 5/8/09).

By the 1920s, Aravaipa fruit was well known. Prizes at the Pinal County Fair in 1924 almost all went to Aravaipa growers. The list of fruits and vegetables indicated that Aravaipa farmers were growing a large variety. Prize-winning fruit came from the Brandenburg, McClure, Buzan, White, and Baker farms (*ABT* 12/15/24). In 1927, the Aravaipa district received official recognition as a leading "citrus belt" (*ABT* 11/12/27). In 1929, Aravaipa sent ninety entries to the state fair and won many blue ribbons (*ABT* 11/18/29).

During the early decades of farming in Aravaipa, newspapers and agricultural specialists recommended grafting English walnut stock to black walnut stumps. The procedure was practiced with some success in the lower Aravaipa. Local farmer Roy McClure instructed other local farmers in tree grafting. During the early spring, farmers removed the trunks of small black walnuts approximately two feet above the ground, leaving a hollow cone of outer bark. The English walnut splice, with bark removed at the bottom, was inserted into the hollow space on the black walnut stump, and the graft was wrapped tightly with cloth and beeswax. The graft was usually successful as long as an air-tight seal was made at the splice point (C. Wood 1990). A number of west end farmers made successful walnut grafts.

West end farmers lobbied for better roads and for the inclusion of "a proper water clause" in the Arizona state constitution. They wanted to safeguard priority water rights and to establish a permanent water preemption after irrigation diversion had been established (*ABT* 7/9/10). After a few years of public pressure, the Arizona Public Water Law of 1919 recognized priority rights based on continuous beneficial use.

Like their neighbors upstream, lower Aravaipa farmers produced large quantities of value-added products from their corn during Prohibition. In addition to *mula blanca*, higher quality fruit brandies were made by lower Aravaipa farmers, and the production of apple, plum, and peach brandy was not discontinued after Prohibition ended. A number of west-end moonshiners were caught by county agents. However, as with their neighbors upstream, sentences were minimal, and little social censure accompanied the arrests (C. Wood 1990).

Several of the local ranchers, including the Woods, the Buzans and later the Fliegers raised feed crops associated with their ranch operation. However, because of the structure of the canyon on the west end, with its narrower flood plain and steeper-sided canyon walls, feed-crop farming did not undergo an expansion during the 1950s similar to that of the east end. After the advent of refrigerated trucks and railroad cars, west-end farmers suffered from competition from out of state producers. Many of the green grocers and fruit stands in Tucson switched to California produce. Some west-end farmers converted to field crops and others simply reduced their production. The peak of farming occurred prior to 1930, when up to 300 acres may have been under cultivation. A total estimate of cultivated acreage would remain approximately the same from the 1890s through the 1930s, with a slight decrease in acreage, and a change in crops. Although some farmers on the west end replaced their diversion dams with instream pumps, they did not sink large wells as on the east end.

ENVIRONMENTAL IMPACTS OF FARMING

Farmers on the west end indicated that, in general, they experienced more problems from flooding than farmers in upper Aravaipa. Beginning in the earliest period of Euroamerican farming, occasional floods inundated fields, destroyed berms and deposited debris, rocks, inferior soils and sand on top of better soils. Although west-end farmers have experienced destructive flooding for a longer period of time, they agree with east end farmers that flooding problems became worse after the 1960s. The major impacts from farming which affected Aravaipa Creek, are discussed in Chapter IX and Chapter XII.

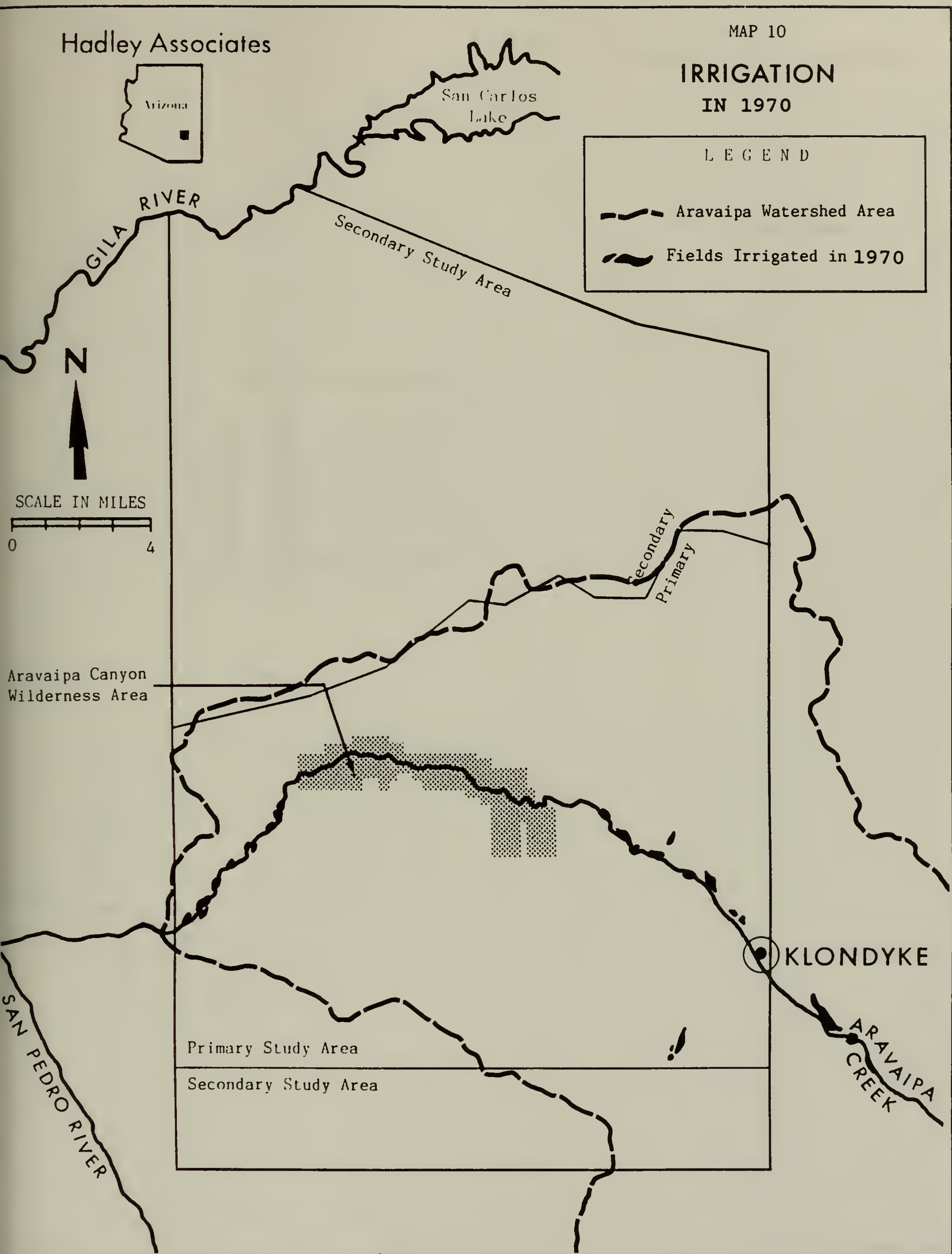
TABLE VIII.A
IRRIGATED ACREAGE FOR THE ARAVAIPA BOTTOMLANDS*

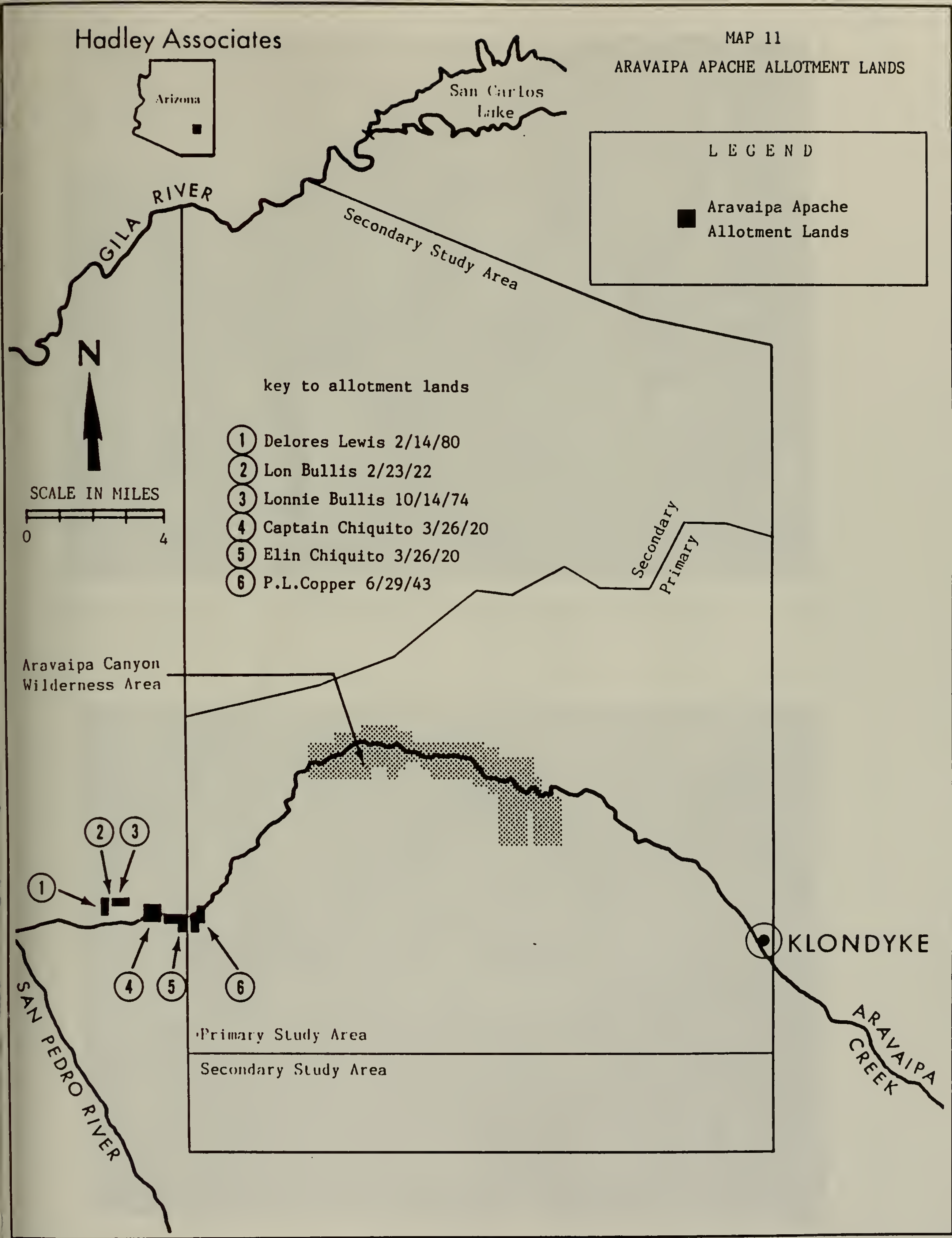
Year	Acres
1880-1920	236 acres
1920-1955	486 acres
1956-1987	169 acres

*Preliminary Hydrographic Survey Report for the San Pedro Watershed, 1990

TABLE VIII.B
TOTAL ACREAGE CONTINUOUSLY SERVED BY SURFACE WATER

Year	Acres
1900	167
1920	212
1975	226
1980	200
1985	82


Hadley Associates
Arizona
MAP 10
IRRIGATION
IN 1970
San Carlos
Lake
LEGEND
Aravaipa Watershed Area
Fields Irrigated in 1970
GILA RIVER
Secondary Study Area
N
SCALE IN MILES
0
4
Secondary
Primary
Aravaipa Canyon
Wilderness Area
KLONDYKE
ARAVAIPA
CREEK
SAN PEDRO RIVER
Primary Study Area
Secondary Study Area


Hadley Associates
Arizona
MAP 11
ARAVAIPA APACHE ALLOTMENT LANDS
San Carlos Lake
LEGEND
Aravaipa Apache Allotment Lands
GILA RIVER
Secondary Study Area
N
SCALE IN MILES
0
4
key to allotment lands
1 Delores Lewis 2/14/80
2 Lon Bullis 2/23/22
3 Lonnie Bullis 10/14/74
4 Captain Chiquito 3/26/20
5 Elin Chiquito 3/26/20
6 P.L.Copper 6/29/43
Secondary
Primary
Aravaipa Canyon Wilderness Area
1
2
3
4
5
6
KLONDYKE
SAN PEDRO RIVER
ARAVAIPA CREEK
Primary Study Area
Secondary Study Area

Gathering hay on the "Kennedy Horse Ranch" (former Ming ranch), c. 1910. (Irene Kennedy collection)

Members of the Kennedy and Dubois families in the field on the "Kennedy Horse Ranch" (former Ming ranch), c. 1910. (Irene Kennedy collection)

IX

LAND, WATER, AND PLANTLIFE

OVERVIEW

Both cultural and natural impacts have caused land changes in the Aravaipa area. The major sources for sequence of change include documents, the recollections of living informants, and information which former Aravaipans, now deceased, passed on to their children. This chapter covers the changes observed in the creek and on the land which resulted from farming, incidental economic activities and natural events, including fuelwood cutting, fishing, road construction, wild food gathering, flood and fire. Impacts of mining are discussed in Chapter V; the impacts of cattle grazing in Chapter VI; and the impacts of goats in Chapter VII.

Using early descriptions (Bell 1869; Bourke 1871; Surveyors' Records) and the recollections of the oldest informants, it is possible to trace the series of changes, both sudden and gradual, within the canyon itself. Sudden change has occurred most noticeably during floods, during the droughts of the 1880s, 1920s, and 1930s, and in the resculpting of the valley floor through road construction, leveling of farm land, and clearing of large trees. Subtle, gradual changes are more difficult to document than the dramatic events. Yet, even the incremental changes were apparent to many former residents. The majority of the informants interviewed agree that human impacts have contributed to Aravaipa's major land changes, the intensity of floods in recent years, and to the redistribution of plant populations.

THE WATERS

ARAVAIPA CREEK

Aravaipa Creek is the heart of the Aravaipa drainage. Its extravagant riparian vegetation presents a striking contrast to the drier hills which surround it. Many informants for this report knew the creek intimately for seventy years and were keen observers of its patterns. Local farmers who irrigated from the creek and residents who used it as a road noticed its many subtle changes. The earliest oral history recollections describe the creek during the first two decades of the twentieth century, by which time the banks of the creek had undergone a radical change since Bell's visit (1867), acquiring a more pastoral and agricultural pattern. Both upper and lower Aravaipa Creek was a tree-bordered, sandy-bottomed stream, and the banks were a patchwork of small farm plots. Farmers and grazing livestock kept the understory clear of brush, and intermittent farms along the creek added to the impression of openness. Aravaipa Creek presented the idyllic picture of a peaceful stream, usually one foot deep, bordered by a solid canopy of cottonwoods and sycamores with an open understory. However, the creek bed and channel remained essentially unchanged. The gravel beds now found on the stream bottom had not yet formed. Children walked barefoot for miles on soft sand and swam and fished in the creek's deep holes. Almost every one of the large sycamores provided its own pool, and some holes were up to twenty feet deep (C. Wood 1990; B. Avery 1990; P. Nichols 1990).

Irrigators had a special intimacy with the banks and channel of the creek. They worked along it for at least five months a year, constructing and removing sand dams, diverting the water into "mother" ditches, clearing brush from banks, cleaning irrigation canals, and removing snags and flood debris from the channel. Their descriptions of the creek between 1920 and 1960 bear witness to a dynamic, changing bed, which passed through an essentially static channel. During this forty-year period, the bed (or bottom) underwent a constant state of minor change, while the banks and channel stayed in place. Floods occurred periodically, sometimes depositing sediment, sometimes removing it and depositing it farther downstream. Yet east-end irrigators reported that prior to 1963, the amount of sand required to dam and divert the creek below the emergence point never changed, indicating that no major downcutting had taken place. The channel had not deepened, and until 1963 the irrigation ditches and fields along the creek never washed out (C. McNair 1990).

Periodic flooding disturbed the creek from the time the first settlers arrived in Aravaipa. Particularly destructive floods were reported in local newspapers. In February 1915, Aravaipa Creek jumped its banks, washed away several pieces of land, and caused the closing of schools (*GG* 2/12/1915). On July 18, 1923 a severe storm with "hurricane" winds hit the east end of Aravaipa, causing the "biggest flood in twenty years," damaging orchards, and carrying away seventeen head of Jake Weathersby's cattle. The newspaper noted the extreme change in weather, remarking that the week prior to the storm Weathersby's cattle had been starving to death (*GG* 7/18/23). In April 1926, another destructive flood was recorded (*GG* 4/30/26). In 1941, the Brandenburgs' original two-story stone house on the west end was washed away. However, none of the earlier floods affected the drastic changes which resulted from the floods of 1963, 1977, 1978 and 1983.

The floods were apparently more destructive on the east end above the emergence point and along the lower Aravaipa. Stella Wootan Medlock wrote a description of the creek near the Wootan Ranch, approximately three miles east of Klondyke, far above the emergence point. She recalled that during the 1920s the creek bed was approximately a half mile wide with banks "a good six feet high", and that many times the creek jumped its banks and "ran up around the house [150 yards distant from the creek] about a foot deep." Several miles upstream from the Wootan Ranch, Warner Mattice observed evidence of ancient changes in the creek channel. During the early 1930s, when the Mattices expanded their farming operation, they discovered areas in the farm land they had cleared where the ground was so filled with pea gravel that it would not hold water. When water from the irrigation ditches entered the fields it disappeared quickly into the gravelly soil. It was evident that in these places the creek had changed its course at some time in the distant past (W. Mattice 1990). Mattice noted that these channel changes had not resulted from human interventions.

Some flood control was practiced on critical points along the creek, particularly along the lower Aravaipa. Farmers protected the edges of their fields by planting borders of willows and cottonwoods. They planted willow shoots ten to fifteen feet apart; the roots grew together to form a solid barrier to the creek, the fibrous spongelike roots slowing down the water and protecting the banks. Every three years the farmers topped the willows to keep the bottom growth thick. With the willow borders in place, except in the cases of unusually large floods, the creek did not cut the banks. The practice probably began prior to 1900 at the time of the earliest Euroamerican farming on the lower Aravaipa, affecting most of the banks which had farm land. In later years, the Woods, Buzans, Brandenburgs and Whites all planted willows. In addition to the willow borders, farmers prevented flooding of their fields by constructing small dykes using horse-drawn fresnos. The dykes were sometimes reinforced with pig wire and rocks. Many farmers believed that the willow borders provided more efficient protection than berms or dykes (C. Wood 1990; C. Whelan 1990).

In the days before automobile travel, people frequently used the creek bed as a route between the east and west ends of Aravaipa. Horse travel presented no problem, and wagons occasionally went from the east end to towns along the San Pedro River. Angelina Moraga Valenzuela recalls traveling the entire length of the canyon in her father's wagon in April 1925 to bring the midwife from Winkelman for Mrs. Quijada. The water was low, but the drop-off in the box, which in times of high water became a waterfall, presented a problem. They stopped in the box, unhitched the horses and placed large rocks on the creek bottom to lessen the drop, and the wagon went over it without too much difficulty (A. M. Valenzuela 1990). Epimenio Salazar and other east end farmers frequently made the trip through the canyon in wagons to Winkelman to sell produce. Commercial walnut cutters, who removed many large trees from the creek, were able to drive their trucks through the Aravaipa box with the assistance of their stump-pullers. They piled rocks up in the stream bed to level out the places where the drop-off was too steep and lowered the truck with their winches (F. Wood 1989, C. Wood 1990). In May or June 1964, Dr. William Minckley drove (upstream) the entire length of the canyon in a 1955 Chevrolet car without having to build up any rock dams in the box. Several years after Minckley accomplished this impressive feat, Rodney Engard drove a small four-wheel drive vehicle from the west to the east end (W. Minckley 1990). At the present time, damage from the 1983 flood, including the presence of large rocks and downed trees, would make it impossible to drive through the canyon.

Informants expressed different opinions concerning the sequence of changes in the creek bed and channel, and their causes. However, most informants agreed that until approximately the 1960s the perennial stretch of the creek (below emergence point) remained similar in appearance and structure to the condition in which they first saw it, with only the minor bank protection provided by small sections of rip-rap above the emergence point and by willow borders below it. Until the 1960s the perennial creek still had its deep holes, sandy bottom, smaller gravel deposits, minimal downcutting, and little arroyo cutting in the side channels (C. McNair 1990). By the early 1970s there was obvious evidence of downcutting, depositing of gravel beds, disappearance of the deep holes, arrival of new types of vegetation (salt cedars, and "sugar maples"), a relocation of the emergence point, and depositing of silt. While the creek bed cut down, the floodplain channel widened. Larger amounts of silt and gravel were carried in the creek each time it flooded, and were deposited in the stream bed, filling in the deeper holes under the large sycamores and next to bluffs. The creek bed deepened and the creek became capable of carrying more water. Many informants maintain that prior to the 1970s the creek ran deep water much less frequently. Until the two big floods of the late 1970s (1977 and 1978), the creek had been gradually filling in. In 1977, the first of several major floods washed much the sediment out of the creek and deposited it on fields by the San Pedro (C. McNair 1990; J. White 1990).

Although a process of gradual change had been in place for many years, the flood of 1983 devastated Aravaipa Creek. Such a radical alteration in the appearance of the creek made it difficult for informants to analyze the causes of the slower less dramatic processes of change. Residents attribute gradual channel changes both to misguided human tampering and to new weather patterns. The area under cultivation below the emergence point on the east end increased considerably between 1920 and 1960. Farmers removed substantial amounts of brush from creek banks and cut down dozens of large cottonwoods and sycamores. The most significant alterations occurred after the World War II when bulldozers became common. The advent of this technology enabled residents to more radically alter the course of the creek. On the west end, farmers constructed large dykes along the edge of the creek to keep the water in a more specific channel. The dyke building contributed to downcutting. At Trails End Ranch after the installation of large dykes, farmers had more problems with flooding. Prior to dyke construction, flood water ran across the fields and then returned to the creek, only occasionally washing out berms or ditches (J. White 1990). During dyke construction, bulldozers uprooted the big trees which had slowed down the water and held the banks in place. The removal of large trees and the straightening of the channel allowed the water to move faster, and as a result downcutting occurred at a faster rate. Once the large dykes had been built, the creek was restricted to a narrower channel, and during floods, large uprooted trees unable to work their way to the natural edge of the creek, more frequently lodged in the creek. The waterfalls created by the downed trees increased downcutting, tore holes in the creek bed, and often redirected the channel (C. Wood 1990). Many informants noted that tree falls during floods caused the most radical changes in the channel, occasionally moving the creek into an entirely new channel for a short distance (T. Salazar 1990).

The emergence point of Aravaipa Creek, the place at which the perennial stream begins its continual flow, has changed in recent years. The traditional emergence point was three-quarters of a mile above the "Valenzuela Crossing", flowing out of a hole in the ground as a visible spring (J. Schnell 1990; B. Avery 1990). In drought years the emergence point moved downstream, its farthest downstream point occuring in 1977. However, in 1979-80, after good rains, water emerged two or three miles above Klondyke, well above the traditional emergence point (J. Schnell 1990). Many former residents believe that since the advent of deep well pumping, the water table has dropped at least ten feet, affecting both the emergence point and the depth of wells in the area. They attribute the drop in water table to excessive pumping (C. Turnbull 1990).

Undersirable invader species along the creek banks became apparent by the early 1970s. Informants attributed their appearance to the decline in farming. Cockleburrs, salt cedars, and "water maples" all increased as farming gradually decreased. The salt cedars, not present until the late 1960s, gradually crept up from the San Pedro River (S. Neal 1990). Abandoned orchards, on the banks of the creek like the orchard at the Turnbull place, have been taken over by ailanthus (C. McNair 1990). Prior to the 1960s farmers had judiciously chopped out undesirable invader species.

The cumulative alterations observed by informants included loss of large trees, the disappearance of deep holes, an increase in gravel deposits, deepening of the overall channel, entrenchment of the creek bed, widening of the floodplain, arrival of invader species, creation of new side channels, and arroyo cutting. However, there has been no indication of significant changes in the volume of water in the creek on a long-term basis.

SPRINGS AND CIENEGAS

Both documents and informants attest to a general drying trend throughout the Aravaipa area. Spanish military diarists were well trained to record pertinent information and were expected to include distances travelled and sources of water in their records. Several diaries of campaigns through the Aravaipa area mention important water sources which no longer exist. Comadurán (Dobyns 1981) mentioned the *Agua de los Muertos* which was probably the cienega in the Aravaipa Valley first described, but left unnamed, by Coronado (Winship 1969). Bell described the cienega and located it near the beginning of the Aravaipa Valley (Bell 1869). Archaeologist Emil Haury identified this cienega as the modern inner remnant of the floor of pluvial Lake Cochise (Meinzer and Kelton 1913: 34; Reid and Doyel 1986: 93). Surprisingly, for the arid southwest malaria proved to be a major problem for the United States Army near Aravaipa. "Camp Grant was a hot bed of the worst kind of fever and ague, the disease which made many portions of southern Arizona almost uninhabitable during the summer" (Bourke 1971: 8). Mosquitoes bred in pools and marshes along the San Pedro, the Gila, and other water courses near Aravaipa. However, by the first decade of settlement in Aravaipa (late 1870s), many local marshes, cienegas, and other water sources dried up or diminished in size. The cienega and many other water sources described in early documents have disappeared.

A general drying of climate, with a decrease in rainfall and snow, form a constant refrain in the reminiscences of former Aravaipa residents. Almost every informant reported that the Aravaipa area receives less precipitation than in previous times, in both winter and summer. They also note that rains begin later in the summer and do not occur as regularly as they did prior to the 1950s. Many informants reported deep winter snows. On Table Mountain, for example, one informant recalls that snow was frequently so deep that the burros children rode to school had trouble getting through the drifts, and that cattle, unable to reach feed had to rely on oak brush (M. Cosper 1990). Other informants recall more frequent frost and dew (M. Ramírez 1990). Durward Sanford recalls that one foot of snow during the winter was common. Newspaper articles corroborate this contention. In 1924, the Allison Ranch near Stanley (elevation 5,500 feet) received six and a half feet of snow. The average up to that time had been four feet between November and April (*GG* 4/18/24). Outstanding wet years are remembered as well. For many years, all the old-timers talked about 1904-05 being the wettest year they remembered, comparing all other years to it (D. Sanford 1990). Drying of the climate is distinguished from drought years, for which specific dates are given in Chapter VI. The effect of delayed and irregular summer rains on rangeland is discussed in Chapter VI and Chapter XII.

The drying of springs and a general decline in the amount of water in water courses is a second theme which punctuates the interviews. Most informants attribute the drying of water sources to the change in rain patterns, and some cite increased pumping as the cause. A few of the noticeable water sources which have dried during the past seventy years include: the spring 200 yards southeast of the Klondyke school (1920s); the cienega on the Hooker Ranch (1930s); Armstrong Spring in a cave on the Wootan ranch (1920s); and many small springs on the slopes of Table Mountain (1930s). A number of creeks formerly had more water, and several of them ran most of the year. Stowe Gulch, Turkey Creek, Buford Canyon, Squaw Canyon and Virgus Canyon all run much less water and run less frequently than prior to the 1950s. Former residents of Table Mountain also recall that the water in upper Turkey Creek frequently ran high. Settlers who lived on Table Mountain and used that route to reach Klondyke often had to wait on the ridge above the canyon until the water went down. During the 1930s, Laurel Canyon ran nine months of the year and provided much of the water for the mining camp at Grand Reef Mine. Many informants have supplied this information (M. Cosper 1990; C. Turnbull 1990; J. Wootan 1990; C. Whelan 1990), and the list of dried water sources could probably be greatly amplified.

THE LAND

EARTHQUAKE

One of the earliest recorded natural events which affected Aravaipa was the earthquake of May 3, 1887. The epicenter was located more than two hundred miles south of Aravaipa in Batepito, Sonora. The earthquake opened a fault in the San Bernardino Valley, released geysers in many recorded locations, and dried up springs all over northern Sonora and southern Arizona. It registered an estimated 7.2 on the Richter Scale. Aravaipa was at the northern limit of the area in which it was felt. No records have been uncovered which describe the effects of the earthquake in the immediate area of Aravaipa, but reports came from locations in every direction surrounding Aravaipa. Fort Thomas, northeast of Aravaipa, reported a moderate quake with undulating motions lasting one and a half minutes. However, in Dudleyville and at the Dripping Springs Ranch west and northwest of Aravaipa, the earthquake was reported to be strong. In Oracle, there were numerous slides, and large quantities of rock fell to the bottom of the Catalina mountains. At San Carlos, quaking lasted two and a half minutes, causing Apaches to abandon their homes. The motion of the earthquake was felt all along the San Pedro River as far as its junction with the Gila and was "sufficiently violent to produce a distinct sense of nausea." In Mammoth, the roof of a saloon collapsed shortly after the quake, and large rocks were thrown down from the surrounding mountains. At Tres Alamos, south of Aravaipa along the San Pedro, the earth opened in several places near the river and a stream of water began flowing. At three or four places in the Pinaleno Mountains, great clouds of dust rose into the air (DuBois and Smith 1980). It is part of the oral tradition of Aravaipa that the earthquake changed the structure of Brandenburg Mountain. George Swingle, who lived on the San Pedro River, was in the canyon at the time of the earthquake and reported disturbances, including large falling rocks, to Brandenburg Mountain (J. Swingle Dorsey 1990 p.c.). Nevertheless, changes in spring flows or the gradient of the creek as a result of the earthquake have not been documented.

FIRE INDUCED LAND CHANGE

No fire history for the prehistoric or protohistoric periods has been done in the Aravaipa area. Few incidents of fire have been reported in historic time. However, there is some evidence that the Aravaipa Apache practiced fire drives for game and burned to clear fields for agriculture. Mexican Army Lieutenant Antonio Comadurán, of the Tucson presidio pursued the Apache through Aravaipa in 1830, approaching the canyon from the east. His scouts informed him that a large fire started by the Indians had been burning for five days in Aravaipa Canyon. Comadurán surprised the Apache tending a fire at the *Canyon de la Agua Nieva de San Calistro* (Snow Melt of San Calistro Canyon). The Apaches were burning *pasto* (grass or plants suitable for feed) along with large pieces of wood. Presumably the large pieces were windfall on the ground since the Spanish word does not indicate living trees (Dobyns 1981: 18-22). The report clearly indicates that the Apache had used fire as a tool to modify the natural environment in Aravaipa Canyon, either to facilitate hunting or clear land for agriculture (Dobyns 1981: 28).

The Apache may have practiced agricultural fire clearing on a regular basis in Aravaipa. Grenville Goodwin (1942) and Winfred Buskirk (1986) reported that fire clearing was a common practice among the Western Apache. During the 1930s Goodwin's informants told him they had farmed in Aravaipa, specifying several locations. In 1857, Hutton (1859) observed active Apache farming along five miles of the creek. In 1867, Bell (1869) observed Apache "wigwams," fields, and irrigation ditches at a time when the Aravaipa were under intense pressure from the United States Army and had abandoned many of their fields. This evidence of irrigated farming increases the likelihood that the Apache practiced agricultural burning in Aravaipa.

In general, agricultural fire clearing has not been part of Euroamerican culture. Aravaipa settlers practiced limited fire clearing, occasionally burning thickets of catclaw, mesquite, or batamote. These small controlled fires usually covered only a portion of an acre (T. Salazar 1990). None of the early descriptions of Euroamerican agricultural clearing mentions setting fire to large trees. Instead farmers employed other methods, including stump pulling and chaining.

Informants consider that lightning-set fires have been infrequent during the period they recall. No informant reported lightning-set fires inside the canyon, and on the tablelands outside the canyon, none larger than 200 to 300 acres have been reported . Informants recall only two fires on the Salazar Ranch, one on the ridges east of Turkey Creek and another in Booger Canyon (T. Salazar 1990). Wilfred Claridge, whose father George was on the Forest Service fire crew, reported several lightning-set fires. Prior to 1960, two fires burned in Rattlesnake Canyon, one of which was fairly substantial and burned for three or four days. Imperial Mountain has had two large fires, the first during the mid-1940s and the second during the early 1980s. One of these fires burned the entire north side of the mountain and covered half of a section, burning a ledge in an area where cattle could not graze. Grass was thick on Imperial Mountain prior to the fire and has remained abundant. However, brush has not returned in quantities as thick as before the fire (W. Claridge 1990). Other fires in the area include: one on China Peak, one in the head of Cottonwood Canyon, one between Warm Springs and Stanley Butte, a 250 acre fire near Anderson Spring, a smaller fire between Head Center Mine and Deer Creek, and a fire on Dry Camp. During the 1950s a fire on Hugh Claridge's ranch near the junction of the Safford and Bonita roads burned a large number of mesquites. One fire, accidentally set by humans, burned the area along the Klondyke road between the Weathersby ranch and the former Forest Service ranger station. The construction of a firebreak helped to stop it. After this fire pepperweed and mustard in the burned area died out, and foxtail grass replaced them (W. Claridge 1990). No fires in the Aravaipa area were reported in local newspapers.

It would appear that fire did not play a significant role in land change in the study area during the 100 years of this study. However, for the period prior to the overgrazing and drought of the 1880s and 1890s, range fires may have been more frequent and may have had considerable influence on range land plant composition. (See: Dobyns 1981 and Cooke and Reeves 1976 for full discussion of the influence of fires on rangeland and plant populations.)

ROAD BUILDING

The earliest roads in the Aravaipa area came about through the incremental improvement of Indian trails. A clear Indian trail followed the side of Aravaipa Creek and was used by Bell's railroad survey party in 1867. Bell stated that an Indian trail, "easily followed in single file," led all the way through the Aravaipa "gorge." In addition to the main trail, the canyon contained four "lateral means of exit" on the northern side and one on the southern side in the upper canyon (Bell 1869: 74). The San Carlos trail which connected San Carlos with Aravaipa Creek had two branches. From San Carlos it went through Hawk Canyon with a branch to the west end by Apsey Camp and Painted Cave Ranch, and a branch to the east end by Lone Cedar Canyon, Telegraph Wash and Warm Spring. Portions of the trail which are deeply cut into the hills near the Painted Cave are still visible today (W. Claridge 1990; J. Flieger 1990). Smaller Indian trails led to most of the significant springs in the area. Many of the early wagon roads were made by gradually improving old trails with casual, occasional road work rather than by formal road-building work. In comparison to other canyon areas, travel was not particularly difficult.

Early roads were associated with either mining or the army. The relocation of Fort Grant in 1873 initiated the first formal road building efforts on the east end of Aravaipa. By 1875, a wagon road connected Fort Grant with the east end of Aravaipa (T. S. White, U. S. Surveyors' Notebooks, 1877). The army probably constructed and maintained this road, which passed by the supply/telegraph station at what later became the Dunlap Ranch (near the mouth of Stowe Gulch), and continued on to the Ming Ranch (later T-Rail) in the canyon. The road brought supplies to soldiers and scouts who used the canyon to reach the San Pedro River while in pursuit of Apaches. Originally the road followed the bed of Aravaipa Creek more closely than today, and over the years it has been moved both intentionally and by changes in the creek brought about by floods. During the 1870s or 1880s, the Army constructed a telegraph line from Fort Grant to San Carlos by way of Warm Springs, Telegraph Wash, Lone Cedar Canyon and Hawk Canyon, partially approximating the Indian trail between San Carlos and Klondyke. Several of the original metal telegraph poles are still standing. The area was so steep that the army had to construct a wagon road part way in order to bring in the poles, and had to use block and tackle to put the poles in place (W. Claridge 1990).

Mail trails and later stage roads connected Fort Grant and Willcox with local post offices Dunlap (at the Dunlap Ranch), Mingville (at the Ming Ranch), the Aravaipa townsite, and Klondyke. Mail to Dunlap, Mingville and Klondyke arrived from the south, but mail to the Aravaipa Mine and the camp at Stanley came over a northern trail from Fort Thomas. Still visible in several places north of the Aravaipa townsite, the trail was used by mule and horse riders twice a week (W. Claridge 1990). Shortly after 1900, the biweekly Willcox, Klondyke and Aravaipa Stage Line began operating from headquarters in the Soto Brothers Store in Willcox. The trip from Willcox to Aravaipa (townsite) took twelve hours and cost $7.00; the shorter distance to Klondyke took ten hours and cost only $5.00 (*Arizona Range News* 8/30/07).

Many of the secondary roads in upper Aravaipa were in place before 1900, having been constructed by the mining companies in the area. The road to the mining town of Aravaipa was constructed during the late 1880s and improved during the 1890s at the time of peak activity at the mine. The road to Grand Reef was built at the same time. Captain John Burgess of the Table Mountain Mining Company constructed a road between Four Mile Canyon and Table Mountain. In 1897, the Table Mountain Toll Road Company filed incorporation papers in Pima, Pinal, and Graham Counties. The promoters anticipated the construction of a fine modern road beginning at Table Mountain and extending ten and a half miles west to "Red Rock Ranch" in the Aravaipa Valley, connecting the mine to the railroad at Willcox. However, the wagon road they built required constant maintenance and fell into disrepair as soon as the company stopped operations. The road bypassed Turkey Creek and followed a route through Four-Mile Canyon.

In 1915 the main road from Safford was enlarged and straightened all the way to Klondyke. In February, newspapers announced that "everybody was busy moving back their fences to make room" for the wider road (*GG* 2/12/1915). By April, the road crew had gotten as far as the "goat ranch" in Cottonwood Canyon (*GG* 4/15/1915). Another straightening project took place during the 1920s when William Whelan of Aravaipa was county road supervisor. Whelan made sure that the road was improved all the way to the head of Aravaipa Canyon. Many other subsidiary roads came later. Turkey Creek did not have a road until the mid-1920s. Former residents of both Table Mountain and Turkey Creek recall that almost all of their travel was by horse or burro (M. B. Cosper 1990).

Homesteaders were surprisingly willing to live in areas in which vehicular travel was impossible. Lupe Salazar's homestead at the confluence of Deer Creek Canyon and Aravaipa could be reached by wagon and Model-T. However, rather than attempting to construct a "real" road, the canyon bottom was simply kept clear of major obstructions to allow occasional vehicles to pass, and most of the travel to the Salazar homestead was by horse (T. Salazar; B. Salazar 1990). The road which followed Bear Canyon to the Dry Camp Ranch was not constructed until the Sanfords had lived there for a number of years (D. Sanford 1990). North of Aravaipa Creek, ranchers and mining companies constructed several later roads, including the road to Tule Tanks which crossed the old mail trail (C. Turnbull 1990).

On the west end, the original road went directly up the bed of Aravaipa Creek from the junction of the San Pedro to Alexander Vail's homestead. Residents made frequent requests for road improvement, including a 1910 open letter from Emil Kielberg urging Pinal County to make road improvements so that Aravaipa residents could supply fruit and vegetables to the penitentiary and to Florence (*ABT* 2/19/10). In 1923 another petition, this time presented by Mrs. Martin Wood, urged the board of supervisors to repair the road, which became impassable on occasion. Since farmers did "just enough work to get by" the county never bothered to do real road work (*ABT* 12/22/23). In 1937, the Civilian Conservation Corps constructed the present road, employing several local people to work on the project. Some residents regretted having given easements for the new road construction, complaining that the "improved" road had many hills which their Model-Ts could only negotiate in reverse. A wagon road connecting the Brandenburg homestead with Stone Cabin was built around the turn of the century and was improved during the 1930s. The road to Mining Mountain was constructed during the 1930s. The road to the White's homestead on the Rim Rock was built during the 1940s (J. White 1990). Joe Flieger built the road to Painted Cave in the early 1950s and converted the goat trail up the north side of Brandenburg Mountain into a road during the 1960s (J. Flieger 1990).

Two roads remained persistent dreams in the minds of Aravaipa residents. During the 1920s, miners wanted a road connecting the Aravaipa townsite with San Carlos. The distance to the railroad by this route was forty miles less than the trip to Willcox, and mining companies could have shipped their ore much less expensively by taking it north. A road from San Carlos to the Princess Pat mine and Stanley had been constructed during the nineteenth century; however, the four mile section between Aravaipa Mine and the Princess Pat Mine, which would have completed the connection, was never built. In the 1920s, Graham County estimated that the "Black Rock Canyon Road" from Aravaipa to Fort Thomas would cost between $17,000 and $20,000. The county was willing to pay for half if the Douglas group, which operated the mine at the time, would pay the other half. When the Douglas company stopped mining in 1927 the project was abandoned (Aravaipa files ABM).

During the 1920s, Graham County newspapers promoted a road connecting Klondyke and Winkelman. Engineers had made a tentative plan to construct the road closely following the course of the canyon on the tablelands above it. Members of the Dunlap and Dowdle families, both active in county and state politics, and J. F. Wootan of Klondyke, a member of the Highway Commission, were also ardent promoters of the road (*GG* 3/7/24). Although Graham County appropriated money for construction, Pinal County failed to guarantee completion from the Pinal County line to Winkelman (*GG* 2/29/24). Residents in Pinal County also presented petitions to their board of supervisors but to no avail (*ABT* 7/23/27). During the late 1930s the county surveyed another east-west connection by way of Copper Creek, extending west from the Bonita-Klondyke road for twelve miles to Copper Creek, eight miles in Graham County and four in Pinal (*GG* 9/3/37). Like its predecessor, this road was never completed. During the late 1960s, Adolfo Salazar constructed the "Rug Road" connecting

Parson's Grove, Table Mountain, and Mammoth, paving steeper portions with pieces of carpet from the dump. The road is nearly impassable and so difficult to negotiate that it does not shorten transit time.

Several railroad schemes for the Aravaipa area also remained uncompleted. A number of nineteenth century railroad surveys had planned a section of the southern transcontinental railroad through Aravaipa (Parke 1857; Bell 1869). During the early twentieth century some of the mining companies continued to promote the idea of a railroad to the Klondyke area. In 1904, the Aravaipa Canyon Railroad applied for a right of way for railroad purposes. The project was subsequently abandoned, and many of the lots which the railroad had claimed from the public domain were sold. The Santa Fe Pacific Railroad Company also had lots in the Aravaipa area until 1916 (Titles, Graham County Recorder's Office). Railroad schemes are discussed in Chapter V.

The advent of the bulldozer in Aravaipa had significant impact on road building. Although county road crews had mechanized equipment shortly after World War I, few ranchers had power equipment until after World War II. Small access roads to cattle tanks and corrals were built by fresnos pulled by one or two teams of horses. Ranchers and farmers purchased the first locally owned bulldozers shortly before World War II and began to use them in earnest after the war, when a real boom in small road construction took place on both the east and west ends of the canyon. During the late 1940s and early 1950s, new roads were built on the Wood ranch, the White ranch, the Weathersby ranch and many others. The first roads to reach the Sanford's home at Dry Camp Ranch and the Flieger's home at Painted Cave Ranch were not constructed until after the war. Until this time the ranches could only be reached by horse and pack animals. With the new equipment ranchers built new water catchment tanks and small roads leading to them.

The majority of informants agreed that poorly constructed roads initiated erosion and the downcutting of creek beds through which they passed. Observations of road induced erosion and downcutting were made as early as the nineteenth century (Griffiths 1901; Cooke and Reeves 1975: 94) and present informants have added to the list.

PLANTLIFE

GATHERING WILD FOODS

Gathering wild foods constituted an important cultural activity for the Aravaipa Apache and a secondary activity for subsequent Euroamerican settlers. Wild food gathering certainly impacted the density of desirable plants in areas of intense settlement.

Contemporary Apache Food Gathering

The Aravaipa band of the Western Apache inhabited Aravaipa Canyon from the mid-eighteenth century through the 1920s. Individuals continued to visit the canyon in large numbers until the 1950s to gather traditional foods, and some members of the Tsé jiné clan (Surrounded by Rocks or Aravaipa), still return today (1990). The family of Capitan Chiquito Bullis had lived on the west end of Aravaipa on allotment land, spent summers on their farm through the 1930s and returned at other times of year to gather particular foods. The gathering practices of contemporary Apache are strikingly similar to those described by the Jesuit missionary Father Ignaz Pfefferkorn (1949) in the eighteenth century and by anthropologist Grenville Goodwin (1942). With the exception of the distribution of mescal (agave), which was intensely cut by the Apache, food gathering practices may have had little overall impact on the plant communities of Aravaipa.

The Apache came from the reservation on horseback by way of the San Carlos Trail though the Mineral Strip. According to informants, the ride from Old San Carlos where most of the Aravaipa band lived (now under San Carlos Lake) took two days. To reach the west end, they left Old San Carlos and continued through Hawk Canyon between Rawhide Mountain and Stanley Butte. They usually camped at a spring on the U B Ranch and continued on down into Aravaipa the following day, arriving in the canyon at a point below Painted Cave Ranch (R. Bullis 1990). The trail down into the canyon passed by a striking rock formation, which features a large erect white rock, known to the Aravaipa band as "Sitting White Lady" (now called Winnie the Pooh). At this point the trail became so steep that the Apache had to lead their horses. After they arrived in the canyon, they made traditional camps. Members of the Bullis family camped by the big sycamore on Chiquito Bullis's property, after former structures on his land were no longer standing (R. Bullis 1990; L. Bullis 1990). Apache people who were not related to the Bullis family moved their camps more frequently and camped on both the upper and lower Aravaipa.

Other Apache went directly to the Klondyke area, initially traveling over the same trail but branching east while still on the San Carlos Mineral Strip. Informants who made this trip travelled by horse with older relatives and have only vague recollections of the route. They spent the night at different places, usually somewhere on the south side of Stanley Butte (A. Kenton 1990). When camping, they made brush shelters covered with a tarp (W. Johnson 1990). The Apache made the trip at least once a year and during different seasons gathered walnuts, acorns, squawberries, saguaro fruit, mescal (agave), and Apache tea (W. Johnson 1990).

Two informants described gathering practices in considerable detail. Eighty-seven year old Wallace Johnson, who was raised at Big Sunflower on the San Pedro, visited his relatives in Aravaipa frequently and was familiar with the combined farming and hunting/gathering economy practiced by his parents and grandparents during the twentieth century. Seventy-eight year old Della Steel, whose grandparents lived in Aravaipa until the Camp Grant massacre, was taught traditional foods and medicine by her parents and is considered an expert on the subject. Wallace Johnson reported that he was familiar with Euroamerican food since childhood, but Della Steele was raised only with traditional Apache foods and recalled "learning" of sugar, salt and coffee about 1918 or 1920. Both informants reported collecting many of the same plants which appear in the historical literature.

These informants collected mesquite beans for flour and as a sweetener for other foods; mescal for roasting as a major food staple; acorns for soup and stew; two kinds of wild spinach; ripened saguaro fruit (which was dried and rehydrated as a drink); prickly pear fruit; squawberries for a beverage; "bananas" from banana yucca for roasting; Indian or Apache tea; dipper gourds; seeds of devils claw as a food, and devils claw plants for making plates and baskets; cottonwood shoots for making coil plates and baskets; and a mixture of walnuts and the outside leaves of mescal for making a coffee-like drink. Their descriptions of mescal roasting conform to those given by Pfefferkorn (1949) and Goodwin (1942), and both informants agreed that in former times mescal provided a substantial portion of the Apache diet. Mescal was roasted in a rock lined pit, twenty or thirty plants at a time, usually overnight, until the color changed to reddish-yellow and the plants became tender and sweet. Mescal has the advantage of being always available and lasting for five to six weeks without spoilage (W. Johnson 1990; D. Steele 1990; Pfefferkorn 1949; Goodwin 1942).

As medicine, informants listed: boiled tubers of wild potatoes for application to sores; boiled stems of "pig weed" for blood, particularly for diabetes; creosote bush as an inhalant in steam baths for colds and lung problems and as a drink or liniment for sore joints; roasted pads of prickly pear as a drawing poultice; yucca stalks split into four sections as splints for broken bones; lower yucca stalks for soap and shampoo; manzanita berries for stomach aches; a paste of jojoba for sores; boiled elderberries as a laxative and to eliminate intestinal worms; and *enil chil*, a high elevation plant, for diabetes and strengthening the blood (W. Johnson 1990; D. Steele 1990).

For ceremonial and traditional religious activities the informants cited three plants as most important. The pods of tule stalks provide the yellow pollen for *hodentin* used in sacred rites. Acorns are the most important ceremonial food and are required for the traditional food exchange which takes place the Friday evening preceding the girls' initiation ceremony. If acorns are unavailable, it causes considerable embarrassment to the host family (M. Cassadore 1990). During the girls initiation ceremony, Arizona broom is used to paint the white color on the initiate, *white changing lady*, along with lime from natural outcroppings.

Anglo and Mexican residents of both the west and east ends of Aravaipa recall Apache visits to the canyon. Informants reported that large groups of Apache, up to fifteen, arrived on horseback and stayed until they had completed the harvest of acorns, walnuts, berries or cactus fruit (B. Salazar 1990; N. Weathersby 1990; J. Wootan 1989; C. Wood 1990; J. White 1990). On the west end they gathered saguaro fruit and other cactus. On the east end acorns and other higher elevation foods were gathered, particularly above Grand Reef Mine and the Table Mountain area where there were good acorns (V. Tapia 1989). Before the 1930s, the majority of Apaches did not speak English, although some spoke limited Spanish. Reservation officials issued them written passes which they carried with them and often displayed to Aravaipa residents.

Apaches frequently traded with canyon residents, who remember them as skilled and enthusiastic traders. They sometimes purchased fruit, vegetables or meat from local farmers (V. Tapia 1989). Apache groups often went to Table Mountain to gather acorns, walnuts, and wild cherries. Carl Bleak, who lived at Bleak Springs, learned from the Apache "how to be a trader." He gathered acorns ahead of time and exchanged them with Apache visitors for saddle blankets, bits, reins and rawhide ropes (M. Cosper 1990). On the east end, Apache people frequently camped near the home of Chepa Duran, the midwife for the Aravaipa Canyon community. Doña Chepa was an Apache woman who had been taken captive by Mexicans as a child. Although raised as a Mexican, she still spoke Apache (V. Tapia 1989). One Apache informant remembered that when her great grandmother went to the east end of the canyon, she always stayed with an Apache-speaking woman, who may have been Doña Chepa (A. Kenton 1990). Apaches also stayed with the Epimenio Salazar family, usually camping near the Salazar home or staying in an empty adobe house in the yard. Members of the Salazar family recall many Apache friends. One woman in particular, the wife of *Narices Mochas* (Chopped Nose) is remembered as a *comadre* (godmother to one's child) of Crespina Salazar's. The Apache made themselves at home, and although they always brought food for themselves, they sometimes chopped corn stalks or Johnson grass for their horses. They ground acorns on a metate for acorn bread and made tortillas on the side of a split eight pound lard can (B. Salazar 1990). On the west end, residents recall that visiting Apaches sometimes made *tulapai*, the traditional fermented corn beer, and held some fairly wild celebrations. Apache people returned to the canyon to pick cotton for Lyle Sanchez during the 1950s, and several Apache men worked for Charlie Prude as cowboys on the Deer Creek Ranch (L. Sanchez 1990; C. Prude 1989). They still return to areas near Klondyke to gather acorns.

Settlers

Most of the settlers in Aravaipa gathered special plants as food or for their medicinal qualities. Gathering of wild foods varied according to ethnic group. Although Anglo-American families gathered and prepared many wild foods, in general, Hispanic settlers included a wider variety of native plants in their cuisine. Immigrants from Mexico brought with them a long tradition of gathered plant foods and remedies (some native and some invader species) for both humans and animals. Many of Aravaipa's Hispanics included the following wild food in their diet: *nopalitos*, the pads of prickly pear (*Opuntia spp.*) as a vegetable; candy made from *bisnaga*, the inside of barrel cactus (*Ferocactus wislizeni*); *covenas,* wild onion; and a large variety of *quelites*, the generic term for wild greens of all varieties. The wild greens included *verdolagas*, purslane (*Portulaca oleracea*); *chuvales*, miners' lettuce (*Montia perfoliata*); and *bledos*, careless weed (*Amaranthus palmeri*). All of the above were cooked like spinach and were occasionally referred to as wild spinach. Trebol (*Trifolium spp.*), clover, was less popular since it has a strong flavor but it was sometimes used as salad, along with *berros,* the plentiful watercress (*Rorippa islandica*) which grows in Aravaipa Creek. A number of wild fruits and berries were gathered as well. Many women made jelly from saguaro fruits and candy from the inside portion of barrel cactus. The popular berries included *bachata* (*Zizyphus obustifolia*); *uvas*, wild grapes (*Vitis arizonica*); *moras*, wild mulberrys (*Morus nigra*); and choke cherrys (*Prunus capuli*). As seasoning, wild onions, wild garlic, and *raíz de vibora* (*Zornia diphylla*) were commonly used. Near Klondyke a large number of *peonias* grew and were frequently gathered (B. Salazar 1990). For medicines, *garambullo,* desert hackberry (*Celtis pallida*) was used to treat ulcers, *yerba del pasmo (Baccharis)* for injuries and to take down swelling, *llerba del manzo* (*Anemopsis californica*) for general illness, *llerba del indio* golden seal (*Bouvardia spp.*) for weakness, allergies, and head colds.

Although the Angloamerican cuisine for wild plants was more restricted than that of either the Apache or Hispanic families, the Anglo families made use of many types of wild greens, nuts, fruits, and berries. The wild plants most frequently consumed by Angloamerican settlers were lambs-quarters (*Chenopodium album*), pig weed (*Amaranthus*), and watercress. They Angloamerican settlers also gathered acorns and walnuts, usually using them to make candy. They made jelly from wild grapes and berries and cherries (M. Cosper 1990). Many families had their own presses for extracting the juice from wild grapes.

COMMERCIAL WOODCUTTING

Occasional fuelwood cutting for sale in towns gave local settlers supplemental income and was practiced irregularly by many local farmers and ranchers (C. Whelan 1990). There were, however, a few Aravaipa residents who were professional woodcutters for whom fuelwood and fencepost cutting was the primary source of income. Jesús Macías, who lived near the Mercer ranch (and for whom Macias Canyon is named), cut wood in the Copper Creek area to supply miners with fuel wood. Macías delivered the wood on eighteen burros, selling it in Copper Creek for $1.00 a burro load. Macías continued his woodcutting after the population boom at Copper Creek had ended, cutting fence posts for local ranchers, and firewood for town dwellers through the

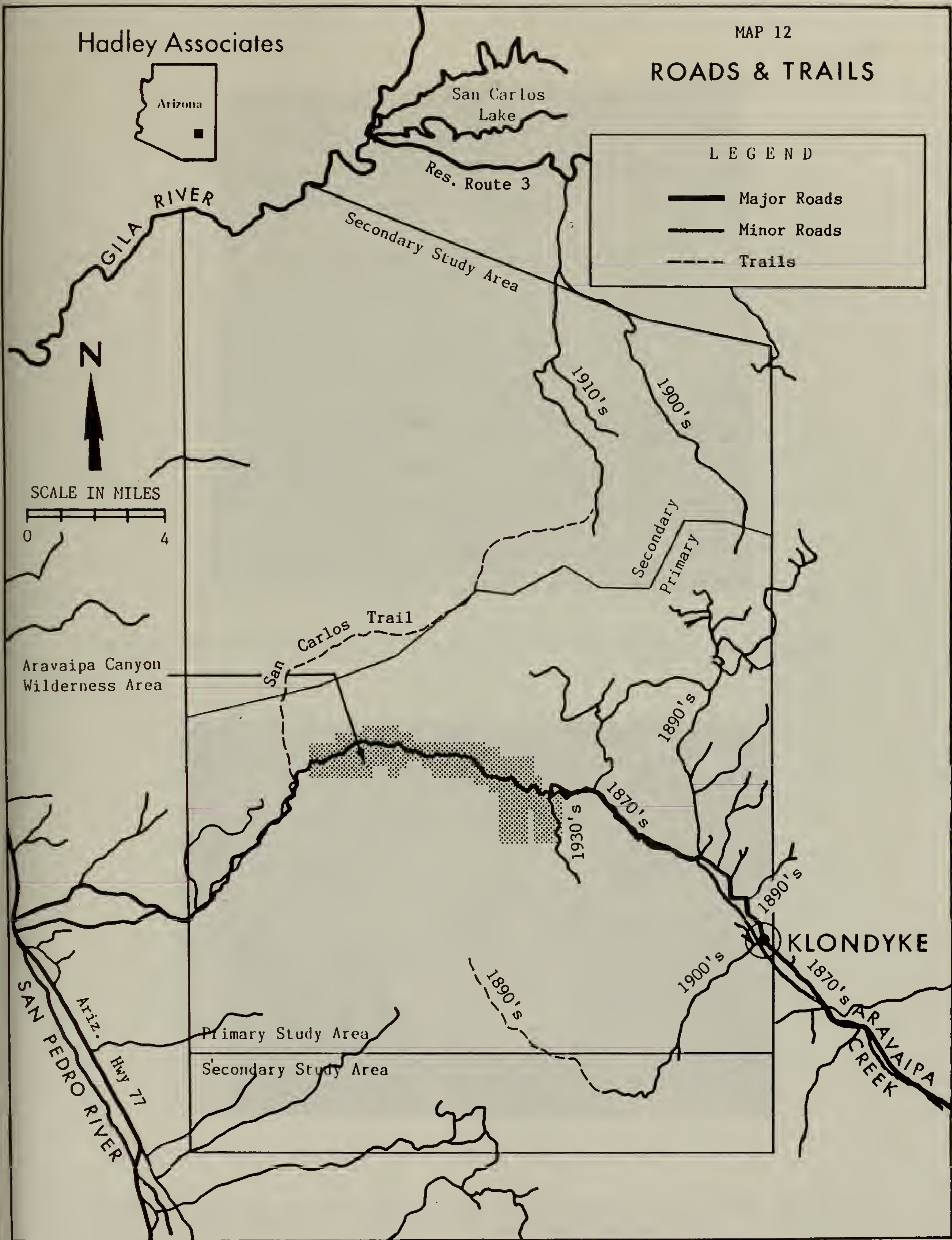
1930s. Although his activities were concentrated in the Copper Creek/Sombrero Butte area, he often moved temporarily to other areas to cut wood close to the point of demand (V. Mercer 1990).

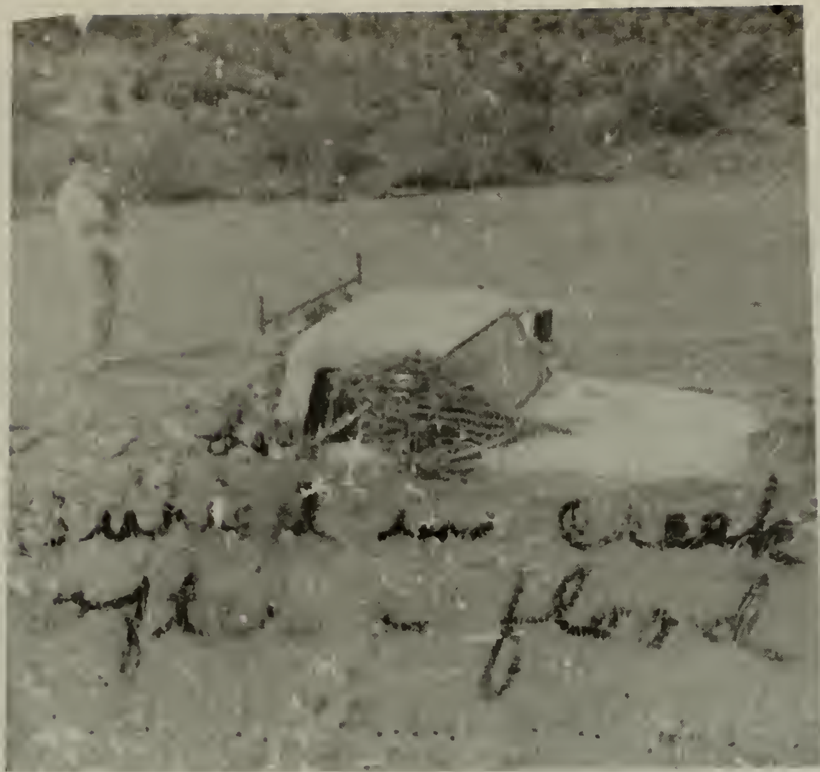
On the east end, several families cut and sold mesquite from the mesquite bosques on the sides of Aravaipa Creek above the emergence point (R. Valenzuela 1990). During the 1920s, a number of recent immigrants from Mexico made their living as woodcutters. Marcellino Ramírez and several of his brothers (Julian, Julio, Domingo and Pascual Ramírez), who lived near the Davis place at the junction of the Bonita and Safford roads, all cut wood for a living. During the early 1920s, other east end commercial woodcutters included José Rubalcava, Francisco Zavala and several others. They transported the cut mesquite on burros and stacked it on the road, where wagons from the lumber yards in Safford picked it up. The wood yards paid $4.00 a cord for mesquite and twenty-five cents per cedar post (M. Ramírez 1990). The Aravaipa woodcutters also sold fuelwood to Roman Romero and Harry Minor who trucked it into town and sold it to individuals. While out cutting, they lived in tents, which enabled them to work wherever they wished to cut. They each cut approximately three cords a week. For five or six years, woodcutting was the main work for this entire group. Martín Ramírez remarked that the entire area from the Davis place to the Eureka Ranch was formerly very wet and had a thick stand of trees. It is now entirely cut out (M. Ramírez 1990). Additional extensive fuel woodcutting for the steamboilers at mines is discussed in Chapter V.

During the 1920s professional hardwoodcutters came to Aravaipa and many other riparian areas to pull out walnut trees on both private and public land. The professional cutters came equipped with saws, winches, chains, flat bed dual-wheel trucks, and all the machinery needed to remove the entire stumps of the largest trees. More interested in the burl-like patterns found in stumps than in the lumber from the trunks and branches of the trees, they carefully dug out the entire root and removed it along with the lower portions of the trunk. They camped in Aravaipa Canyon near the trees they had selected for cutting (F. Wood 1989).

One of the walnut cutters, George Welch, a brother-in-law of Mrs. Abe White, came during the late 1920s or early 1930s with two fully-equipped Chevy trucks. He pulled two truck loads of walnut burls in the area just below the Aravaipa box. He was able to take his trucks through the box after having built up a platform to drive over the box's "waterfall." Welch sold the burls in Safford (J. White 1990). Altogether the cutters harvested between fifty and seventy-five large walnut stumps weighing 1,000 to 1,500 pounds each. Some of the later cutters brought milling equipment, milling walnut and sycamore into one- to four-inch boards on the spot (T. Salazar 1990).

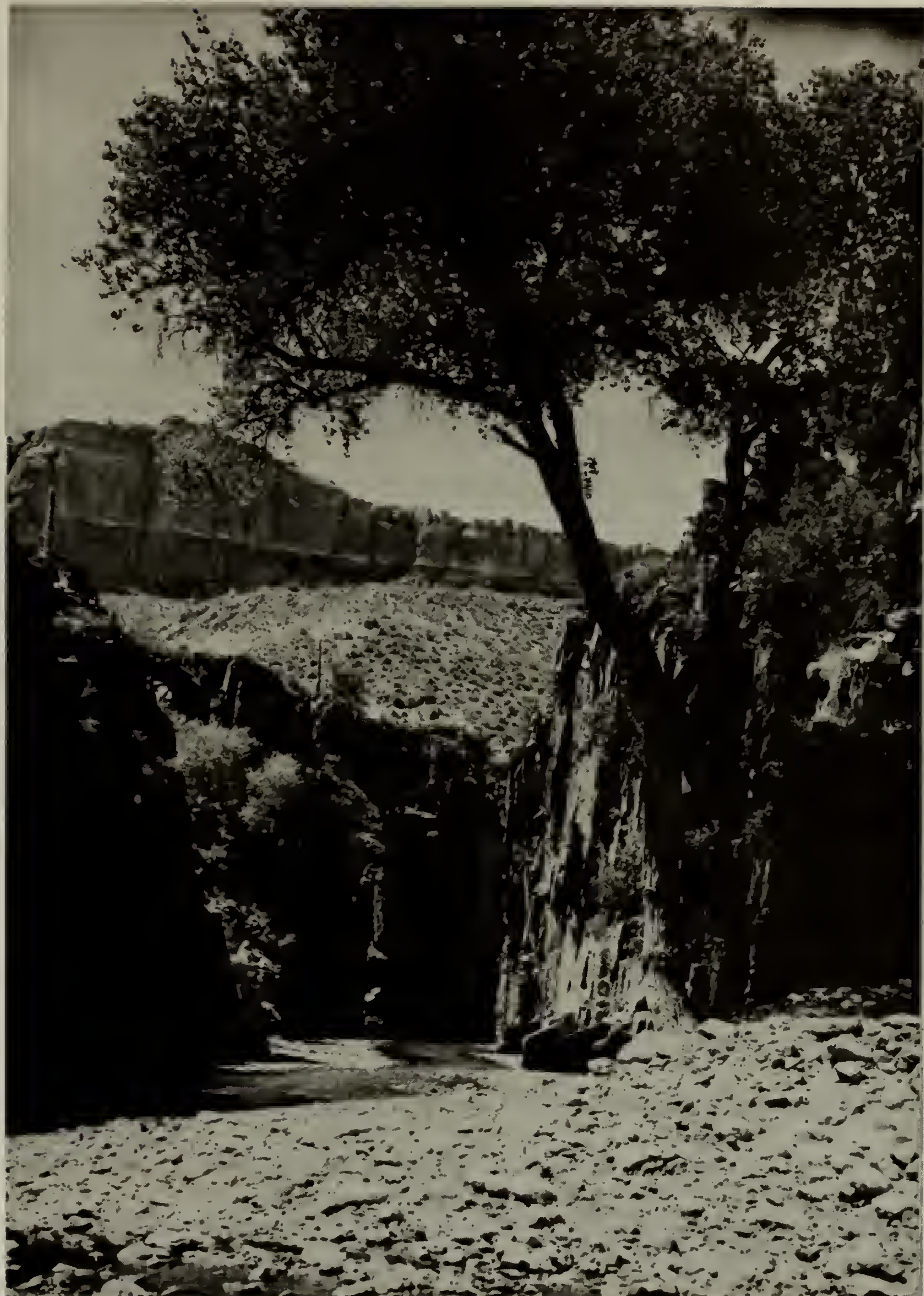
Walnut cutters removed trees from public land without permits and purchased individual trees from private land owners (F. Wood 1989). When Paul Brooks, the owner of Brooks Lumber Company, arrived in Safford in 1920, several flat bed railroad cars were loaded with enormous walnut stump-roots for shipping to furniture manufacturers (P. Brooks 1989). Many canyon residents objected to the removal of the trees. The Wood family made an intense effort to stop the cutting, writing to President Roosevelt himself, and during the early 1930s the federal government put an end to public land walnut removal (F. Wood 1989; C. Wood 1990). Some of the cutters may have continued their work after it was made illegal, since one group left the canyon quickly, abandoning all their camping equipment, stump pullers, saws, and a diesel engine (T. Salazar 1990). Informants noted that additional walnut trees died after severe floods, particularly the 1983 flood. Residents speculate that the pressures of the flood water damaged the trees or that possibly chemical residue left by mining operations in Klondyke, particularly in the slag piles by the mill, was carried downstream during floods and somehow contaminated the trees (F. Wood 1989).


Hadley Associates
Arizona
MAP 12
ROADS & TRAILS
San Carlos Lake
Res. Route 3
LEGEND
Major Roads
Minor Roads
Trails
GILA RIVER
Secondary Study Area
N
SCALE IN MILES
0
4
1910's
1900's
Secondary
Primary
San Carlos Trail
Aravaipa Canyon Wilderness Area
1890's
1870's
1930's
1890's
KLONDYKE
1900's
1870's
1890's
ARAVAIPA CREEK
SAN PEDRO RIVER
Ariz. Hwy 77
Primary Study Area
Secondary Study Area



Buried in the creek after a flood, 1939. (Clay Turnbull Collection)

Joe Tapia telling one of his famous fish stories about the "largest Aravaipa trout ever caught" 1950s. (Victoria Salazar Tapia collection)



Lower Aravaipa, Creek bed, 1938, by Tad Nichols.
(Tad Nichols Collection)

X

WILDLIFE

OVERVIEW

Wild animals entered the lives of Aravaipans through hunting and fishing, trapping, predation on domestic stock, sport hunting, and as part of the conservation movement and increased concern for natural history. The historic richness of Aravaipa wildlife is confirmed by all residents and was recognized by outsiders beginning in the 1930s. Over the past century, Aravaipa's wildlife has changed through extinctions, introductions, and changes in habitat.

Documenting these changes is difficult. Records for the history of local animal populations, particularly non-game species, are hard to find. Earliest descriptions come from the last half of the nineteenth century. They are anecdotal and focused on huntable food or profitable fur species. From about 1850 to 1920, the period when the most dramatic changes in animal populations occurred, the records are limited to general observations such as "abundant antelope" or "decreasing bighorn." The first records are bounty records for lion, wolves, bears and coyotes which were kept (more or less) by private, county, state, and federal agencies. In 1929, the Arizona Game and Fish Department (AGFD) began the first modest surveys of local animal populations near Aravaipa. Even these were limited to deer, javelina, and other game species. The AGFD Wildlife Units did not conform geographically to the Aravaipa area. It was not until 1964, when W. L. Minckley began to survey Aravaipa Creek, that quantitative transects, population estimates, and species lists became part of documented history. Throughout the whole of recorded history, newspapers randomly mentioned flashy game and wildlife items but, until recently, had no ecological reporting.

In short, oral history has been the main source of information on animal resources. Particularly during the period since 1920, many Aravaipans had intimate, daily contact with the study area's fauna. Their observations have been combined with the first complete biological survey done for the Defenders of Wildlife (1980) in which many local residents participated.

EARLY OBSERVATIONS

Spanish explorers, Mexican military officers and early Angloamerican visitors to the canyon all noted an abundance of game. In 1857, James Tevis travelled "down the Aravaipa to the Gila River" on a hunting and trapping expedition with Kit Carson's brother, Mose Carson. Tevis remarked that they had "good luck and lived like two kings. Deer, turkey and fish were plentiful, and so were bear and mountain sheep." Tevis's companion loved to trap Arizona otter and beaver, even though the price for Arizona pelts was lower than pelts trapped farther north. Although Tevis does not mention trapping in Aravaipa Canyon itself, during his last night on the "Gila" (sic. San Pedro) near Aravaipa, a number of beaver constructed a dam which backed up water and flooded their camp site (Tevis 1954: 26, 46). His description of the San Pedro valley near Aravaipa takes the presence of antelope for granted. The grass was so tall "one could see only the heads of antelope that roamed over the valley in large herds" (Tevis 1954: 26). Ten years later, William Bell reported the same abundance of game, especially turkey, beaver, and quail (Bell 1869). However, by the early 1870s, at the time the Aravaipa Reservation was established, Apaches frequently complained that they were starving because deer and other game were no longer plentiful in the immediate area of the military post and reservation (Bourke 1971; Clum 1929).

BIG GAME

EXTINCTIONS AND INTRODUCTIONS

Aravaipa residents were present at the time of the extinction of the desert bighorn sheep, the wolf, and the pronghorn antelope. The extinction of the grizzly bear occurred before settlers arrived or before the memory of the Aravaipans interviewed. Bighorn and pronghorn have subsequently been reintroduced.

Desert Bighorn Sheep

The history of bighorns falls into two periods: the original bighorns from pre-Euroamerican times to their disappearance in the 1930s; and the period of restocking with bighorns from the Kofa Mountains in the 1950s to the present. The introduction of domestic goats during the 1890s and the penetration of cattle into the tributaries of the Aravaipa probably posed the first real threats to the Aravaipa bighorns. Goats not only used many of the same browse, grass, and forb species as the bighorn, they also displaced bighorns from shaded cliff overhangs, bedding areas, and from proximity to terrain to which they could escape during the lambing season. Although cattle and bighorn had less dietary overlap, it occurred in certain forbs and the "six week" summer grasses. Because of their need to cluster near water and to graze on gentler slopes, cattle utilized a distinct type of terrain. Nevertheless, cattle and goats and feral burros displaced bighorn from alluvial flats and mesa tops, known to be bighorn feeding grounds in other parts of Arizona. They also partly consumed the "curing" grasses which can constitute twenty to thirty percent of bighorn feed. At present, in "normal" years, the dietary overlap in cattle/bighorn diet is as great as thirty-nine percent at Aravaipa' but food has not been shown to be the limiting factor in bighorn population growth. Acacia spp., scrub oak, prickly pear and red brome overlap extensively in the diets of both species but these plants are not major components of the bighorn's total diet. Bighorn prefer shrubby globe mallow, jojoba, and buckwheat which separates them substantially from cattle but not from goats (Dodd 1987).

The advent of settlement after the 1880s reduced bighorn access to water sources as miners, goat herders, and other settlers selected homesites near springs. Gradually cattle, goats and feral burros usurped watering areas. Bighorn are known to avoid water sources when burros are present. Disease transfer between domestic goats and bighorn may have occurred. The severe drought of the late 1800s and early 1900s was a period in which the number of water sources diminished. Bighorn access to the limited number of water sources was further restricted by human settlement, cattle, goats and burros. Feed competition occurred with domesticated browsers and grazers for the small amount of feed available, and possible disease transfer increased. Despite the fact that hunting bighorn had been illegal in Arizona since the mid-1880s, poaching with improved rifles continued.

Between 1880 and 1910, the most severe bighorn population collapse occurred. After 1910, informants reported straggler bighorns but no herds nor major hunts. The last Aravaipa unofficial record occurred in the 1930s, when one of Wheeler Reece's cowboys shot the "last" bighorn on Brandenberg Mountain. Records for other parts of the Galiuros occurred until 1942. Since goat herds and burros remained in the area through the late 1930s, unimpeded access to water, shelter, and lambing quarters, even for stragglers, would have been difficult.

After World War II, the habitat of Aravaipa improved for bighorn in many ways. Burros, feral horses, and goats had been absent for a decade. The numbers of cattle were substantially reduced. Increasing numbers of water tanks would have benefitted bighorn had they still been in the area. Only the increase in five-strand barbed wire fencing would have hindered bighorn movement.

Local memory of the bighorn, and particularly the enthusiasm of Durward Sanford, led to the restocking of the canyon in 1957 under the auspices of the Arizona Game and Fish Department. After initial failure, another restocking occurred in 1965. In 1972, the enclosure which had initially sheltered the bighorn was opened (D. Sanford 1990; T. Waddell 1990). At present, cattle and bighorn overlap on two 450 animal-unit-per-month cattle allotments. Overlap of about eighty percent in range occurs, although portions of Aravaipa Canyon are off-limits to cattle and steeper slopes outside the canyon are difficult for cattle to negotiate, reducing range overlap.

The advent of many conservation and hunting groups shifted the bighorn issue from reintroduction and survival to proper management and monitoring. In 1980, Floyd Krank became a minor hero by proving his on-the-ground census was more accurate than the helicopter census of AGFD. The Aravaipa herd is now one of the healthiest in the state. Concerns for human disturbance from recreational hikers, hunting, fencing and disease control predominate.

The Wolf

Only three informants had observed wolves in the Aravaipa area (D. Sanford 1990; N. Weathersby 1990; C. Prude 1989). One wolf was seen on the Whalen place in Aravaipa Valley in the early 1920s. In 1932, a wolf was poisoned on the Mattice Ranch, (E. Claridge 1989: 145). In 1952, a lone female wolf appeared at the Deer Creek Ranch in the Galiuros. Previously injured, she stayed around the ranch dogs and was eventually caught by the government trapper (C. Prude 1990). In 1976, a lone male wolf was trapped between Haby Spring and Rattlesnake Canyon. This wolf has achieved considerable fame since it may have been the last wild wolf in the American Southwest (Brown 1983: 114-115).

Wolf extinction was finally accomplished after a fifty year cooperative effort in the Southwest between ranchers, federal hunters from Predator and Rodent Control, the State of Arizona, and private trappers working for cattlegrower's associations. The major blow to wolf populations occurred between the mid-1920s and 1950. By then, many of the wolves were without packs, and those seen were stray wolves, or "lobos," as recorded by Aravaipa residents. Although not reported for Aravaipa, some cattle killings attributed to wolves had actually been attacks by feral dogs (Brown 1983: 88-98).

The Pronghorn

Through the 1920s, antelope roamed in large numbers in the Sulphur Springs and upper Aravaipa valleys and in smaller numbers between the Eureka Ranch and the emergence point of Aravaipa Creek. Residents recorded herds of fifteen to twenty animals throughout the entire area from Bonita to Cottonwood Pass. One large herd stayed east of Deer Creek Ranch and another grazed closer to the Eureka Springs and Sierra Bonita ranches. According to Charlie Whelan, antelope suffered from competition with cattle in the Sulphur Springs and Aravaipa Valleys. The final blow was the drought of the early 1920s (C. Whelan 1990). Antelopes were reintroduced in the 1950s, although exact locations are not known. On the west end, no informant can remember seeing pronghorn, although nineteenth century documents mention large herds of antelope in the San Pedro Valley (Tevis 1954).

The Grizzly

In 1852, a party of Missouri prospectors killed two grizzlies in a tributary of Aravaipa Canyon (Thompson 1895), perhaps Booger Canyon (Brown 1985). There is clear evidence of grizzlies in the Galiuros (Brown 1985). The San Carlos Apache Reservation was considered one of the last strongholds, a "center" of Arizona grizzly country. Southwestern grizzlies, known to be partial to riparian areas, were reported in other parts of the San Pedro Valley not far south of Aravaipa. During the summer of 1871, General Crook's pack train encountered a group of seven bears in Aravaipa Canyon. Packers shot five of them and wounded the other two. Lieutenant John Bourke recorded the incident without noting the type of bear (Bourke 1971: 141), although it is likely that had they been grizzlies, he would have mentioned it. By 1900, the grizzly had surely become extinct in the Aravaipa area (probably a few decades earlier) with the few closest grizzlies living in the San Carlos area (Brown 1985). None of the informants for this study had ever heard members of the preceding generation mention grizzlies in Aravaipa or along the San Pedro.

CHANGES IN ABUNDANCE AND DISTRIBUTION

The most frequently mentioned alterations in abundance and distribution of large game concerned: (1) the abundance of deer, (2) the expansion of mule deer in the 1950s and their replacement of white-tail, and (3) the descent of mountain lions into lower elevations in recent years (see Hunting, Trapping, and Predator Control).

Mule Deer and White-tail Deer

There is little controversy on the recent history of deer numbers in the Aravaipa area. Residents and game managers both recall that from the 1940s to the 1960s, the area had many more deer. In the late 1960s, deer populations went into a rapid decline. This change occurred all over southern Arizona. Many ranchers believe that hunting pressure radically reduced the number of deer. Recent observations in Aravaipa, at least, indicate very few bucks compared to does, suggesting that overhunting of bucks has occurred (T. Waddell 1990). Arizona Game and Fish Department is interested in maintaining a high kill rate for Arizona hunters. Informants for this study stated that increased hunting pressure on deer forced mountain lions into lower areas where calves took the place of deer in their diets. From the point of view of the historian, there is a complex interaction between food supply, deer, hunters, mountain lions, calves, ranchers, and government agency monitoring and decisions. The "food web" is even more complex because javelinas are an alternative prey, diverting lions from calf killing.

According to informants, white-tail deer were the only widespread deer until the 1930s and 1940s in the Aravaipa area. Prior to the 1930s, white-tail dominated the Table Mountain area (F. Wood 1989). During the 1930s, herds of ten to fifteen white-tail were commonly seen in the canyon (C. Turnbull 1990). Desert mule deer were only observed in small clusters near Eureka Springs and Cedar Springs (T. Waddell 1990) and along the San Pedro (S. Neal 1990). Many informants had never seen a mule deer in the higher elevations through the 1950s (J. Rubal 1990), and as late as the 1950s, they were unknown around Klondyke (T. Waddell 1990). Local rancher Durward Sanford noted that mule deer did not reach their present highest elevations in the area until the late 1960s.

The first change in mule deer distribution may have started with introductions by AGFD sometime in the 1930s or 1940s. Introductions of northern mule deer from the Kaibab plateau genetically swamped the Cedar Springs and Eureka Springs populations which belonged to the *crookii* subspecies or race. After World War II, mule deer began to spread throughout the area. Ranchers observed the replacement of white-tail by mule deer on the Claridge Ranch near the Aravaipa townsite. White-tail, which formerly inhabited most of the ranch, are now found only above Landsman Camp, on the higher elevations of Imperial Mountain and on Horse Mountain above Anderson Spring. Dry Camp Ranch, which formerly was white-tail country, is now exclusively mule deer range (W. Claridge 1990).

Mule deer densities rose throughout Arizona during the late 1950s and early 1960s. Densities of up to twenty-five deer per square mile were common in desert scrub and chaparral. During the mid- to late-sixties, mule deer went into a rapid decline, bottoming out in the early 1970s (AGFD, annual area reports). Explanations for the spread of mule deer during the 1950s differ among both residents and game managers. Fred Wood stated that hunting at lower elevations eventually pushed the mule deer into higher elevations, forcing the white-tail still higher. Durward Sanford and Shorty Neal believe that the mule deer returned to former habitat.

They speculate that mule deer originally inhabited the lower elevations up through the chaparral country, moved to lower elevations in the 1920s to 1940s, and then returned again to the higher elevations during the 1950s. Sanford has found both old bighorn horns and mule deer antlers which appeared to be many decades old in higher elevation caves near Dry Camp ranch, and Neal, who worked in the Copper Creek area, observed similar evidence.

There appear to be good reasons for Neal's and Sanford's observations. By the 1940s, goats and burros had been removed from the Aravaipa area, re-opening the browse habitats to the mule deer. In addition, after World War II, individual residents and the Biological Survey operated an effective predator poisoning campaign. In 1949, Compound 1080 joined strychnine as a poison and was used until 1972. Many coyotes were killed. Coyotes are a major predator of mule deer fawns in years of low rabbit/rodent populations, and in drought years when does experience nutritional stress and fawns have reduced cover. The presence of fewer browsers and fewer coyotes perhaps allowed mule deer to reinhabit and repopulate higher elevations of the Aravaipa area.

Goats and mule deer overlap on almost all preferred food plants. Dietary overlap between mule deer and cattle, especially for spring forbs and for fall and winter shrubs, has been reported in the Tonto National Forest. Shrubby buckwheats and mallows, lotus, false mesquite (fairy duster), ceanothus, and jojoba nuts account for most of the dietary overlap (O. D. Knipe 1982). Cattle/mule deer competition appears severe only in dry years. In wet years, other factors, like hunting, limit mule deer. Claude McNair noted that in many years cattle may help mule deer. Deer often followed cattle during the "green up" period, moving from lower elevations in the spring, to higher elevations in the fall. During the early fall, as cattle ate the older grass and new shoots appeared, mule deer followed the cattle eating the new shoots as they were exposed by the cattle.

There is some controversy over what causes fluctuations in the ratios between mountain lions, calf kills, and mule deer. Some wildlife managers believe that calves "prop up" the densities of mountain lions so that "cycles" of predator/prey oscillation do not occur. The situation seems more complex when alternative prey, competing predators, and sheltering sites for mule deer are considered.

HUNTING, TRAPPING, AND PREDATOR CONTROL

As the twentieth century progressed, the distinction between sport and predator control became sharper and sharper. In the early 1900s, these finer distinctions were often ignored. The killing of black bear, wolves and mountain lions was predominantly for predator control, more rarely for sport, occasionally as a kind of predacide sport. The killing of coyotes by hunting or poison was for predator control and/or pelts. Although coyotes are "small" game, they will be discussed here because they were treated as a major nuisance. Hunting and trapping other small game is described in the next section.

Predator control started in the 1800s with hunting and trapping. Individual ranchers paid bounties for pelts, skins, paws, or other proof that a predator had been killed. During the territorial period, the Arizona territorial legislature, several counties, and many cattlegrowers' associations paid predator bounties. After the early 1920s, the Arizona Livestock Sanitary Board, the Arizona Cattlegrowers Association, the Arizona Mohair Growers Association, and, in the Aravaipa area, the Cochise-Graham and Pinal County Cattlegrowers Associations, all paid bounties. At various times, lions, wolves, coyotes, and bears had bounty prices (McEuen 1987).

Between 1917 and 1937, the Cochise-Graham Cattlegrowers Association (in cooperation with the counties) paid approximately $25.00 to members in good standing for lions or wolves taken on their range. The rancher had to submit a hide, "scalp," or paw as proof of the kill. The applicant had to file a "hide affidavit" with the clerk of the county board of supervisors who, in turn, forwarded the payment to the Association (McEuen 1987: 16). From 1947 to 1971, the State of Arizona offered a $50 bounty on lions. Arizona was the last state to repeal lion and wolf bounties (AGFD records).

From the late 1800s, federal predator control agents concentrated on trapping lions and bears. Federal predator control was initially administered by the U.S. Department of Agriculture (USDA) with Arizona receiving assistance as a sub-division of the New Mexican program. Agents from the federal Division of Biological Survey killed predators for stockmen upon request. By 1916 or 1917, Arizona obtained an independent office. In 1939, the Biological Survey for the entire country was transferred to the Department of the Interior and the U.S. Fish and Wildlife Service (USFWS) was given responsibility for a department known as Predator and Rodent Control (PARC). PARC later became the Animal Damage Control (ADC) unit of USFWS. In 1986, it was returned to the USDA (*Wildlife Views*; Brown 1985). The exact date when federal agents began to hunt and trap predators in the Aravaipa area is not known. During the 1940s, federal agents trained in predator poisoning began to assist ranchers by setting baits for coyotes, bobcats and rodents.

Throughout Aravaipa's history, some ranchers preferred to solve their predator problems privately without assistance from outside agencies (N. Weathersby 1990). In the early decades, strychnine was the most commonly employed poison. Without restrictions, the poison was readily available to private individuals in feed stores throughout Arizona. Goat herders used it in Aravaipa shortly after the turn of the century. Poison was more effective against coyotes and bobcats than was trapping or hunting. Herders baited goat or calf carcasses killed by predators and frequently carried strychnine in their pockets. Until the 1940s, these practices had little government supervision. After 1940, agents trained ranchers in proper use of strychnine and provided them with personal supplies. Despite federal attempts to control strychnine, many untrained individuals still had access to it (S. Baker 1990; N. Weathersby 1990).

When not properly used, the strychnine remained active in the carcass even after it had dried. The carcass became a non-specific poison, often killing birds and non-target mammals. During the 1940s, the powdered form was replaced by tallow pills. When not consumed, the pills melted down into the ground and rendered the poison less harmful. Some Aravaipa ranchers remember that even in the pill form, strychnine sometimes killed dogs and other non-target species (C. McNair 1990).

In 1949, the Compound 1080 predator control campaign began. The poison, administered only by federal agents and not available on any markets, imposed predator control agents more directly into the lives of ranchers and government land managers. No longer was poisoning a home ranch operation. The 1080 program centered in an area near Safford, although some use occurred in the Aravaipa and neighboring ranches. Ranchers witnessed the rapid thinning out of coyotes. They subsequently observed an increase in fawns, deer, javelinas and rabbits (N. Weathersby 1990; D. Sanford 1990). Although directed at coyotes, Aravaipa residents maintain that the program killed other carnivores such as ring-tailed cats and omnivores such as badgers.

The Mountain Lion

All early reports remark on the relative abundance of lions in the Aravaipa area. Their commonness during the 1880s is illustrated by a story recorded by Dan Ming's daughter. One night, Ming's dogs treed a lion behind his house in Aravaipa Canyon. Ming fired a shot from his back door. The lion became confused and ran into the house, leaving the dogs outside. Ming shot again, but only grazed the lion's head. Unable to reload in time, Ming was forced to dispatch the lion inside his kitchen with the stock of his gun (Ming file AHS).

Lions were known as calf killers, although many informants stated that lions preferred to eat colts when available (N. Weathersby 1990). When a lion kill was found, Aravaipa ranchers either hunted or trapped the offending lion themselves, invited professional hunters to hunt the lion with dogs, or sometimes requested federal agents to poison or trap it. Equipped with lion hounds, camping gear, and their own horses, lion hunters either set out alone (predator control) or guided sport hunters. Many of the sport hunters came from out of state to hunt with local ranchers (*Los Angeles Times* 7/9/1939). Members of the Lackner family, for example, have hunted and trapped lions from their ranch in upper Four Mile Canyon since the 1940s. Dr. Harold Lackner offered guided lion hunts, advertising in sports magazines like *Outdoor Life* and *Field and Stream*. During the 1940s, the price was approximately $100 for a week-long hunt, $150 for a ten day hunt, and $300 for a guaranteed lion kill. The Lackners also guided hunts for bobcat, bear, and javelina (Calder 1990: 162).

Until the 1960s, livestock losses were greatest on ranch allotments in the higher elevations (C. Prude 1990; E. Lackner 1990; D. Sanford 1990). Deer Creek Ranch is in the upper elevations of the Galiuros, and Four Mile Canyon Ranch has canyons which connect to the higher elevations of the Galiuros, making lions more common on these ranches. Professionally guided lion hunts probably took place more frequently on these ranches. Between 1951 and the 1970s, up to 100 lions were trapped or shot on Deer Creek Ranch. During the years the ranch was operated by Charlie Prude, professional hunter Ted Ferguson hunted or trapped about eighty lions and the Wallaces and Glenns also guided hunts (C. Prude 1990). The Lackners did most of their hunting in the higher elevations of their ranch prior to 1970. However, after that time, lions moved into lower elevations. The Salazars, who ranched at lower elevations, never had to trap or shoot lions until the 1970s. Lupe Salazar, who operated the ranch from about 1915 until 1970, killed only one lion. He never owned his own traps.

Members of the Salazar family noted that deer were plentiful on their ranch in former times, and lions preferred deer meat to beef (B. Salazar 1990).

Ranchers claim that since the 1970s, there are more lions and more calf killings (W. Claridge 1990). After the 1960s, the deer and javelina population declined at the higher elevations and lions moved downslope and/or switched to calves. Some ranchers attribute the change in lion patterns to over-hunting of deer and javelina permitted by AGFD. They also attribute lion increase to diminished trapping and hunting since the return of ranches on the San Carlos Mineral Strip have been returned to the Apaches. In addition, hunting and trapping is not permitted on land owned by The Nature Conservancy. Wildlife managers are not necessarily in agreement. Trapping and poisoning of mountain lions has been maintained on some allotments with the help of Animal Damage Control. In 1974, the AGFD stated that an "above average number of lions had been harvested from the Santa Teresas which could increase fawn survival rate" (AGFD records). Although exact statistics for the Aravaipa area are undetermined, between 1917 and 1973, the Animal Damage Control and predecessor units claimed to have killed 2,774 lions statewide.

Black Bear

Although bear must have been more common during the first decades of settlement, as indicated by U.S. Army packers killing seven bears in one day (Bourke 1871), informants for recent years reported them in smaller numbers than lions. On the west end, the Wood family saw bears very infrequently in Aravaipa Canyon itself. They saw bears more often at higher elevations near Bear Springs and near Table Mountain. Like lion populations, bears entered Aravaipa largely from the Galiuros (F. Wood 1989). Few ranchers experienced bears killing livestock. Most agreed that once an individual bear developed a taste for livestock, it became a more serious problem than a calf-killing lion, sometimes killing every night. On the east end of Aravaipa, above Klondyke, members of the Weathersby family trapped for bears on the higher elevations of the ranch, killing an average of two to three bears each year (some years none, some years four or five). Traps were mainly set on the slopes of the Santa Teresas (N. Weathersby 1990).

SMALL GAME AND OTHER ANIMALS

EXTINCTIONS AND INTRODUCTIONS

Beaver, prairie dogs, and Merriam's Turkey have all become extinct in the Aravaipa area. Beaver were last mentioned in Aravaipa by Bell (1869):

> The stream had to be crossed over and over again--often every hundred yards; and it was curious to see how active the little axe-men of nature, the beavers, had been, for many a wetting was saved by our men on foot being able to cross over the large trees which, having been felled by the little fellows, had fallen athwart the stream.

An early government poison program extirpated the prairie dogs which formerly were very thick between Aravaipa and Willcox (V. Tapia 1989). Turkeys were last seen in the Aravaipa area in 1960. They had suffered from the late 1950s drought (T. Waddell 1990). Attempts to re-introduce turkeys have not been successful in the canyon itself. Twenty to thirty were introduced into the Oak Springs area in 1972-73 (F. Wood 1989). A few were reported by Neuel Weathersby for the Santa Teresas and Galiuros. Whether they were introduced or were Merriam's Turkeys is not known.

Chukars were introduced into the Oak Springs area in 1973 (F. Wood 1989) where they were seen by an unidentified rancher in 1978, but have not been reported since then. An attempt to introduce bobwhite failed. Surprisingly, the house mouse (the European import, not the local native mouse) has not arrived in Aravaipa. Starlings, pigeons, and European House Sparrows introduced themselves at some unknown date.

CHANGES IN ABUNDANCE AND DISTRIBUTION

Most small mammal changes in abundance or distribution go unnoticed. For instance, particular micro-habitats heavily influence the distribution of amphibians and reptiles in Aravaipa. Some micro-habitats, such as rocky outcroppings, are natural. But others are of human construction and include brush piles, rock or boulder piles, rubble, building ruins, and ponds. Leopard frogs and Colorado River toads have spread into the uplands with the increase in watering areas. Greater earless lizards and collared lizards have profited from road building through the increase in rock piles and sunning areas. Tree and spiny lizards use vertical surfaces such as fence posts and corrals, which compensated for the loss of many trees. On the other hand, roadkills of some lizards and snakes have increased. All amphibians appear to be at low population levels, if not threatened, throughout the Southwest. The causes are unclear.

In human-created water habitats, desert shrews, three species of bats, and raccoons have found additional habitat. Various bats, cliff chipmunks, rock squirrels, brush mice, woodrats, and skunks have profited from the presence of human buildings. Caves, including mine shafts, have provided shelter for many species of bats.

Two ponds (Hyacinth Pond and Eureka Tank) and various stock tanks (e.g., Woodrows Tank) are human-constructed environments that support wintering ducks and some shorebirds. In the Oak Spring Cabin area, a high diversity of birds is reported (Johnson 1980) because of tight juxtaposition of biotic communities and introduced apple and fig trees. In these areas, the presence of Desertscrub and Desert grassland birds probably reflects the degradation of the desert grasslands (Johnson 1980).

Coatimundis

Coatis were collected in the Huachuca Mountains as early as 1892. They were common in the Patagonia Mountains by 1914. Nevertheless, residents of Aravaipa did not see coatimundis until the late 1940s. Their arrival in Aravaipa may have been the result of a coati population explosion. The Arizona populations supposedly peaked in 1959 and declined in 1960-61. The race of coati has not been studied in Aravaipa.

Trappers active in the canyon since the 1920s never saw coatis as children (J. Rubal 1990). They first appeared south of the Aravaipa area in the late 1940s and gradually moved northward (C. Whelan 1990), but were not commonly seen until after 1970. Aravaipa is apparently the northern breeding limit of coatis, since they have not been seen north of Aravaipa with young.

During the 1960s, animal handlers making a nature film near Sombrero Butte accidentally let an unknown number escape. These coatis thrived, concentrating around particularly desirable foods like wild grapes on the Mercer and Rhodes ranches (V. Mercer 1990). It is not known whether the escaped coatis integrated into local coati groups. In the past, Aravaipa residents referred to coatis as monkeys and considered them mean.

Several informants reported relatively large bands of coatis with thirty to fifty animals, particularly near Table Mountain (C. McNair 1990).

Woodhouse's Toad

The southwestern Woodhouse's toad appears to be threatened with local extinction stemming from human influences. The Great Plains Toad is expanding its habitat. The changes in riparian habitat of Aravaipa Creek have placed the two toads in direct competition for breeding sites in irrigated fields, resulting in hybrid forms. Concern for the Woodhouse's extinction emerged in the late 1970s when the first detailed survey of Aravaipa's amphibians occurred (Johnson 1980).

Gambel's Quail

The history of quail in the Aravaipa area is not well documented. Quail profited by the spread of mesquite and filaree during the early part of the century but suffered when overgrazing reduced the abundance of annuals or when cattle ate a substantial portion of quail food (e.g., mesquite beans or filaree). Wilfred Claridge feels that the decrease in filaree and increase in fox tail may have hurt quail abundance in the Aravaipa area. Biologists have observed quail eating the young shoots of filaree in the spring, but not the seeds. Residents have witnessed various natural catastrophes, such as the 1967 snow storm, which temporarily set back quail numbers. Ranchers found large numbers of dead quail under brush piles after the storm (W. Claridge 1990).

Javelina

After heavy hunting during the first years of this century, javelina populations plummeted throughout southern Arizona. Protection during the 1940s and 1950s restored numbers sufficiently that javelina hunts were resumed. Aravaipa's javelina populations probably did not suffer the severe reductions experienced in other parts of southern Arizona. However, in recent years, local residents have expressed the concern that over-hunting occurs and that severe reductions in javelina populations may force lions to increase calf kills. The AGFD is interested in increasing javelina hunts but not in over-exploiting the population in relation to food availability. AGFD has not addressed the lion/javelina relationship.

Prior to the 1950s, residents reported numerous, large herds of javelina in Aravaipa. Between Dry Camp and Painted Cave Ranch, in the area of Deer Creek, and from the head of Sand Wash to the Claridge farm in Aravaipa the herds averaged between fifteen and thirty animals. Several residents observed herds of fifty. AGFD rangers have reported herds as high as forty-five to seventy. This is higher than the overall average for Arizona of nine (Knipe 1964: 24) and higher than the largest herds for other parts of the state. Javelina biologists believe that most herds subdivide when they reach about twenty-five (Knipe 1964). Informants dispute this perception of small herd size, saying that such small herds must be the result of hunting pressure and the need to move in smaller, less vulnerable groups. Many informants commonly saw herds of forty to fifty during the 1950s (W. Claridge 1990; C. Turnbull 1990; C. Wood 1990; J. White 1990; D. Sanford 1990; N. Weathersby 1990; B. Salazar 1990; J. Rubal 1990). Some of these larger herds were observed in spring and summer and were not the "coalesced" winter herds which biologists admit can be as large as twenty five (Knipe 1964).

During the period of abundant javelina, several locally famous hunts took place. Some ranchers believe that, in drought years, javelinas compete with cattle and goats for spring feed. During the spring of 1946 or 1947, over 100 javelinas dug up all the filaree at the PM Bar pasture on the Weathersby Ranch, eating the roots and leaving the rest of the plant. It was a dry year with scarce feed for cattle (N. Weathersby 1990). The Weathersbys invited hunters from the Gila Valley and surrounding areas to join in a javelina hunt, lending horses, guns and ammunition to those without them. During one weekend, approximately 180 javelina were shot (N. Weathersby 1990). During the late 1950s or early 1960s, an unsolicited radio announcement informed sportsmen that javelina hunting was particularly good at Dry Camp Ranch and gave explicit directions to reach the area. So many hunters arrived that it "looked like a little city ... with a solid line of cars." After that hunt, javelina numbers declined permanently (D. Sanford 1990). On the west end, during the 1960s, Joe Flieger employed an intentional hunt strategy to reduce javelina numbers. Much to his later regret, he encouraged sports writers to publish reports of excellent javelina hunting near Painted Cave Ranch. He discovered that an over-population of hunters was more trouble than rooting javelinas (J. Flieger 1990).

HUNTING, TRAPPING FOR FUR, AND PEST CONTROL

Raccoon, ringtail (civet), coyotes, badgers, bobcat, fox, and skunk were all hunted or trapped for furs throughout the settled portions of the Aravaipa area. Prairie dogs and rabbits were considered the major small mammal pests in the upper Aravaipa Valley. Government control programs were directed against the prairie dog in the upper Aravaipa Valley (V. Tapia 1989). Shortly after 1900, large rabbit drives were organized by Graham County farmers and ranchers. Farmers paid boys five cents apiece for each rabbit killed. Such drives, commonly held at the turn of the century, may have taken place in the Aravaipa Valley. Trapping provided important supplemental income to settlers on both ends of the canyon, particularly during the Depression. Informants reported that during the 1930s, trapping brought in "the only cash money we ever saw" (J. Sanchez 1989) or "kept the kids in clothes" (N. Weathersby 1990). Although the amount of trapping varied significantly, in almost all families with sons some trapping occurred. On the east end, dozens of individuals trapped regularly. School boys set trap lines along the edge of the creek and checked them on the way to school in the morning. The boys in the Rubal family, who lived by the road to the Grand Reef Mine, had trap lines all the way from their house to the Aravaipa school within the canyon. They ran at least ten traps during the season (J. Rubal 1990). On the west end, the boys in the White and Wood families were the regular trappers. The White boys ran trap lines while they were out in the goat camps (J. White 1990).

Some adults trapped as well. José Sanchez frequently trapped with Juan Calderon. They were familiar with the habits of Aravaipa fur bearers and set the traps "where the animals went" (J. Sanchez 1989). Sanchez ran a trap line of about thirty traps. He caught many foxes but only five or six bobcats each year. He seldom trapped raccoons and always tried to avoid catching skunks. Lupe Salazar trapped small fur-bearers once, when he had a broken leg and was unable to ride. Inspired by a report that "coon" skins would bring $6.00 apiece, he set racoon traps with mirrors made of tin foil. Although he caught a few racoons, skunks appeared in the traps more often and he soon gave it up (B. Salazar 1990).

Trapping occurred only in winter when the skins were well-haired and would not spoil. In warm weather, skins became wormy. Trappers tried to preserve the skin, killing the animal in a manner that did the least damage to the pelt (J. Sanchez 1990). They used traps appropriate to particular species and baited them with ground fermented fish and rabbit meat.

Fur companies actively solicited pelts from their Aravaipa suppliers. They published price lists and advertised in local newspapers. They sometimes mailed price lists directly to the trappers. In the fall, at the beginning of the trapping season, price lists were posted in the local mercantile or post office. Buyers occasionally came to the Klondyke store to purchase skins, but more often trappers sent the skins by mail, receiving checks some time later (J. Sanchez 1989).

Eastern fur companies usually paid $2.00 to $4.00 a hide depending on the species (J. Sanchez 1990). Fox, bobcats, ringtailed cats and coyotes (in this order) were in greatest demand, and trappers aimed their sets at these species. Fewer raccoons and badgers were caught. Badgers were undesirable because they were difficult to skin and had too much fat. Coyotes were the most difficult to trap and were not as marketable to fur companies until the 1960s. The skins of ringtails brought the highest prices (up to $8 to $10), particularly for skins with a greater proportion of black. Fox and bobcat brought the next best prices and were easier to trap (S. Neal 1989). Small mammals were rarely hunted, with the exception of raccoons. During the period that the Athletic Mining Company ran the Aravaipa Mine, they hired workers from Arkansas. Accustomed to "coon" hunting in Arkansas river bottoms, the workers strapped miner's lights to their heads, stalked Aravaipa Creek at night, and shot many raccoons.

FISHING

Until William Minckley studied Aravaipa Creek (Minckley 1981) and discovered one of the last remaining strongholds of native fish, local residents did not make finer taxonomic distinctions. There were "suckers" or "catfish" *(Catostomus)* and "mud trout" or "Aravaipa trout" (Roundtail chubs, *Gila robusta*). The smaller Aravaipa native fish were simply called minnows (loach minnows, spikedace). Several species have been introduced. Members of the Wood family planted bass and other fish on several occasions. The attempts were largely unsuccessful as the fish were washed out of the creek by floods (F. Wood 1989). Nevertheless, Aravaipa

Creek has four introduced species: (catfish, largemouth bass, green sunfish, and mosquitofish); the red shiner invaded in 1990.

Fishing along Aravaipa Creek was common, and was particularly popular with young boys. Until the 1960s, the large holes under bluffs and big sycamores were always full of fish. A popular fishing spot on the east end was at the emergence spring on the north side of the creek. In the spring's big hole, the water was so clear that all the fish could be seen (B. Avery 1990). Aravaipa trout were plentiful and were the most popular food. If the boys forgot their fishing poles, they could catch fish with their bare hands. Canyon residents also ate large suckers, reporting that, although boney, the flavor was not bad.

Residents fished by means of diversion dams, dynamite, and seines, as well as with lines and bare hands. Seines were used only in lower Aravaipa Creek. At the east end, fishermen placed big rocks across the creek to slow down the water flow, which allowed them to fish with nets or hands. They also built small dams diverting the flow into a side channel where the fish could be scooped from the shallow water. Diversion dams for fishing were often constructed during holidays when residents gathered for picnics and fish fries. Family members were ready with a barbecue fire and tortillas (V. Tapia 1989). Dynamite, readily available to local miners, was thrown directly into the deep holes, literally shooting the fish into the air. When fishing in an area without deep holes, fishermen made a diversion dam to deepen the water, tossed the lighted stick into the backwater, and skimmed off the stunned fish. This method proved dangerous. Dynamite accidents severely injured both José Sanchez and Jorge Rayos, who lost both his hands when some caps exploded unexpectedly (J. Sanchez 1989; B. Salazar 1990).

A small amount of commercial fishing took place during the depression. Clay Turnbull and several partners seined for minnows which they took to Coolidge Dam Lake to sell for bait. They placed the minnows in large oil drums filled with creek water and drove during the cool of the night to the lake in order to deliver the fish alive. They could transport about 1,000 live minnows per barrel (C. Turnbull 1990).

OTHER ANIMAL STORIES

Desert Tortoises

Informants reported that both upper and lower Aravaipa had large numbers of tortoises through the 1950s, followed by a sharp population decline. They distinguished two types: one was a darker gray with darker spots; the more common tortoise was lighter in color. Many tortoises were larger than dinner plates and some reached a size that tempted the small children in the Sanchez family to try to ride them. Tortoises were often seen in orchards and vegetable gardens. They were particularly fond of eating tomatoes and any fallen fruit (J. Sanchez 1989). Residents speculate that with the reduction of orchards and vegetable gardens, the tortoise population near settlements declined. Blanche Parker, the wife of Will Parker, lived near the mouth of Aravaipa Creek and kept tortoises as pets. When she found the shells of dead tortoises, she filled them with cement and used them for doorstops (J. White 1990). Informants reported that after floods, tortoises and rattlesnakes were conspicuous. More recently, collection of desert tortoises has been part of the Aravaipa "hiker's booty."

Swallows

Informants reported that thousands of cliff swallows formerly came to Golondrina Cave (Swallow Cave) near the Aravaipa box. The numbers of swallows crashed sometime before the 1970s (B. Salazar 1990).

TABLE X.A
EXTINCT ANIMALS OF THE ARAVAIPA AREA

Beaver
Gray Wolf
Grizzly Bear
Pronghorn Antelope
Merriam's Turkey
Prairie Dog
Desert Bighorn (reintroduced)

TABLE X.B
ANIMALS TRAPPED FOR PELTS AND/OR EATEN

Raccoon
Ringtail* (Civet)
White-tail Deer
Mule Deer
Coyotes
Bobcat
Mountain Lion
Black Bear
Wild Burro**
Gray Fox
Western Spotted and Hognose Skunk

* Pelt only
** For dog food

XI

A DIVERSITY OF LAND ETHICS

> What pleasure it was to see once more around me trees and flowers, to listen to the song of birds, the rippling of waters, and the subdued rustling of the leaves overhead; it seemed that the deserts had all been crossed, and that danger was but a dream. . . . Never shall I forget the six days and five nights we spent in cutting our way through this wonderful defile. . . . (Bell 1869: 61, 65)

> Everything on this earth is meant for something (W. Johnson 1990).

APACHE LAND ETHIC

The Apache informants interviewed for this study all stated a strong attachment to the area which they considered to be the homeland of their clan, the *Tsé jiné* (Surrounded by Rocks, or By the Dark Rocks) clan. Their territory, described in greater detail in Chapter IV, extended from the head of the Aravaipa Valley to the San Pedro River, and from the Santa Teresas to the Galiuros, and was centered on the *Little Running Water*, as they called Aravaipa Creek. Their territory included several vegetation zones, which allowed them to move to more comfortable climates as the seasons changed. Within the general area, they moved their rancherías (camps, or settlements) according to the season and the dictates of their agricultural and hunting/gathering practices.

Several of the Apache informants for this study had ancestors who were present at the Camp Grant massacre and as children had heard accounts of the event from survivors. Several informants had grandparents who were killed during the massacre. Contemporary members of the *Tsé jiné* clan have strong attachments to Aravaipa because it was their homeland, it is the place in which their ancestors were killed and were buried in a common grave by Lieutenant Whitman's soldiers, and it is an area which still provides Apache people with their traditional foods and medicines and the plants required for ceremonials and religious rites. Members of older generations told their grandchildren that prior to the time of conflict with the United States Army, Aravaipa provided them with a comfortable, happy life. Grandparents instilled a strong respect for *place* in the present generation of elders.

In recent years, two Apache organizations, the Apache Cultural Project, initiated by Philip Cassadore, and the Apache Survival Coalition, headed by Ola Cassadore Davis, have launched efforts to preserve Apache traditions. Much of the membership in these groups is made up of the Aravaipa Apache, members of the *Tsé jiné* clan. They are particularly concerned to see that the traditional Apache reverence for the land, as a provider, is instilled in their children. Wallace Johnson, almost ninety years old at this writing, possesses a vast knowledge of Aravaipa traditions, land use, and land values. Wallace remarked, "everything on this earth is meant for something, but now we don't all know about it. The old-timers, they knew." In recent years members of the San Carlos tribe have expressed a desire to commemorate their ancestors who died at Camp Grant. Some individuals wish to construct a commemorative monument at the burial site. However, above all they wish to assure that they and their children have access to their former homeland in the Aravaipa in order to continue hunting and gathering practices so essential to their traditional culture and ceremonial and religious life.

NINETEENTH CENTURY LAND ETHIC

The residents who arrived in Aravaipa during the period of early settlement shared Bell's admiration for the canyon's natural setting. They appreciated the beauty and fertility of the canyon bottomlands and enjoyed the abundance of wildlife. Their attitudes toward nature were those which were common to nineteenth-century thought. According to the prevalent view, human agency on the land was bound to make improvements. Human impacts were part of the providential aspect of history, which directed all human enterprise toward progress. Nature, particularly in the arid Southwest, no matter how impressively beautiful it might be, could be improved. The landscape could and should be rearranged to suit the needs of mankind and to reflect his toil and productivity. According to this view, men and women were caretakers, God's stewards on the land. Their role as caretakers was to reshape the primeval aspect of nature through agriculture and through the creation of other human designed impositions. Darwinian biological interpretations reinforced the concept that human beings had the right to control their natural surroundings in whatever way they saw fit. Herbert Spencer's doctrine of "survival of the fittest" augmented the notion of the human right to subjugate the land (Goudie 1986: 1-4).

Although the Bridwells, Mings, and Dunlaps might not have voiced this attitude in quite the same manner, the providential view of human agency on the land was part of the conventional wisdom of their time. The initial Aravaipa settlers, whether from Mexico or the United States, shared a similar late nineteenth-century land ethic. They altered the natural environment to their own purposes, in a manner which reflected their industry, and gradually sculpted an idyllic, "Arcadian" landscape on the banks of Aravaipa Creek. The cultural landscape reflected a second widespread nineteenth century land value, the romantic attachment to an Arcadian vision of nature. Inspired by Greek myths about the remote area of Arcadia, this ideal valued peaceful rural life and rustic simplicity. The riparian aspect of Aravaipa particularly fit into this vision, and appealed equally to settlers from other sections of the United States and to immigrants from Mexico. Aravaipa's similarity to the river valleys of northern Mexico was immediately apparent. In Aravaipa, settlers from Mexico were able to continue with subsistence strategies they had practiced for two hundred years in equivalent arcadian settings.

The cultural landscape created by Aravaipa's settlers also reflected the nineteenth-century frontier values of economic independence, agricultural subsistence, rural community life, and distance from the corrupting influences of the city. On both the east and west ends of the canyon, hard work, mutual cooperation, and family participation enabled settlers to create dispersed rural villages in which each family had a tidy homestead surrounded by enough cultivated land to provide almost all of their basic needs. Former residents recall their independence with pride, noting their infrequent trips to town, since their own toil provided all their needs. The subsistence economic activities of the settlers converted the land from a state of "primeval wilderness" into what they considered to be an idyllic scene of civilized, protected rural life, part of the cultural and natural process of evolutionary development from savagery to civilization. The settlers' dependence on the land for their livelihood increased their appreciation of the tidy sculpted landscape they had designed, with its fenced orchards, cleared fields, open understory, easily visible trails, and orderly creek bed. Settlers perceived of the land as bountiful, and themselves as improvers of the land, bringers of civilization. The sense of being custodians of Aravaipa was shared by all but the largest absentee ranchers.

Among many of Aravaipa's residents on both the east and west ends, this vision of the frontier Arcadia persisted well into the twentieth century. And many former residents hold to it today. A striking feature of the land ethic is that both of Aravaipa's cultural and social groups adhered to it almost equally. Although minor refinements in attitude and land use practices exist, for the most part, there has been little difference in the attitudes toward land expressed by Mexican-American and Anglo-American former residents. The most significant cultural difference in the use of resources resulted from access to capital and familiarity with "the system." In general, Anglo-Americans with larger ranches and farms, had greater access to outside capital for improvements and more developed technology. Groundwater pumping, development of water catchments, construction of stock tanks, roads, or irrigation systems frequently determined duration of residence and the economic success of resident families. In some cases, larger Anglo-American capital investment lead to longer tenure, more isolated residences, with more extensive improvements, and ultimately in greater impacts on the environment.

Mexican-Americans espoused a strong community-oriented land ethic, clinging to cultural traditions from Mexico which featured communal land use activities (i.e., land clearing, dam building) and labor exchanges. Their cultural traditions and more modest expectations enabled them to live more directly "off the land," gathering more food and manufacturing more equipment (horse gear and certain tools) than some of the Anglo-American settlers.

In many instances hard economic choices determined land use decisions. Many ranchers, even those with the largest holdings, owned highly mortgaged ranches, and most of the cattle in the Aravaipa area were mortgaged as well. During the drought of the early 1920s, the experiences of the Kennedys at the MK Ranch and the Wilson brothers at the T-Rail are cases in point. The decision not to sell cattle during droughts and depressions as an attempt to save the ranch was wrong in both instances. Both ranches were foreclosed and on both, cattle starved to death, causing irreparable damage to grasslands. Other ethical decisions associated with land use appeared to have been made on an individual or family basis rather than on a cultural or ethnic basis. Certain families, like the Salazars, did little trapping while others, like the Rubals, trapped frequently. Some ranchers shot their old saddle horses when they became too old to work, considering that this was the kindest solution for both horse and rangeland. The owners of the T-Rail shot a team of pure-bred work horses as soon as they acquired a tractor. Other ranchers turned their old saddle horses out to pasture, retiring them for a few years of rest. They expressed shock at what they considered to be their neighbors' indifference toward their old *compañeros* (companions) on the range (B. Salazar 1990; T. Salazar 1990).

Differences in attitude toward the land varied more according to occupation than according to culture or ethnic group. Former miners, wood cutters, and goat herders who perceived themselves as less permanent residents, did not express quite the same degree of affection and respect for the land in Aravaipa as did long-term farmers and goat and cattle ranchers. Some of the difference in attitude may stem from the commitment of ownership. However, several men who worked as cowboys, never owned property expressed strong attachment to the land and stated attitudes which indicated that they shared the sense of custodianship (C. Whelan 1990).

THE CONSERVATION MOVEMENT

Away from the banks of Aravaipa Creek, concerns for the destructive aspects of human impacts on the land were voiced as early as the 1880s. The environmental crisis which occurred during the drought of that decade initiated a new respect for the natural setting among residents of southern Arizona. During the 1880s, the first animal protective associations were formed, and many individuals, including hunters, called for game protection and hunting regulations even before the prolonged drought began to damage wildlife. During the 1880s the Arizona Fish Commission, which also had responsibility for game, was formed. During the mid-1920s, civic-minded sportsmen formed the Arizona Game Protective Association (later the Arizona Wildlife Federation). The group succeeded in having the Game and Fish Department establish regulations aimed at protecting wildlife (*Wildlife Views* 1980: 3).

Concern for forest depletion and its effect on local watersheds began in Arizona during the 1890s. Citizens petitioned for protection of the forests, and the first of many forest reserves were established in Arizona shortly after the turn of the century (Wilson 1987). Many people noted that heavy timber cutting had initiated extensive watershed destruction with subsequent flooding, erosion and water scarcity. Arizona territorial governors supported regulation and protection of watersheds and requested that the Interior Department inaugurate a reforestation program in Arizona to keep water sources unimpaired (Matheny 1975: 205). During the 1890s, two distinct attitudes toward the best method for forest and land protection emerged. Preservationists supported closing forests to the public and removing entire sections of land from any type of use. Conservationists supported planned perpetual use of the forests, recognizing the need for appropriate legislation, controlled access, and reasonable exploitation.

As early as 1901, cattlemen lamented some of the changes which they had observed during their brief tenure on the land and suggested the reorganization of the open range grazing system as a partial remedy. H. C. Hooker's 1901 description of rangeland and water course deterioration during his thirty-five years in southern Arizona is poignant (Giffords 1901). By 1910, rangeland specialists were lamenting the negative impacts of overgrazing on grasslands, riparian areas, and water tables in southern Arizona and began calling for federal and state supervision of grazing. According to J. J. Thornber, "free or open range grazing has failed utterly wherever tried" (Thornber 1910: 341). Both ranchers and agricultural specialists recognized that the open range cattle industry had been a "feast and famine proposition." Frequent spells of scarcity initiated periodic overgrazing and permanently diminished the carrying capacity of the range (*ABT* 3/10/17). Cattlegrowers associations representing ranchers on both ends of Aravaipa called for control of the public domain as soon as they organized. By the early 1930s, they were requesting range classification for cattle, sheep or goats (McEuen 1987). At that time, range management specialists, conservationists, and ranchers joined together to call for regulated grazing (Barnes 1926). Beginning in the 1920s and 1930s, historical geographers like Carl Sauer stressed the negative effects of long-term resource exploitation in their analysis of cultural landscapes. During the 1930s a stronger focus on the destructive, negative aspect of human impact on the environment emerged.

EARLY CONSERVATION EFFORTS WITHIN ARAVAIPA CANYON

From the time of earliest settlement, the residents of Aravaipa recognized that their environment was exceptional (F. Wood 1990). They possessed their own well-developed land ethic and frequently expressed their sense of responsibility in caring for the land. The ethic was not exclusive to land use but was strongly intertwined with a sense of community and place. Residents of Aravaipa believed that they cared for the land just as they cared for other members of the community. A communal land ethic and community cooperation ethic developed, partly as a result of isolation and the settlers' pride in independence. Isolated from outside assistance, by miles of dirt road and the absence of telephones until recent years, settlers took it for granted that they would take care of each other, particularly during floods, fires and other emergency situations which required immediate action. Residents performed many subsistence and economic activities in a cooperative manner including round-ups, hay gathering, creek diversions, irrigation, and harvesting. The sense of mutual assistance which existed between individuals in the area extended to the greater community and to the community of nature as well. One former resident expressed it with considerable eloquence.

> Everything on the land has a purpose. We were brought up knowing that water is a god-given right. Everybody has to share. It's different than if you were in a big city. If there's a spring on the land, somebody has to be responsible for it. You have to make more water, not just put in a trough and take it, and that water is not just for the cows. It's up to the people who have the land to care for it. We were taught to take care of the natural waters, dam up the little canyons; protect the soil if you see it's washing away; trim the trees, not cut them down. You have to do it a little at a time. It's the same in any canyon (Alice Whelan).

The settlers in Aravaipa considered that their custodianship of the land was adequate, and that their improvements were helpful to nature. As thoughtful husbandmen of their land, they occasionally regretted well-intentioned actions which had unanticipated results. Occasionally, efforts to develop springs forced the water underground, or attempts to channelize the creek increased the speed of the water, washing away soil from downstream bends. Residents regret, for example, that the large berms, constructed by bulldozers to prevent the spreading of the creek, deepened it and created greater long-term problems (F. Wood 1989; C. Wood 1990).

A few individuals perceived that some of their economic activities or production methods might be destructive to the environment. However, hampered by the external forces of governmental policy, markets, and inadequate access to capital or technology, many Aravaipa residents had little choice but to continue with their original production strategies. The land ethic was particularly strong among certain families. Both Fred and Cliff Wood recall that their mother, a teacher by profession, instilled a sense of responsibility for land preservation in her sons. The Woods made early attempts at rangeland rehabilitation, importing exotic grass and wildflower seeds. During the 1920s and 1930s, they made concerted efforts to have the cutting of Aravaipa walnut trees stopped on the public domain, writing letters to officials as high as President Roosevelt. Their efforts proved successful, but only after many trees had been removed. Photographer Tad Nichols, who frequently stayed at the Buzan ranch during the 1930s, recalls that the Buzans' expressed strong conservationist sentiments, and were particularly critical of the impacts which goats had on the landscape (M. Buzan 1990; T. Nichols 1990).

Most of the people interviewed for this study expressed a depth of feeling for Aravaipa far stronger than is normally felt for a place of former residence. Many individuals felt that just as they had cared for their land, when they were in need of help, Aravaipa had provided for them. They considered the canyon as a place of refuge. During the Depression, at the worst of times, when people who had moved away were out of work, they returned to the canyon. In spite of the hardships and the drought, the canyon and its people provided for those in need (R. Whelan 1990).

THE ENCOUNTER OF LAND ETHICS

The effects of outside conservationist and preservationist efforts began to affect Aravaipa residents during the early 1930s, particularly through the activities of governmental agencies. The Soil Erosion Service and the Soil Conservation Service initiated programs in the general area, with small amounts of work in Aravaipa. The Civilian Conservation Corps did road work on the west end of Aravaipa and constructed some bank reinforcements on the east end on Aravaipa Creek and on several tributaries. After the Taylor Grazing Act, both east and west ends of the canyon had local Grazing Districts, administered through the Grazing Service.

During the 1930s, outsiders began to take notice of Aravaipa's exceptional riparian habitat and spectacular seenery. At that time, Tad Nichols' photographs began to appear in magazines, giving Aravaipa a wider exposure. By the end of World War II, the canyon had become a favorite recreation area for campers, hikers, and hunters, and local ranchers felt pressured by the increase in recreational activity. By the late 1940s, the canyon was beginning to receive national attention, largely through the efforts of Montana resident Dr. John Blackford, who considered Aravaipa so exceptional that he mounted a one-man campaign to have it placed into some type of protected status. Blackford contacted the Wilderness Society, the Ecological Society of America, the Arizona Wildlife Federation and several other organizations in his efforts to preserve the canyon. An article by Blackford, "Aravaipa Canyon: A Living Laboratory", appeared in *Living Wilderness* during the summer of 1950, proposing that Aravaipa be turned into a wilderness preserve and scientific study area. The May 1950 issue of *Arizona Highways* featured an article by Weldon Heald, which drew additional attention to the area.

During the late 1940s and early 1950s, outside conservationists joined some residents of the canyon to express their concern that the Bureau of Land Management had granted a power withdrawal for the construction of several small dams within the canyon. The Army Corps of Engineers had actually performed surveys in the canyon and had placed markers at the proposed dam sites. One of the proposed dam sites was slightly above the confluence of Deer Creek; the others were in the lower canyon (B. Salazar 1990). Some residents of the canyon believed that small dams would provide protection from flooding, while others were as distressed as the conservationists at the prospect of damming the flow of the creek.

Dr. Blackford believed that the National Park Service was the most appropriate agency to preserve the canyon. In 1952, he presented a written proposal to the Park Service that they enter into a secondary withdrawal with the BLM in order to place the canyon under "legal custodial status" for purposes of preservation. He wished to forestall the Army Corps of Engineers or any other agency like the Bureau of Reclamation from exercising the power withdrawal right. He suggested that the Park Service set up a "Wilderness or Primitive Study Area and Scientific Reserve" within the canyon (Blackford 1952). Park Service personnel made a preliminary reconnaissance of the area in 1952 and recommended that the canyon be considered for complete protection as a "nature reserve" or "ecological preserve" under the Wilderness Society, Audubon Society or The Nature Conservancy (TNC). They did not, however, recommend that it be incorporated into the national parks system.

In 1951, E. D. Coleman purchased the Wagner Ranch (Trail's End) at the end of the road on the west end of the canyon, rescuing it from what he considered to be nefarious development schemes. A previous potential buyer had proposed to run a dude ranch on the site and intended to construct dams in the creek to provide "trout fishing" for eastern fishermen. A conservationist, Coleman immediately began to discourage hunting and fishing and limit access into the canyon. Coleman thought his private conservation efforts would be more effective than the establishment of a public preserve in the canyon. Like many local ranchers, he believed that wise and cautious private management provided greater protection than could be offered by a governmental agency with responsibility for public access (Coleman letters, The Nature Conservancy).

During the late 1960s, Fred and Cliff Wood began negotiating with The Nature Conservancy, a national conservation group dedicated to protecting areas with significant wildlife values, for acquisition of their ranch. In 1970, they completed the sale. From that time on, conservationist organizations controlled access to the canyon from the west end with 4,200 acres of deeded land and 11,000 acres of leased land. In 1972, Defenders of Wildlife (DOW), a second conservation group interested in Aravaipa, took over responsibility for The Nature Conservancy property (Wood ranch) on the west end and at the same time acquired the McNair ranch (former T-Rail Ranch) on the east end.

Between January 1972 and November 1975, DOW acquired nine additional properties on the east end of the canyon and one on the west end, adding them to the Wood ranch. In 1974, DOW received a large bequest from the estate of George Whittell, a wealthy Californian whose life had been dedicated to animal protection. The bequest enabled DOW to establish a separate land trust, the Defenders of Wildlife George Whittell Wildlife Preserve at Aravaipa Canyon, to manage and preserve the property initially acquired by Nature Conservancy. During the next decade, DOW expanded its holdings considerably, acquiring over 7,700 acres of deeded land and 34,167 acres of grazing lease land from state and federal (BLM) agencies. The large Salazar ranch, which connected holdings on the east and west ends, completed the acquisitions in 1985. Some of the purchases included stipulations that owners had rights of life-occupancy. The Salazar sale provided that a limited number of cattle would remain on the ranch in order to maintain the grazing leases. The arrangement with the Whittell Wildlife Trust lasted until May 1988 when Nature Conservancy took over the Whittell Preserve at Aravaipa Canyon and other DOW holdings. Nature Conservancy provided the preserve with a larger staff and greater expertise in land management.

Public land in the canyon was also being preserved. In January 1969, shortly before conservationist organizations began purchasing land, the Bureau of Land Management established the 4,044 acre Aravaipa Primitive Area in the center of the canyon. The BLM prohibited all shooting and hunting within the canyon proper, since intense visitation made firearm use unsafe (*ADS* 3/27/1977). The Primitive Area was later expanded with two land additions totaling more than 2,000 acres, and in 1984, it became the first national wilderness area managed by the BLM under the Federal Land Policy and Management Act of 1976 (*ADS* 1/29/1986).

Former residents refer to this period (late 1960s and early 1970s) as the time of the acquisitions and recall it with some pain. Establishment of the Aravaipa Primitive Area in 1969 required public hearings, which focused national attention on Aravaipa and led to some heated exchanges. Not long after the hearings, Nature Conservancy and Defenders of Wildlife began purchasing property on both ends of the canyon. It was during this period that the major out-migration of old-timers in the canyon occurred, completing a process which had begun with the closing of the mines in the late 1950s. At this time, when conservation organizations were purchasing ranches, many families who had resided in Aravaipa Canyon since the late nineteenth century sold their properties and moved to nearby towns.

It soon became apparent that the two groups, the displaced settlers and the representatives of the conservation groups, adhered to somewhat different sets of land values. Under the life-occupancy clauses, ranchers, who had been in Aravaipa for a half century or more, were now tenants of the conservation groups on the properties which they had formerly owned. Neighboring ranchers who had not sold land to Nature Conservancy or DOW found that the conservation groups, with their prohibitions against hunting and trapping, made difficult neighbors. One of the primary concerns of Defenders of Wildlife, for example, was to assure that fur bearing animals were fully protected on the preserve. George Whittell, whose bequest had financed the purchase of some properties, had stipulated in his will that the money was to be spent to prevent suffering in animals (Whittell Trust files). Clearly, trapping and hunting could not be practiced on the Whittell Trust lands. Although Aravaipa's ranchers and farmers appreciated the value of wildlife, they did not adhere to a conservation ethic which would cause detriment to their livelihood. During the initial purchase period, DOW attempted to prevent trapping through a policy of paying ranchers at current market price for livestock lost to predators. The complicated policy required proof of predator kill and within two years it was abandoned.

Increased tourism and recreation in the canyon caused additional problems. While the conservation organizations attempted to preserve the land, and at different periods had restricted access to portions of it, their very presence, accompanied by the publicity surrounding the land acquisitions, attracted move visitors to Aravaipa.

Many former residents expressed confusion concerning what they considered to be the differing policies of Nature Conservancy and Defenders of Wildlife with regard to preservation. They perceived a switch in policy from non-cattle emphasis by the Nature Conservancy (1970-72) to vehement animal protection during Defenders' stewardship (1972-88). Residents perceived an inconsistency in goals, one group (TNC) attempting to preserve riparian habitat and watershed exclusively, while the other group (DOW) focused on protection of particular species. During part of the period in which DOW managed the canyon preserve, they combined predator protection with a cattle breeding program on their leased lands, a plan which increased confusion considerably.

One former resident described the conflict and confusion experienced by families who had lived in Aravaipa for almost a century.

> The people of the canyon lived independent of lawyers, outside the system, they were truly self-reliant. They had great pride in doing it on their own. Their livelihood and their whole identity was inside the canyon. People passed their knowledge on, men taught their sons and nephews. People who had lived there for years knew the cycle well, they were very biological in their observations, but they couldn't explain it. They knew where every hawk was nesting. They knew where to find all the wild animals. They knew ahead of time what would happen in the creek if it rained hard in a certain place. They knew the cycles of the weather, the best pastures, the places that grew the feed first, where the filaree would come up. The women had a different kind of knowledge. Victoria and Rosalie [Salazar] knew about generosity and graciousness. People who had lived independently for years, were suddenly thrust in the midst of this environmental clash which had national interest. The issue overwhelmed them. It was very disorienting to be accused of not having cared for the land. There was real confusion about what was being damaged. They wanted to preserve the dignity of their life-style. No one had really been out of the canyon, and suddenly there were public hearings, lawyers to deal with. Lupe [Salazar] did all the land sales without a lawyer. The environmentalists were very sophisticated. Suddenly there were questions of stewardship, preservation, overgrazing. There was a real question about what was being damaged. None of the new rules recognized the old refinements. It's such a delicate question. There's so much sensitivity involved. So much sentiment, so many memories. How can we bridge this gap? Everybody was brutalized. No more livelihood in the canyon, and now, no more identity with it. (Teresa Acevedo)

One major component of the traditional Aravaipa land ethic had been the preservation of a life-style which now seemed inconsistent with main-stream America. At the same time, the prestige of Arizona's agricultural and stock-raising interests began to decline, the political power of rural counties was on the wane, and it became more difficult to make a living in all sectors of agriculture. Aravaipa, like all other rural portions of the state, was being abandoned.

Today, many former Aravaipans are harshly critical of the condition of the canyon. They consider it unkempt, overgrown, and disorderly, its appearance radically altered for the worse. The refrain, "it isn't the same canyon, now," punctuates interviews with old-time residents. "*Tierras de siembra* (farm land) can't have all that brush. Now it's just like a jungle." A frequent lament is that the flood (1983) has taken farm land, and the land it left behind is covered with a profusion of useless mesquite and catclaw (R. Whelan 1990). Many ranchers predict that when the next big flood comes, it will do more damage than any in the past has done. Sapling trees, obstructing the main channel, will cause the flood waters to spread out more. Conversely, in the absence of rain, the presence of so many trees will use up all the water and lower the water table even more than it has been depleted.

On the other side, conservationists believe that their goals are to protect rare species, through protection of the entire watershed along with the riparian corridor. They maintain that increased vegetaton in all the canyons improves overall watershed condition by slowing run-off, controling instream flow and decreasing erosion. In short, they believe they are enabling the canyon to protect itself - if and when the next catastrophic flood occurs. Agency managers also place particular emphasis on maintaining an environment supportive to native fish and raptors. It is clear that the rural land ethic is not always consistent with the contemporary conservation ethic, and that even within the conservation community, priorities are not monolithic. In the future, it may be possible to reconcile the gap between the two visions, the "Arcadian" land ethic and the cosmopolitan perception of nature. Scientific anaylsis may prove that traditional land use and conservation values are not so distant and with time will prove to be compatible.

NATURE CONSERVANCY/DEFENDERS OF WILDLIFE ACQUISITIONS

Date	Property	Cattle	Deeded Land Acres
1970	Wood	60	4,200
1972	Salazar		142
1972	Maggie McNair		178
1972	Claude McNair	144	648
1972	W. McNair		177
1972	José Sanchez		40
1973	C. Ramírez		11
1973	M. Gonzalez	17	328
1974	Westerfield		80
1974	Turnbull		70
1975	Proctor		210
1985	Salazar	221	1,650

XII

CAN THE LAND BE HEALED?

The landscape of the Aravaipa has been wounded by over a century of human activities. Many individuals, agencies, and organizations want to see these wounds healed. They want the land to reflect a sustainable--non-exploitive--relationship between humans and nature. They desire to restore both the productivity as well as the unique plant and animal communities of Aravaipa. This chapter explores the complex questions of landscape *restoration* (exact species and habitat recovery) and *rehabilitation* (preventing further damage but not necessarily with the same or native species). Restoration and rehabilitation are recent endeavors with few precedents in arid land ecology (Allen, 1988).

The chapter is divided into four sections. It starts with a historical summary of earlier chapters from the point of view of renewable vs. non-renewable natural resources. Second, it asks: What would a "healthy" Aravaipa look like? How do we set goals for appropriate landscape recovery? Can we reconstruct the pre-1880s landscape of Aravaipa? What are the limits to landscape (especially plantlife) restoration in the Aravaipa? Third, it presents a summary of the ethnoecological results of this study, particularly the involvement of ethics with best management practices. Finally, it discusses the future possibilities of combining oral histories, photographic documentation, ecological fieldwork and knowledge with natural resource decision making.

OVERVIEW OF ARAVAIPA'S NATURAL RESOURCES

Natural resources are usually defined as the useable parts of the environment. Air, water, soil, solar energy, plants, and animals are commonly considered the basic renewable natural resources. Minerals and petroleum are the nonrenewable resources. But, the definition is too limited. Fossil groundwater can be mined and, once mined, is nonrenewable. Plant and animal genetic resources (cultivars and species) can go extinct. Soils can lose their rich topsoil and recovery may not be possible for thousands or even tens of thousands of years.

In the Aravaipa, natural resources provided both goods and services. Goods included food, crops, fuelwood, fish, game, furs and minerals; obvious services included diluting and cleansing polluted air and water, filtering and chemically transforming harmful mining residuals, manufacturing and supplying plant nutrients (i.e., from photosynthesis and soil supplies), and conditioning microclimates.

The isolation and ruggedness of the Aravaipa area protected it from extreme resource exploitation. Railroad promoters could find an economical route through the canyon. No major road was built between the Sulphur Springs Valley and the San Pedro River. The geological history saved it from the fate of Bisbee or Ajo strip mining. The relatively small floodplain discouraged large human settlements which grew up along other Arizona perennial rivers. The rugged terrain provided sanctuaries for wildlife and reduced extinction rates.

Minerals are the most obvious nonrenewable resource of the Aravaipa. Accessible mineral resources were limited to relatively small acreage in eight tributaries of Aravaipa Creek and three tributaries of the San Pedro. Many of the ores became rapidly depleted or so dilute that only new technologies revived mining. The access roads, mines and tailing piles changed sediment loads, erosion rates, stream channel and hillslope stability. The concentrator at Klondyke significantly impacted Aravaipa Creek. In a few tributaries, percolating groundwater from mine shafts, wastes, and excavations has increased heavy metal and other ion concentrations, especially during floods.

The perennial creek, springs, tributaries, and wells are the most important renewable resources of the Aravaipa. Where water was not abundant or reliable (e.g., Stanley or Aravaipa townsite), human settelement lasted only as long as mining continued. Where perennial water was most abundant, along Aravaipa Creek, homesteads, roads, farming, fishing, livestock grazing, and irrigation concentrated on the creek's riparian soils. Even during extreme droughts, residents of the Aravaipa had no need to ransack the land, as occurred in other arid parts of the planet. Out-migration and other resources (e.g., trapping) prevented this intensity of desperation.

The abundance of water (rain and soil moisture) determined the abundance of crops and rangeland. Availability was determined by climatic changes as well as human inventiveness (pumped groundwater, cattle tanks, channel irrigation). The abundance and availability of water remains central to any restoration or rehabilitation project. Such projects will always prosper or suffer according to changing or unpredictable weather patterns.

Of all the resources, soil is the least understood and least studied in the Aravaipa. The impacts of land clearing and cultivation, livestock, mining and road building on soils have not been well documented. Losses in soil nutrient wealth and depth to bedrock, and increases in runoff and erosion rates cannot be stated accurately. Their rehabilitation is the most problematical.

The combination of all plant and animal resources (furs, fuel wood, fish, gathered plants, game) provided crucial diversity to early household economics. This diversity probably reduced the rate of outmigration, in comparison to other Arizona settlements. Cattle and goat grazing and browsing, farmland clearing, woodcutting for mining, home-use and commercial sales as well as the importation and invasion of exotics are all well documented uses of plantlife. Upland range and, until recently, riparian feed were the mainstay of long-term Aravaipa settlements. Even when overexploited and reduced in quality and quantity, rangeland remained the most reliable renewable resource in Aravaipa. Oak and mesquite productivity has never recovered from early mining requirements. Walnut has not recovered from commercial sales. Cottonwood has not recovered from livestock impacts. Most of the plant associations no longer resemble their pre-1880 counterparts. Reversing these impacts is a major reason and focus of restoration goals.

The value of Aravaipa's wildlife resources has played a central role in its history. Wildlife numbers and species have fluctuated with livestock pressure, hunting, trapping, habitat changes, introduced species and society's changing attitudes toward the animal world. Many animal species have gone extinct, joining minerals as the only other non-renewable resource. The first attempt to restore a natural resource focused on the bighorn sheep.

Finally, Aravaipa has had great value as an aesthetic resource. Beauty is abundant. Recent land ownership patterns reflect a desire to re-allocate the aesthetic resource to more citizens. Recent land purchases reflect a desire by new landowners to reduce other resource uses in order to maintain the aesthetic quality of Aravaipa. Controlled non-consumptive uses such as bird-watching and hiking have replaced or supplemented many of the previous extractive and consumptive exploits.

A BRIEF CHRONOLOGICAL SUMMARY OF HUMAN IMPACTS

The exploitation of Aravaipa's resources became intense during the 1890s with the increasing introduction of cattle on the open range and the initiation of three mining developments. The "hey day" was perhaps during the 1920s when mining thrived, the goat and human populations peaked, and cattle, horses and burros roamed the open range. A brief summary of impacts by decade follows.

1860 to 1880: Until 1873, the west end supports up to 1,000 Apache along with a small military force, cattle and horses, and small farms on the San Pedro and at Camp Grant. On the Aravaipa Creek floodplains, the only land clearing is for small Apache farms. Malaria is endemic and both the Apache and the Army request a new location.

Small amounts of mining occur near the Aravaipa townsite, Copper Creek, Deer Creek, and the Table Mountain and Stanley Butte areas. Small smelters at Aravaipa, Stanley and Copper Creek, erected during the 1870s, initiate some demand for fuelwood. Travel occurs on wagon roads or trails. The first road through the Aravaipa Valley and a telegraph line to Fort Thomas are completed.

Burros are probably present near mines. By 1880, open-range cattle are in the upper valley, and widespread cattle penetration into the canyon is assumed. There are no reported goat herds. Winters are dry from 1867 to 1877 but summers remain wet. In 1874, there is an exceptionally prolonged wet winter.

Antelope could still be seen in the upper valley. Beaver are last reported in 1867, the grizzly, in 1852, and wolf packs during in the 1870s. After 1857, the Aqua de los Muertos cienega is never described again.

1880 to 1890: At the Aravaipa townsite, the miners excavate shafts in search of silver. The Grand Reef Mine, operated by steam boilers, consumes large quantities of oak, mesquite and juniper cut in the Stowe Gulch area. Table Mountain Mine begins operation with extensive woodcutting but undocumented production. The first major road construction into the tributary watersheds occurs in this period.

During the 1880s, winter rains oscillate between dry and wet with severely diminished summer rains after 1885. A combination of overstocking, no rotation programs, and droughts create dramatic livestock die-offs. Horse and cattle carcasses rot in the upper Aravaipa Valley. Angora goats first appear. There are 4,000 to 8,000 goats on west end tablelands and smaller numbers probably present on the east end.

Creek diversion farming slowly grows in the canyon and valleys. The east end may have had three farms totalling some 120 acres. Photos show the floodplain near Klondyke cleared with remnant cottonwood-willow groves; channel changes do not appear to be severe, as phragmites (a plant indicator of stable streambeds) appear in photos near Chimney Rock, and the streambanks seem less steep than today. Trees appear to be denser and the stream narrower between wider stands of cottonwoods. The west end begins agriculture on small acreage plots (especially citrus orchards) totaling some 150 acres by 1890.

There are no personal accounts of the 1887 earthquake, but rockslides may have damaged the saguaro-palo verde hillslopes and altered the channel of the canyon itself. There are no reported changes in spring flows. Nevertheless, if the power of the earthquake was similar to that in other nearby areas of Arizona, it may have played a deciding role in the future topography of the channel of Aravaipa Creek.

<u>1890 to 1900</u>: 1892-93 was considered the worst year of drought, but the early and late years of the decade are all years of severely below-normal rain. Open-range livestock ranchers unsuccessfully attempt to maintain their previous stocking rates. Goats become increasingly common on both ends of the canyon as residents use the "Sahelian strategy" of mixing herds of browsers and grazers. This decade probably irreversibly changed the character of Aravaipa's rangelands, with permanent loss of abundant bunchgrass and sacaton and the first widespread local invasion of exotics (Bermuda grass, rabbit foot grass, and tumbleweed). Filaree establishes itself at this time. Farming continues to expand slowly. By 1893, the Aravaipa mines could not economically continue in America's depression markets. Table Mountain has a brief promotional boom in the late 1990s. Settlement and farming roughly doubles. The last renegade Apache are captured.

1900 to 1910: The early years of the decade remain in severe drought. In 1904, the fifteen-year drought cycle breaks. Residents remember 1904-05 as the wettest year. Ranchers begin to rebuild their herds. The Mohair goat industry is about to boom. Burros and some horses have gone wild and feral herds are abundant. Farming, mostly of food crops for local consumption, continue a slow expansion in the alluvial floodplains of Aravaipa Creek. Exotics, including red brome, wild oats, salt cedar (tamarisk) are well established in surrounding rivers but their appearance in Aravaipa is not recorded.

The availability of untapped minerals increases with new technology. Klondyke becomes a minor commercial center as mineral markets recover and energy requirements are freed from woodcutting and burros. Roadcutting for trucks is the major environmental impact. Grand Reef Mine splays tailings into the Laurel Canyon watershed. Copper Creek mining also expands at this time.

1910 to 1920: A regional freeze in 1913 and various floods (local residents say 1916 and 1919) impact the Aravaipa. A drought (October 1918-September 1919) causes some ranchers to slaughter calves. Construction of cattle tanks spreads throughout the watershed as ranchers guard against the pre-1904 disasters. Goat herds continue to expand into the foothills of the Santa Teresas on the San Carlos Mineral Strip from Hawk Canyon to Stanley Butte in Turkey Creek and around Table Mountain. A new road to Klondyke is built along the north side of the creek, next to the bluffs, to accommodate motorized vehicles. Old growth walnuts are selectively cut along Aravaipa Creek. Prairie dogs and cottontails are subjects of rodent control programs. Bighorn and antelope rapidly decline. European house sparrows invade the ranches.

1920 to 1930: During the early years of this decade goat herds peak. Low estimates of 20,000 goats to high estimates of 40,000 goats browsed the canyon and tablelands. Private use of strychnine to poison predators escalates with unrecorded impacts on non-target species. Large cattle herds, not counted for small areas like Aravaipa, roam on the open range system. In 1925, a flotation concentrator is built in Klondyke and the Grand Reef becomes the second largest Arizona lead producer. The mine and concentrator probably had major impacts downstream but they remain unrecorded. The Grand Reef complex sinks a new 400 foot shaft; Aravaipa

Mine expands its infrastructure. Human population probably reaches its peak during this decade with more than 400 on the east end and 300 on the west end. Significant woodcutting for domestic use and supplemental income harvests mesquite, oak and juniper.

A severe drought occurred in 1921-22. Some residents state that 1926 to 1930 were good years, although others mention a local drought in 1929-30. The whole of Arizona suffered from drought from March 1928 to March 1929. Floods occurred in Aravaipa (1922, 1923, 1926) but none were considered truly devastating.

1930 to 1940: During the 1930s, Aravaipa experiences the Depression, the drought, and the New Deal. The Klondyke concentrator closes in 1931. Copper Creek has a revival during the 1930s.

1933-34 is the worst drought reported. Goat herds plummeted after 1934 from markets, drought and the Taylor Grazing Act. After 1935, approximately 10,000 goats remain. Cattle numbers drop by about half: some cattle starve, some are shot, and some are sold with subsidized offtake prices. Federal permits, grazing plans and fencing end the era of open range. Wild horses and burros are killed or marketed in 1934, 1935 and 1936. About 600 to 700 feral burros and approximately 2,000 wild horses are removed from the Aravaipa area. The last bighorn is shot on Brandenberg Mountain.

By the late 1930s (1938), the first large tractors appear in the Aravaipa valleys. The creek remains perennial despite the severe drought of 1934. East end farming expands above the emergence point. A major road alongside Aravaipa Creek on the west end replaces the old road which followed the creek bed.

1940 to 1950: The war boosts prices. Mining resumes at Aravaipa Mine, Iron Cap and Head Center mines in 1942 and continues until 1957. Klondyke has a new concentrator and the Aravaipa Mine roasts tailings in addition to mining. Mining resumes on a small scale at Imperial Hill, Landsman, Tule and Copper Bar Gulch.

The late 1940s bring bull-dozers to build bigger and better stock tanks and roads. Cattle operations settle into arrangements with government agencies and cooperate on predator control. Compound 1080 is used against coyotes to protect livestock, increase deer, and rid the area of lions. Only a possible 2,000 to 4,000 goats remain in all of Aravaipa.

Wells and diesel pumps encourage farming especially in the areas of saturated alluvium. Between 1946 and the mid-1950s, farming acreage more than doubles and approaches its present 600 or more acres. The freeze of 1949 goes unnoticed at the west end; floods in 1940, 1941 and, especially, September 1946 leave strong memories. The regional droughts in 1943 and 1947 have little impact on Aravaipa economics, and unknown impacts on the vegetation.

Coatis appear and become more common. Mule deer begin to move to higher elevations.

1950 to 1960: By 1957, all active mining ends in the Aravaipa area. No goat herds remain in the area and cattle are under still tighter control. The human population declines. The total yearly rainfall remains low. Cotton farming is tried for a few years on the east end and with it, the first significant use of pesticides and well irrigation. Large tractors become common. Farming expands. On the west end, instream pumps begin to replace diversion dams. Despite droughts, the springs, abundant groundwater, and the perennial creek remain a strong buffer against economic disaster. West end farming and orchards decline. East end homes and well pumps receive electricity and telephones. Aravaipa is now part of a more general American TV culture. The decade has big javelina and widespread mule deer hunts. Bighorn are re-introduced. Turkeys disappear and starlings invade.

1960 to 1970: The west end begins to experience the new urban values. Ranchettes and the conservation movement impact the area. The academic world, noting that Arizona landscapes have been abused and are rapidly disappearing, "discovers" Aravaipa Creek. Major floods occur in the canyon (1963 and 1967). The first severe downcutting on the east end is recorded. By the mid-sixties, climate returns to wetter summers for the first time since the turn of the century.

HISTORIC RECONSTRUCTION OF THE "ORIGINAL" VEGETATION

In order to restore landscape, the restorers must decide which era they wish to reproduce. In Aravaipa, the goal appears to be the 1870s, -- the period prior to intense Euroamerican activity. This is not the period of pristine or original vegetation. Arizona plantlife has been influenced by humans for, at least, 5,000 years. The Sobaipuri, the Apache, and imported cattle changed the landscape long before botanists or land surveyors arrived (see: Chapters II and III). Pre-contact plantlife was more luxuriant and greater fire frequencies resulted from natural causes as much as human intentions (Baisan, 1990). Precontact landscape changed at much slower rates. Species replacement took thousands of years, not decades. Human influences had much more patchy and less intense impacts. Landscape recovery was faster and irreversible damage to soils or hillslope stability was a rare event. The early 1870s provide a good benchmark. There are enough descriptions of this "Grama Grass Period" in which subsequent perennial bunchgrass communities dominated to clearly distinguish it from the periods "the Filaree Period" and "the Succulent-Scrub Period."

This section on reconstruction is necessarily incomplete, even experimental. Separating natural from cultural impacts is always difficult and, sometimes, impossible. In just the century of concern, there have been three major weather patterns that combine with dozens of human activities to change the species composition, extent, and commonness of the plant groupings. Attempts to reconstruct the twenty or more plant associations in Arizona have never been tried before. Ideal reconstruction of plantlife would require a species by species understanding of how each plant species (or even each specialized plant ecotype) reacts to both climatic and human influences. This knowledge is difficult to find for the 450 to 600 species which are present within the Aravaipa community. Without detailed understanding of the seed germination niche, the seedling establishment niche, the juvenile growth niche, the reproductive niche (including pollination), seed development, the dispersal niche, the timing of one complete life cycle, and plant response in all its life history "niches" to both climatic and grazing/browsing stresses, it is not very clear how much a species should be increased, decreased or associated with other plants or particular habitats.

To give a picture of the "ideal" restoration, eight steps in historical reconstruction will be outlined, followed by some general comments on the Aravaipa community as a whole. Three examples will illustrate historical reconstruction for the Aravaipa Creek bottomlands, the semi-desert scrub (Turkey Creek), and in-stream water quality (Hell Hole Canyon). The need for diagnosis of watershed "dis-ease" is emphasized. Pinpointing the causes and giving each proper weight is the only way to make restoration and rehabilitation economical and ecological.

Eight Steps in the Reconstruction of Plant Associations In Aravaipa

Step 1. Determine the exotic species added by Euroamericans.

Step 2. Determine the increasers -- the plants that have increased as a result of human imposed impacts, such as farming or livestock disturbances. Determine the resisters -- the plants which have resisted human impacts, such as plants poisonous to livestock. Determine the evaders -- plants which could evade human impacts, such as quick maturing grasses that set seed before they could be completely eaten by livestock. Determine the decreasers -- the plants that have decreased in abundance as a result of human impacts.

Step 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.

Step 4. Review the climate to see if changes (especially droughts and inter-annual trends) in winter/summer rainfall and temperature would have naturally increased or decreased species' abundance, especially species with either C3, C4 or CAM metabolisms.

Step 5. Understand the frequency and intensity of fire effects on each species.

Step 6. Reconstruct soil losses from human-induced erosion, "replacing" the lost soil layers and the plants that went with them.

Step 7. Reconstruct the competition and co-evolution of various species which might "fine tune" our understanding of plant distribution.

Step 8. In riparian communities, focus on the many influences on channel and streambed changes.

Steps 1, 2 and 3: Undoing Livestock Impacts on Plantlife

In Step 1, we group species in broad-brush categories: exotics, evaders, invaders, decreasers, resisters, and increasers. No attempt is made to state how much more abundant or less abundant a species or group was at any particular time.

Exotics

Ranching, farming, homesteading, and deliberate and accidental introductions have added thirty-two to thirty-six exotics to the native flora (Table XII. A). [This table does not include crops that rely on humans for their propagation such as dates, peaches, apples, corn, etc.] Many European exotics arrived with feeds or imported livestock. The earliest exotics known in the Aravaipa area include filaree, collected elsewhere in Arizona in 1866; Bermuda grass and tumbleweed, recorded in Tucson in the early 1890s; and red brome, tamarisk, wild oats, and salt cedar, all recorded near Tucson or the San Pedro by 1910. Filaree was deliberately cast to increase pasture quality. Tamarisk has invaded almost all of Arizona's rivers and streams with only small pockets in Aravaipa. An increased concentration of exotics near the Fred Wood ranch probably results from his attempts to import grasses to Aravaipa from all over the world.

Aravaipa has begun the Mediterraneanization of its plant species. That is, imported plants which flourish with subtropical winter rains have made a home in Aravaipa. These species share a history of evolution with pastoralists. In Arizona, they reflect a history of overgrazing, a freedom from Arizona plant pathogens, predators and other aspects of local food webs. These species have reproductive biologies which include self-compatibility, freedom from precise rainfall triggers, and freedom from density suppression on germination (Burgess et al., n.d.). At Tumamoc Hill in Tucson, even after eighty years with no goats or cattle, new exotic species continue to invade and three annuals, also found in Aravaipa, red brome, filaree, and rabbit grass remain self-perpetuating and abundant. Even though local residents of Aravaipa have observed a decrease in filaree abundance with the removal of goats and reduction in cattle, the invasion of exotic annuals appears to be irreversible. Even without grazing and browsing, it is doubtful that in the future Aravaipa would be able to regain its past.

Seventy percent of the exotics have established themselves in Aravaipa's permanent or intermittent wetlands, including small areas around water tanks. Truly arid conditions act as a barrier to many exotics. About fifty percent of Aravaipa's exotics cluster on disturbed land such as old and new fields, roadsides, livestock tanks, and ranch yards. Stable soils tend to reduce the abundance of exotics with clear exceptions. Three exotics -- filaree, Mediterranean grass and red brome -- have truly escaped the need for wetland moisture or ground disturbance. They have colonized both mesas and slopes. Only three exotics have distributions that reach 6,000 feet -- bent grass, rabbit grass, and puncture vine. It appears that upper elevation plant communities, especially the evergreen woodlands, are somewhat more resistant to invasion or were less disturbed.

Increasers, Resisters, Evaders, and Decreasers

The terms increasers, decreasers, evaders and resistrs refer to the pressure of livestock (and wildlife) grazing and browsing. They do not refer to fire and drought which greatly complicate the picture. In this report, only a short overview with examples is possible.

Increasers

About sixty species of the increasers in Aravaipa are listed in Table XII. B. Increasers are really successful exotics (competition free or better adapted to humanized conditions), evaders, and resisters. They replaced the original clumped perennial grasses, substituting low growing sod grasses (e.g., curly mesquite grass) or, in areas of lower soil moisture, annuals (e.g., red brome, wild oats). The springtime increasers are well-known among residents -- the filarees, lupines, buckwheats and mallows. The summer increasers are less well-known-- the spiderlings, white-mats, and amaranths. Forbs cover fifty-three percent of the total vegetative cover on the ungrazed study plots surveyed by Dodd (1987). This is one of the highest densities of forbs ever recorded on desert grasslands. In addition, forbs were even more abundant on grazed areas. They may be increasing by "filling in" the spots lost to perennial and annual grasses.

In a sense, mesquite, natural to bosque situations, was an exotic invader and an increaser on the grasslands. It had several advantages over the perennial grasses. Unlike perennial grasses, mesquite leaves are not readily consumed by livestock so that mesquite retains its photosynthetic power to grow roots even in drought. Second, in the deeper soils of Aravaipa, the rain soaked below the inadequate root zone of the starving grasses. Once below the grass roots, only the deeper rooted shrubs like mesquite had access to the soil's moisture. Third, grazing eliminated the fine fuel loads and decreased the frequency and heat of fire. Before intensive grazing, these fires could kill mesquites. Fires, which occur more frequently than once every seven years, may be necessary to eliminate mesquite (Schmutz et al. 1985). Nevertheless, in some areas, mesquite has invaded even in the absence of cattle. Altered runoff, and the creation of runon after the removal of the A horizon of the soil, also favors mesquite.

Decreasers

No known plant has completely disappeared from Aravaipa. But many have become drastically reduced in abundance, biomass and distribution. Palatable plants, particularly perennial bunch grasses, were overgrazed by both cows and goats. Dodd (1987) observed that on grazed level slopes in the Aravaipa area, the missing grasses were always the palatable species (sideoats grama, hairy grama and three-awns). On these level and moderate slopes, second class grasses (curly mesquite) took over because they could spread asexually.

Until 1934, the open-range system prevented recovery of perennials (e.g., Arizona cottontop, Cane Beardgrass). During droughts, ranchers observed cattle eating perennial grass roots, completely destroying the plant. More frequently, it was a war of attrition. When perennials are overgrazed they re-allocate their energy into new leaves and regrowing tillers, a last ditch attempt to increase leaf-surface and photosynthesis. The re-allocation of energy reduces root growth and gives less-edible shrubs and plants the competitive advantage. During droughts, perennial grasses need to allocate almost all their energy to roots and crowns, but persistent grazing forces the plant to grow some leaf surface.

Up to thirty percent of all goat food may be grazed (vs. browsed). There is no detailed study of grazing practices of goats in Arizona. Former goat ranchers were able to list preferred feeds (Chapter VII). Peter Sundt watched a herd of milk goats in the Santa Teresas. His herd was quite selective, even avoiding certain species (Table XII. C). Grasses, both perennials and annuals, were eaten while green but avoided when mature or "cured."

Resisters

Well-armored plants are relatively common in arid landscapes. The presence of thorns, spines, and sharp leaf edges resist grazing and browsing. Toxic compounds, coarse seed stalks, and low palatability also protect plants from consumption. Table XII. D lists some toxic plants. The resisters, especially agaves, yuccas, mesquites, snakeweed, burrobush, and Englemann prickly pear, tended to take over the Aravaipa landscape, particularly the desert grassland.

In drought periods, ranchers try to overcome the resisters. For example, they collected prickly pear pads and burned off the spines so that cattle could consume them.

Evaders

Another anti-herbivore technique is to shorten the growth cycle so that some seed can be produced before the onslaught of over-grazing. This pushes the landscape from perennial grasses and long-cycle annuals to short-cycle annuals, ephemerals, and certain dicots. Many of these grasses are known as the "six weeks" grasses.

Decreasing Abundance Resulting From Human (vs. Livestock) Impact

In the Aravaipa area, settlers focused on particular plant associations or species which had special consumption or production values to them (Chapters IV, IX). They started by cropping native hay in the floodplains and the interfleuves of the Aravaipa Valley. From the 1880s until the 1930s, they cut juniper, mesquite, and oak for firewood, corrals, and construction beams, from the riparian forests, mesquite bosques, the juniper tablelands ('savannas'), and the Arizona oak woodlands. They cut single trees in the scrub formations. Fuelwood consumption has been estimated at one cord per person per year if there are no other available energy sources. In the 1920s, the yearly consumption in the Klondyke/Aravaipa area probably exceeded 650 cords per year because some woodcutters supplemented their income with additional harvesting, and corrals were still of juniper. This converts to between 150 and 400 acres per year of juniper and oak (Bahre 1985).

Between the late 1880s and 1920, mining in the Table Mountain and Aravaipa areas used wood for steam boilers, water-jacketed smelters, mining timbers and even small adobe smelters. Because of incomplete records and erratic up-time, it is nearly impossible to estimate the cordage or forested acres exploited for mining. Oak and Alligator Juniper Woodlands, the Evergreen Woodland and mesquite bosques of the alluvial plains were the most heavily exploited for mining.

Clearing land for farming removed over 600 acres of floodplain woodland. Walnuts in the Turkey Creek riparian were selectively cut (See: Chapter IX and "Aravaipa Bottomlands").

Step 4: Climate, Drought, and Natural Impacts on Plantlife

C3, C4, and CAM plants are three broad categories of plant types (based on their metabolisms) which respond differently to rain and temperature patterns. So called "C3 plants" are more adapted to growing at somewhat lower temperatures than the other types. When they grow, they utilize more water. Most green plants have a C3 metabolism. In Aravaipa, the winter C3 annuals, C3 biennials, and various C3 shrubs prosper under wetter and longer than normal winters, especially when the temperatures of wet winter are favorable. Once established, some of the C3 perennials such as snakeweed and mesquite have the ability to tolerate the adverse conditions of drought, freezes or even fires. It takes more than a single-year or even two-year drought to kill off these C3 perennials.

"C4 plants" are adapted to hotter temperatures than C3 plants and utilize less water in growing. The summer perennials, the "original" grasses praised by early ranchers and explores, were mostly C4 plants. Most of these perennials respond to consistent or similar multiple-year weather patterns. They fail to expand or prosper, if only one single year is "favorable".

"CAM plants" are mostly succulents like cacti and agaves. They are adapted to the hottest temperatures and are the most water conservative of the three types. They are the most drought tolerant of the group, but are very vulnerable to fires and catastrophic freezes.

In Aravaipa, changes in rainfall amounts, the consistency of rainfall between years, local inter-storm drought, regional seasonal droughts, the proportion of rain between seasons, along with long-term temperature trends all have the effect of encouraging one species over another. Extreme climatic events (freezes, floods, and fires) may greatly set back or encourage one species over another. The combined impacts of decadal trends in climate, extreme events, and long-term climatic changes on plant abundance is a relatively new study and only a few of the Aravaipan species have been studied. Out of necessity, these will be the only ones discussed.

Climatic trends from Tucson and other parts of the southwest (Table I. A) have been compared with weather stations near Aravaipa (Ft. Grant, Klondyke, and Dudlyville) in a cursory manner so that only those more reliable decadal trends can be described. Weather does not work by decades, local summer storms may vary from regional trends and each Aravaipa tributary respond differently to rainfall because of varied aspects, slopes, and rainshadows. This makes the site-specific climatic reconstruction somewhat speculative (see "Turkey Creek" below).

Prior to 1900, the climate was more consistent. Year after year, there were cooler and drier than average winters and wetter than average summers. This inter-year consistency favored the C4 grasses, the summer perennials, which so attracted the cattlemen. The period of first livestock importation can be called the Grama Grass period. Weather restrained the expansion and abundance of C3 shrubs, winter annuals and ephemerals. Many of these winter annuals and ephemerals were recently imported exotics. The final years of the nineteenth century experienced both drier winters and drier summers. These year-long droughts greatly depressed the vigor of the summer perennials and probably set the stage for shrub invasion in Aravaipa.

From the early 1900s to 1930, the weather turned against the C4 perennials. The winters became wetter and warmer, the summer rains more erratic and drier than average. The warmer/wetter winters favored the winter annuals which livestock consumed vigorously and many of the C3 increasers which were disliked by the cattlemen. Winter shrub germination and establishment, cactus and agave growth, winter annuals, biennials, and invading European exotics thrived. This second part of the open-range period can be called the Filaree period.

From 1930 to 1940, both winters and summers were warmer and drier than average with a severe drought in 1934. The severe winter/summer drought favored drought-tolerant plants like creosote bush and brittle bush, although a few C3 or C4 plants also did well. Filaree and winter annuals declined but summer perennials had no weather advantage to help recovery. Some of the already established C3 "brush species", with deep roots and/or biomass reserves (e.g., acacias and mesquites), weathered the subnormal rains. CAM succulents may not have expanded but their better adaption to this weather pattern probably gave them a stronger foothold in Aravaipa's plant communities.

Starting around 1941, temperatures once again cooled. Ideally, this might have given the perennial grasses a greater chance to recover. But, simultaneously, the summer rains diminished, preventing any vigorous return to "grama grass days." In addition, the already entrenched C3 shrubs and CAM plants now held a competitive edge.

In the 1950s and through most of the 1960s, consecutive years of winter-and-summer drought (though not as severe as the 1890s) returned. The most arid adapted plants (grown shrubs, cacti and agave) were climatically favored once again. The whole period from the 1930s to the end of the 1960s could be called the "Succulent-Shrub Period." In short, even without the grazing pressures, the perennial grasses might have had a difficult time, and C3 shrubs and CAM succulents might have expanded (Schmutz et al., 1985).

Step 5: Fire

The specific history of fire in the Aravaipa area is poorly documented (Chapter I and IX). After 1900, fire frequencies were de-coupled from larger climatic changes associated with El Nino (Swetnam and Betancourt 1990). Because grazing reduced the amount of fine fuels, fire suppression was an implicit Euroamerican cultural impact. Roads and cleared areas also acted as firebreaks. After 1900, fire-resistant and fire-adapted plants had no special advantage over fire-susceptible plants. With increased elimination of livestock and the warmer weather since 1972, fuel loads may be accumulating for the first time in over a century.

In addition, the impact of fire on perennial grasses is not well known. Fire may not restore the perennial grasses. Work by Schmutz (1985) determined that some perennial grasses (e.g. Cottontop at Page Ranch) were drastically reduced by fire and that some increasers (snakeweed, burroweed), normally hurt by fire, recovered quickly. Snakeweed and burroweed increased because the fire was followed by a winter rain, creating a reduced grass competition and increased ash nutrient. Only cacti appear to be uniformly hurt by fire. Forbs appear to have been unaffected.

Step 6: Soils on Hillslopes

Livestock impacts on soils at Aravaipa have not been studied. Pre-1900 *corriente* cattle may have grazed and browsed on steeper hillslopes than those utilized by English breeds. English breed impacts were somewhat mitigated because this type of livestock prefers to graze on short, level slopes which have less dramatic runoff. But droughts and starvation undoubtedly forced even these gentle-slope breeds to use moderate (thirty to fifty percent) slopes. Even with light grazing, Dodd (1987) recorded twenty-seven percent more bare soil in grazed vs. ungrazed areas. Litter loss which provides soil protection is also greater on grazed Aravaipan soils. The exposure of bare soil increases soil erosion during heavy rains. Cattle trails, especially to watering holes, can become major runnels from erosion. Few Aravaipa cattle trails have been described in detail and many have been obscured by changes in grazing patterns after the Taylor Grazing Act.

On the other hand, goats travelled on almost all Aravaipa slopes, and residents noted that their sharp hooves loosened the soil. Hoof-plowing increased churning of the A-horizon soils on slopes and "freed" up the soil particles for both wind and water erosion. The combination of loosened soil and steeper slopes made all goat habitat very vulnerable to soil erosion. Compaction also increased surface runoff, accelerating erosion of the top soil.

There seems to be little doubt that the litter layer and upper organic layers of many slopes suffered heavy damage from goat impact. Some of the runoff became run-on into pockets in rock piles and crevices. This may have encouraged shrub growth in specific locations. Whether sheetwash and runnelling increased the amount of gulleying and downcutting in the more defined drainages of Aravaipa is not known.

Road cutting and land clearing for farms and homes destabilized slopes, especially in the neighborhood of the Aravaipa township and in the upper and lower valleys of Aravaipa Creek. Local over-balancing of hillslopes from mine tailings can be seen at Aravaipa and Table Mountain. To determine how far downstream the impacts of mine wastes can be traced would require a tributary by tributary survey of soil profiles, aggrading and downcutting.

All the soil impacts discussed here are cumulative and once the A-Horizon is gone, the chances of returning to the original vegetation is slight. The nutrient and water "storage bank" of the soil may take thousands of years to re-establish. In some cases, Aravaipa soils were "relict" soils created during a wetter period of geological history. These will never recover on time scales appreciated by humans.

Step 7: Competition and Coevolution

Adding to the complications of historical reconstruction, the interaction of species can help to organize a community and, by organizing it, favor the abundance and distribution of certain species over others. Here are four examples: (1) The simultaneous blossoming of plants can increase the food supply to pollinators and benefit all the species able to synchronize flowering times. On the other hand, if the flowering resource overwhelms the pollinators, there will be a tendency for plants that flower early or later in the season to reproduce more efficiently. (2) "Nurse" plants in both the desert scrub and floodplains protect seedlings from environmental hazards. If the nurse plant is removed, the chances that the nursed plant will survive is greatly reduced. (3) After grasses build up enough density, they can support large numbers of a cactus moth which attacks prickly pears, speeding the reversal of a shrub/succulent scrub back toward grassland (Tony Burgess, p.c.). (4) There may be a complex interaction between ants, flickers, their excavated nests in saguaro, and saguaro survival (a large excavation can lead to fatal bacterial infections). These natural dynamics interweave with human influences making it difficult to distinguish natural from human causes. For example, land clearing or soil exposure in the Sonoran desert scrub will increase the abundance of ants.

EXPERIMENTS IN RECONSTRUCTING ARAVAIPA LANDSCAPE

There are over twenty plant associations in the Aravaipa area and over fifty tributary watersheds of various sizes. Each has had a different intensity of human use and has a slightly different climate. Reconstructing the history of the "Aravaipa area" forces the historian to see these smaller variations. Three examples illustrate the possibilities of historical reconstruction. They are: the main creek itself (Aravaipa Bottomlands); a tributary with heavy livestock use (Turkey Creek); and a tributary with mining (Hell Hole Canyon). Subsequent reconstructions might focus on: Laurel Canyon and the Grand Reef Mine complex; Stowe

Gulch, because it is the main feeder to the alluvial aquifer in the study area; and the "west end", where floods break out of the narrow canyon and confront the human activities of the widening lower valley.

ARAVAIPA CREEK BOTTOMLANDS

The entire Aravaipa Creek watershed is 541 square miles. It is possible that events in the Pinaleno Mountains, upper Aravaipa Valley, or Stowe Gulch could impact the perennial creek, particularly the recharge volume of the alluvial aquifer. In addition, tectonic changes such as the lowering of the San Pedro could influence the gradient of Aravaipa Creek. Tectonic influences, essentially readjustments of the watershed, may take time spans that have neither been studied nor speculated upon. In short, from the very outset, our understanding of changes in Aravaipa Creek must be limited to the last century and to more immediate Aravaipa Creek events. The bottomlands include the Mixed Deciduous Riparian Forest (predominantly the Cottonwood-Willow-Seepwillow Association), the Sonoran Riparian Scrub (dominated by seepwillow), and mesquite bosques. One natural environment, the Sonoran Marshlands, has completely disappeared from the bottomlands. One completely humanized environment, the Old Fields Association, has been created since Euroamerican occupation.

Local residents and climatologists agree on Aravaipa's flood history (Chapter I and Chapter IX). After the 1960s, flood events became more severe and occurred later in the fall. Between about 1900 and 1960, floods were not as severe and took place in both winter/spring (1915, 1926) and summer (1923). Climatologists have recorded a late fall flood pattern before 1900 but without the severity of the post-1960s. The 1970s and 1980s flood events, especially the 1983 flood, have completely revised the concept of what natural events can episodically do to the channel, terraces, and plantlife of Aravaipa Creek. As both biologists and residents report, the frequency and scale of flood events has altered the stability of the riparian communities by creating new side channels, by building or tearing out terraces, by downcutting the main stream, by opening the canopy for increased understory growth, by changing the distance between the streambed or terrace and the groundwater, by increasing the gravel and boulder beds while decreasing the sandy bottom, and by filling deep pools with sediment or washing them away. Residents report only minor channel changes from 1920 to 1960, despite all the human impacts to be discussed below. They report, for instance, that there was enough sand to build diversion dams until 1963. Until the 1960s, the creekbed was flat enough to cross from the east end to the west end in a four-wheel drive vehicle.

Without more explicit work, the details of flow changes, floods, and water quality history on plant associations cannot be reconstructed. For instance, the mining concentrator waste in Klondyke may have contributed heavy metals in significant amounts even though it was separated from the creek's mainstem. Recent changes in the creek channel may now cut into the Klondyke tailing for the first time and increase downstream heavy metal loads. The tolerances of riparian species to heavy metals are now under study on the Salt River. In Aravaipa, the interactions of water quality, species, and stream health require further thought and investigation.

The Mixed Broadleaf Riparian is a suite of plant associations that have been poorly classified for Aravaipa as a result of both human disturbances and the dynamism of Aravaipa Creek. Although we will call Aravaipa Creek "mixed broadleaf deciduous," it is below most elevations for this community, and over eighty percent of the gradient is flatter than this community in other places (The Nature Conservancy ESA 1989). However, Aravaipa Creek is a mixed broadleaf community because of the narrowness of the canyon, the relative rarity of Gooding's willow (vs. Bonpland's willow) and high tree diversity. The narrowness has placed many facultative trees next to the "big five" (sycamores, walnuts, ashes, cottonwoods and willows). In fact, this is one of the great pleasures of the canyon. The juniper, oaks, saguaros and mesquites mix with the broadleaf trees. Some high elevation trees such as Arizona alder grow all along the creek, probably because of cold air drainages and episodic flood disturbances. Recent events have created a thicket of alder below the junction with Turkey Creek. Toward the west end, scattered older alders appear on bank terraces. These may be relics of a time when the streambed was aggraded. As commonly observed, the cottonwood/willow cluster along the stream; the mesquite, hackberry, and walnut live on the terraces; and the ash and sycamore occupy both zones.

The history of walnuts has been partially documented. Walnuts naturally thin out and die from drought, floods, and insect herbivory. Walnut germination can benefit from cattle pushing the fallen seeds into the ground but can also be deterred through browsing and trampling of seedlings. Recovery from cattle browsing can occur if the buried cotyledon has enough reserves to regrow a seedling or new leaves. In Aravaipa, grazing and browsing and soil compaction on the terraces have occurred for about 100 years. Soil compaction from vehicles has occurred for about eighty years. (Soil compaction has been implicated in adult walnut tree mortality.) During the 1920s and 1930s, possibly 100 (totals unknown) large trees were removed from the terraces (including the stumps). Since stumps were always removed, the terraces were essentially excavated and suffered reduced cohesion. Between 1973 and 1980, segments of the creek have been passively restored with walnuts. Abundant seedlings have returned only on the ungrazed vs. grazed terraces. Given their relatively long growth period, the impacts of human activities will be noticeable in the age and composition of Aravaipa's mixed riparian for two hundred more years. The remaining threat to walnuts might be additional soil compaction or ground disturbance from camping, particularly from extensive vehicle camping.

The history of willows in Aravaipa would be interesting to document because they were extensively planted by farmers to hold the banks and terraces in place, and they were periodically removed and spread by floods. Willows are probably the most resilient of the "big five" trees to floods. Additional detailed oral history and review of select photographs might be revealing.

Cottonwood and willow are preferred riparian browse for cattle and probably for goats. Intermittently over the last century, cattle and goats have trampled seedlings, browsed seedling/saplings, and, perhaps, destabilized some of the terraces by hoof-plowing. During droughts, informants recall cutting cottonwood limbs for cattle feed. In addition, the reduction of herbaceous cover by cattle grazing increases the vulnerability of cottonwood seedlings to flood damage and soil loss. Adult cottonwoods can be impacted by soil compaction but many cottonwoods still grow along very compacted roads at the east end. Some sycamores were cut for board timber during the 1920s and 1930s by the walnut burl crews. Sycamore sprouts are also browsed by cattle.

Although no studies of tree age are available, it appears that floods and human activities have impacted sycamores less than cottonwoods. Sycamores can spread and resprout vegetatively. Aravaipa's cottonwoods appear to have a "decadent" age structure with many ancient trees, followed by an age gap, and then younger trees. The sycamores may have a similar age gap but have maintained their abundance asexually. This bodes ill for many riparian wildlife species during the period between the death of older groves of cottonwoods and the recovery of adequate stature and canopy closure by the more youthful cottonwoods.

Tamarisk is the only prominent invader tree. According to residents, tamarisk (along with alder) has become more widespread since the 1960s change in flood patterns. This is a logical pattern, since tamarisks, unlike cottonwoods, are not dependent on spring floods. Tamarisk has not yet become a dominant because the natural spring flood regime has been maintained and disturbances (with the exception of severe floods) have been reduced. The higher saline content of some springs and more saline conditions downstream may create special niches for tamarisk, a situation which deserves study. A longer-term climate change to late summer floods (since the 1960s) may give additional competitive advantage to tamarisk establishment.

The loss of beaver accelerated the loss of Sonoran marshland from the Aravaipa area. It is impossible to know how dependent the Agua de Muertos cienega, the abundant bullrush and tules reported by Bell and others, and Cooke's Lake were on the presence of beaver. It would be interesting to re-introduce sterilized beaver in Aravaipa, although the amount of cottonwood, tules, sedges, cattail, willow, and younger mesquites, as well as the fall flood regime might be limiting. Although beaver consume cottonwood and willow, they also consume some tamarisk and might be introduced in restoration projects.

From immediately above the emergence point all the way to Eureka Springs Ranch, on sandy soils and level floodplains, woodcutters reported extensive mesquite bosques or thick mesquite riparian. Mesquites are the oldest riparian trees, some estimated at over 300 years. Although tree ring assessment is nearly impossible and has not been studied, the present mesquites appear to be less than 100 years old, and many have multiple stems (vs. a single trunk) indicating that the seedling was broused. In some riparian situations, mesquite require cottonwood/willow to stabilize the alluvia before they can take hold. They are closely associated with terrace building and deformation, which is now under human control as the creek bed has been moved and altered by straightening and diking. This prevents the kind of flooding reported by early residents that may be necessary for mesquite bosque recovery. Clearing of fields and woodcutting on both the east and west ends may be responsible for the loss of 300 to 600 acres of mesquite bosque along Aravaipa Creek. Further removal of mesquites took place upstream as far as Eureka Springs Ranch and probably (with all the other impacts) contributed to channel instability. It is not known how changes in water table levels may have impacted the cottonwood/willows and mesquites above the emergence point.

The history of the shrub and understory flora for the riparian forests has yet to be reconstructed. Informants basically recall a cleared pastoral impression while cattle were present in large numbers, and a return to thick understory in recent years. The one plant consistently found with mesquite bosques in Arizona, *Aristolochia watsoni*, has not been recorded for Aravaipa Creek. Sacaton, a perennial grass widely reported in the Aravaipa area in the late 1800s, normally grows on alluvial flats which are flooded, but it has not been reported for the floodplains of Aravaipa Creek. Similarly, other grasses associated with alluvial flats such as Arizona cottontop and Vine Mesquite have not been reported for the bottomlands of Aravaipa Creek. Blue grama, one of the most tolerant grasses to grazing and considered by some ecologists as a possible replacement for sacaton, is still common. The more opened mesquite forests now have Old Fields Association field layers which are weedy (predominantly dove weed, prickly poppy, and jimson weed) with exotic, winter annuals such as red brome. Even the ungrazed floodplain terraces within the canyon remain a cattle-induced disclimax with exotics (predominantly Bermuda grass).

In summary, the bottomlands of Aravaipa Creek have undergone both massive changes from episodic floods, and cumulative slower changes, resulting from road building, channel modification, tree and wood cutting, livestock grazing, and field/homestead clearing. Identification of specific causes for specific changes in the topography of the creek appears impossible at the moment. But a combination of additional detailed oral history for specific portions of the creek, a discussion of the old photographs collected by this project and a detailed survey of terraces, channels, and plant distribution would explain more than could be accomplished in this short investigation.

Changes in plant species and abundance are fairly clear. Recovery of the bottomland mesquite groves and Cottonwood-Willow-Seepwillow Associations will take one to two hundred years to complete. Similarly, the stream terrace tree canopy, especially walnuts, will passively restore itself over the next century. The understory plantlife appears to be irreversibly damaged, and if restoration becomes a goal, more research on what the pre-Euroamerican species were and how to restore them will be necessary. Many of the original species such as sacaton may require reintroduction. Finally, to restore the Sonoran marshlands within the canyon proper may require the experimental introduction of beaver. Preventing further invasion of exotics may require active removal of tamarisk, bermuda grass, and other invaders.

TURKEY CREEK

Turkey Creek is the second largest tributary watershed feeding Aravaipa Creek with the most complex drainage system (sixth order stream). It includes Garden Canyon (a fourth order stream of 5.55 square miles) that feeds Oak Grove Canyon (a fifth order stream which is 3.05 square miles without Garden Grove) which feeds Turkey Creek (6.4 square miles without its tributaries and twenty-two square miles total). It connects to Aravaipa at 3,050 feet elevation having descended through Oak Grove from 5,801 feet. It is the largest drainage south of Aravaipa. Within the watershed, Jackson Spring has been very reliable throughout droughts. Other important springs are Garden Spring and Oak Grove Spring. Mescal Tank is the major livestock watering development. Of all the tributaries to Aravaipa Creek, Turkey Creek has the highest dissolved cations (calcium, sodium, etc.), and spikes of high dissolved mercury, total zinc, chromium, and, particularly, manganese. These have not been traced to any particular rock formation or mine.

Only part of Turkey Creek has been mapped for its plantlife. It includes all three riparian associations and is the only tributary watershed with Alder-Walnut-Netleaf Hackberry Association (Riparian with Alder). The tablelands include Desert-Grassland/Semi-Desert Scrub (Semi-desert Scrub with Blue Palo Verde, Scrub Oak Semi-desert Scrub, Upper Riparian Scrub, and Mesquite Shrub Grassland Associations), Chapparal (at least Chapparal with Pinyon-Juniper), and Arizona Oak Woodland. Black Hawks have been known to nest in the Turkey Creek watershed in the 1930s and 1980's. Oak Grove Canyon had visiting Elegant Trogons in 1988 and 1989. Informants have always said it is an abundant area for wildlife because of its more mesic (wet) environment.

Turkey Creek has been visited or occupied by humans for at least 1,500 years. Euroamerican residence began in the 1880s or 1890s when the Allbritton's brought goats to Turkey Creek. Soon thereafter, the Wootans, Browns, Bleaks and Ditmers had goats. By the 1920s, a peak estimate of 8,000 goats may have used Turkey Creek and surrounding watersheds. The famous Oak Grove goat pen, under an overhanging rock, accumulated over four feet of goat manure which caught fire in the 1950s and burned for weeks. The ashes and remnant manure piles are clearly visible today. The stocking rate of goats is difficult to judge as no standards really exist.

During the 1920s, in addition to goats, Bland Beauchamp ran thirty to fifty horses and cut for stills. The Browns and Bleaks lived in Turkey Creek and replaced the mesquite bosque with two or three acres of orchards.

Little is known of the cattle stocking rates. Cattle were present by the 1880s with heavy stocking rates (perhaps twenty or more cows per section). Since it was open range, they clustered in the bottomlands. Around the time of the Taylor Grazing Act, cattle stocking decreased to approximately twelve cows per section. However, property lines and fencing isolated cattle from Jackson and Oak Springs, forcing them to return to water daily in Turkey Creek. Cattle have remained within Turkey Creek until the present, but water developments and lease changes have reduced the dependence of cattle on the Turkey Creek bottomlands.

Until the 1920s, Turkey Creek only had a horse and cattle trail, which was then converted into a motor vehicle road. Although road maintenance has been a problem, erosion of the hillslopes does not appear significant because of the shallow soils to bedrock. Compaction of the Turkey Creek road bed and clearing for recreational use may have severe local impacts but these have not been investigated.

Oak Grove Canyon, between the spring and the Dick Wootan corral, recently underwent a major arroyo cutting event (with twenty foot cuts) which informants say occurred in the 1960s. The road alongside this part of Oak Grove is gullied. What caused the downcutting has not been investigated but it could be related to the changes in storm events. A major unresolved history is the amount of hillslope erosion caused by goats. The erosion of topsoil may limit recovery in the desert grassland and semi-desert grassland communities and requires extensive study.

The semi-desert grassland/scrub communities of Turkey Creek

Although this section concentrates on the semi-desert grasslands and scrublands, the riparian communities require mention. The mesquite bosque in Turkey Creek has changed as described for the Aravaipa bottomlands and now has an Old Fields Association in an open mesquite grove. The mesquites near the ruins of the Brown/Beauchamp corrals and cabins are not invaders (as on the grasslands) but are the dominant species of the bosque community. The bosque was probably cut for homestead use. A history of the lower deciduous riparian forest could not be obtained but commercial walnut cutters are believed to have selectively cut during the 1920s and 1930s.

Goats did not harm those plants from which they ate only the pods or fruits, and from which they avoided leaves and branches. In fact, they may have been dispersers of these species. In Turkey Creek, these species include snakeweed, whitethorn acacia, yucca, opuntia cacti, agave, barrel cactus, mesquite, jojoba, juniper, burro bush, and bear grass. The taller plants (agaves, yuccas) required the help of the herder to give goats access. These plants are still most prominent in the semi-desert scrub and grasslands of Turkey Creek (Johnson 1980). The most preferred of these "fruits" was jojoba. Goats, in fact, appear to have been summer and fall fruit/pod-eaters in the Turkey Creek watershed.

In average rainfall years, goats could switch from young grasses to perennial bushes and shrubs. In wet years, the grass and fruit abundance gave the perennial shrubs a respite, a chance to recover. In dry years, the perennial shrubs were heavily browsed. In drought years, virtually no seeds and fruits could be produced by the perennials. Herders burned prickly pear to rid the pads of thorns and chopped yucca and agave to create better access to the nutritious internal parts. The last time this occurred was probably 1934. Consistent droughts may eventually kill preferred perennials such as buckbrush (ceanothus) but the subject has not been studied. Goats had a depressive impact on preferred species like buckbrush and squawbush whose leaves and stem tips they consumed. Both these species have the ability to recover after heavy browsing and have remained common. Goats ate almost all grasses when green and young (vs. cured or matured) and probably had the most impact when, along with cattle, they overgrazed the grass resource. They also consumed common shrubby forbs and small shrubs such as buckwheat, white ratany, and wolfberry. But poisonous and resistant species such as turpentine bush, the smaller opuntia cacti, mimosa, gray thorn, and red barberry were strictly avoided and may have prospered from this lack of attention.

In short, it is difficult (after a half century without goats) to reconstruct the turn-of-the-century vegetation. But it is significant that almost all the most frequent and prominent plants catalogued (Johnson 1980) are either goat-immune, goat- neutral, or are plants able to recover from goat over-browsing (goat-resilient). The new information on goat occupation presented by residents and informants adds an additional dimension to the discussion of present communities. There can be little doubt that goat diets encouraged a "livestock-induced grassland disclimax." That is, they harmed the grass layer, and encouraged the spread of bushes, shrubs, and succulents whose fruit they ate and dispersed. They encouraged the spread of forbs vs. grasses and temporarily reduced the abundance and biomass of shrubs whose leaves they consumed. The Semi-desert Scrub with Juniper, Semi-desert Scrub with Blue Palo Verde, and Scrub Oak with Semi-desert Scrub may all have been semi-desert grassland communities before the onslaught of goats.

As opposed to the goats, cattle and horses had greater impacts on level surfaces (the bottomlands and more level plant associations such as the Semi-desert Scrub with Blue Palo Verde and Yucca Shrub Grassland). Cattle sought shade in the washes and riparian scrub communities. Cattle impacts summarized in Chapter VI include: reduced palatable perennials; increased bare soil; increased forbs, annuals, and dicots; reduced canopy cover and fire frequency; reduced competition with exotics and invaders; and dispersal of certain seeds for increased germination. For instance, in Turkey Creek, on the drier, south-facing slopes, Sprucetop grama, which requires grazing or poor soils to become abundant, and Sideoats grama, which is more resilient to grazing, are the characteristic grasses. We might speculate that the earlier grassland contained Tanglehead, Plains Lovegrass, and Texas Bluestem in far greater abundance (Brock and Bock 1986).

The combination of both goats and cattle is hard to untangle. Increasers such as snakeweed, jumping cholla, prickly pear, Christmas cactus, cane cholla, catclaw acacia, and shrub mesquite expanded in distribution and abundance from the indirect impacts of both cattle and goats (reduced grass competition) and their own "personalities" (inedible, thorny, poisonous, drought resistant). The short-cycle grasses ("six week grasses") prospered. Both types of livestock helped reduce fuel loads (especially fine fuels). Lower fire frequency helped maintain established shrubs, cacti, and leaf succulents.

Some of the upper elevation communities may have had large juniper and Arizona oak semi-desert grasslands. The amount of woodcutting of juniper and oak for mining, homesteads, and commercial sale was extensive (Chapter IX). Many of the remaining oaks have crown sprouted from earlier cutting. It is hard to determine in some areas whether the junipers "invaded" or are just recovering from previous woodcutting. Photographs of other portions of Aravaipa Creek from the early 1900s show young juniper (possibly the only trees left). These photos were taken after the major woodcutting period for mining ended. Both the lack of grass and fine fuels and the inedibility of juniper aided juniper invasion or recovery. The lack of young oaks is more perplexing and may relate to problems of dispersal and regeneration. Both Emory and Arizona oak are browsed by goats.

The changing landscape of Turkey Creek is, of course, complicated immensely by changes in weather patterns (Step 4, above). Although from the 1870s until the droughts of the 1880s, the weather pattern favored summer perennials, heavy over-stocking, incessant re-stocking, and open-range cattle management heavily stressed the perennials. In the period where recovery might have been possible (early 1900s to 1930s), not only did the weather turn against the perennials, but open-range grazing open-range and over-stocking continued. In addition, goats and horses joined cattle as grazers. In Turkey Creek, this is the period of filaree and other exotic plant expansion as well as brush establishment. It may also be the period during which the litter layer and topsoil necessary for grassland recovery was lost. The possible suppression of fire was also favorable to shrub establishment.

After 1934, goats, cattle, and burros declined. Shrubs such as buckbrush and squaw bush were freed from overbrowsing. Continued cattle grazing and unfavorable weather probably prevented any strong return of the summer perennials. The lack of fire, in part grazing-induced, prevented any setback or elimination of the drought resistant, fire sensitive CAM succulents. The intermittent droughts favored the succulents and C3 shrubby increasers for the next three decades.

Residents associate the removal of goats in the late 1930s with the decline in filaree. But the winter rains were not to return to the same above-average levels for fifty years. In fact, from 1940 to 1960, the winters were consistently drier and cooler, further hurting filaree and related C3 annuals. Goats may have been involved but the weather was never again as kind to filaree as during the 1900 to 1930 period.

The 1960s, in general, had more consistent rainfall and more summer rainfall. A new rainfall pattern and, perhaps a warming pattern appears to have begun in the Aravaipa area. The trend may favor perennials but will not harm the established C3 shrubs and CAM succulents. In addition, as Dodd (1987) showed, cattle do not hurt or aid these already established "brush" species, which will continue to dominate the landscape until significant fire or senescence sets them back.

In summary, Turkey Creek has the longest known human history of any tributary watershed. The plantlife has been drastically altered by rainfall and temperature fluctuations, droughts, probably by fire, as well as livestock and human activities. Since the 1880s, native trees have been cut to clear for an orchard, for walnut burls, fences, and fuelwood. The shrub and herbaceous layer has been heavily browsed and grazed by cattle, goats, and horses. What were probably grasslands have now become scrublands.

Recovery of these pre-Euroamerican communities cannot occur until fire, severe freezes or human interventions reduce the abundance of the most widespread increaser and resister species. Total restoration is, of course, an unattainable dream, as some exotics have naturalized. Unless integrated pest management or biotechnology devise new species-specific strategies, these exotics appear to be permanent parts of the landscape. If the period of heavy stocking caused significant topsoil losses, recovery may not be possible in human time frames. There is a major need for a soil survey and the identification of sites that may still be representative of the pre-Euroamerican soil profiles, with consideration of the goals of rehabilitation.

Recovery of Turkey Creek grassland would help both the future production of livestock and wildlife as well as be of great historical interest. This long-term project would require the creation of exclosures to allow fine fuel buildup, fires, and subsequent comparisons between grazed conditions and ungrazed conditions complicated by droughts. Recovery of water quality requires an investigation of the source of heavy metals and cations.

HELL HOLE CANYON/DEER CREEK

Hell Hole Canyon is the largest tributary watershed on the north side of Aravaipa Creek. With its Deer Creek tributary, it is a fifth order stream rising from 2,957 feet at its junction with Aravaipa Creek to 7,029 feet. The total drainage area, including its eastern arm (Arizona Gulch), is thirty-two square miles, the largest tributary to Aravaipa Creek. The junction of Hell Hole Canyon with Aravaipa Creek is also the transition point to Lower Sonoran Desertscrub.

Although access to the mining town of Aravaipa was through Stowe Gulch, the actual activity of the town and mines centered in the headwaters of Arizona Gulch. Specific details of ore removed from mine shafts, excavations, road clearing, site clearing, and other aspects of earth moving are not available. They would be particularly interesting in charting the history of Hell Hole Canyon's creek bed.

What is remarkable about Hell Hole is its water quality. To what extent is it influenced by human activity vs natural suspensions and dissolved heavy metals? Hell Hole, at the junction with Aravaipa, has the highest recorded concentration of dissolved iron, manganese, and lead ions. The total calcium and potassium has been measured at levels ten times the concentration of the mainstem and twenty to one thousand times the concentration during high discharges. It has the highest amount of particle bound copper, zinc, chromium, cadmium, iron, manganese, and lead of any tributary. While none of these averages has caused health alarms, the origin and sources of these metals indicate that activities at the headwaters at Aravaipa townsite may have had important impacts downstream. No work has been done in the Hell Hole tributaries to determine the source. In short, more than twenty years after mining ceased, the probable impacts of humans can still be measured in the mainstem. If a return to pre-Euroamerican water quality is a desired goal, then a watershed study of Hell Hole would be revealing.

THE ETHNOECOLOGY OF ARAVAIPA RESOURCES

In natural resource management, three questions are commonly asked: What do you want? What do you know? and, What will you accept? Aravaipa has been no different from other areas from this point of view. Individuals, property owners, regulatory agencies and special interest groups all answer the question -- what do you want? -- differently. There is never perfect knowledge, but many decisions improve when knowledge improves. For instance, when ranchers learned that droughts were normal to the Southwest, they became less resistant to destocking or calf killing.

The "players," the decision makers who determine what any individual or group will accept, have changed in Aravaipa. Since the 1880s, Aravaipa has always had some combination of in-migrating outsiders (mining companies, goat herders, government regulators) along with the long-term residents. Opportunities for mining, alluvial bottomlands, adequate water supply, and tableland range pulled outsiders into the Aravaipa area. From the 1890s to the 1930s, the resident population remained stable with minor ups-and-downs influenced primarily by mining operations. From the 1930s to the present, a general decline in resident population and residency time has occurred. This out-migration and shorter term residency coincided with the general abandonment of rural communities throughout the Southwest. Although no detailed comparison is available, the residents of Aravaipa may have stayed longer than in other rural communities. The ability to make a living from diverse resources (trapping, mining, farming, livestock) and the simple beauty of Aravaipa prevented families from selling out and moving away (See: Chapter IV).

Minerals were the major non-renewable resource. From the very beginning of mineral exploitation, no sense of responsibility accompanied mining developments. The mining companies which took over production from settler/prospectors were non-residents with capital and financial responsibilities to stock holders outside the Aravaipa area. Federal government policies (the 1872 Mining Law) encouraged extraction without addressing watershed damage nor providing any means of watershed protection in the Aravaipa area. By the time mine waste, dewatering, and downstream impacts on water quality were recognized and addressed by the federal government, the mining boom at Aravaipa was over. Any watershed restoration or rehabilitation will now be the financial burden of the United States taxpayer because of the lack of early legal restrictions and the absence of any land ethic on the part of the mining companies.

The most abundant renewable resource was surface water, truly a rarity in southern Arizona. The combination of abundant stream flow and small irrigable acreage meant that severe water conflicts did not arise in the history of Aravaipa. The upstream and downstream users cooperated and shared stream flow. They scheduled water diversions by general consensus. No dam or cattle tank reduced tributary flow into Aravaipa Creek significantly. There were few conflicts over water development of springs in the tributaries. The security of water rights never became a major issue, although Anglo-Americans secured their water rights with greater ease and understanding than Hispanic farmers or ranchers. It was not until the 1950s, with the dispute over a possible series of dams within Aravaipa Creek, that water became an issue. In the 1950s, an outsider led the fight to stop dam construction -- initiating the external influences over water resource management. It was not until the 1980s that instream water rights and water rights filings were to be reviewed by state and federal agencies.

It is noteworthy that Aravaipa never had major water conflicts, never formed a watershed organization to resolve conflicts, and never had water rights as a major source of debate. A "water ethic" was not needed until concern for instream flows to protect native fish and the possible conflict between instream flows and underground pumping became evident. In short, where there is abundance and small usage, a group ethic or group self regulation is not of major concern.

Wildlife and wild plants were important renewable resources. Big game and small game were used consumptively for meat and trade furs. During the early years of settlement, there was no understanding of "existence value", the concept that a non-human animal had an intrinsic value and possessed the right to exist outside of human concerns. The major human concern was economic production. In addition, no laws assured the on-going existence of any particular species. Without any internal or external control, the grizzly, the wolf, the bighorn, the prairie dog, and the beaver became locally extinct.

In Aravaipa, sentiments regarding the wildlife-livestock issue were not monolithic nor unsophisticated. All ranchers knew that strychnine killed non-target species, including sometimes their own dogs. Some individuals tried to restrict their own use of strychnine. But there was no community ethic on the subject. Compound 1080 complimented the "practical rural" approach of ranchers. But 1080 was involved in government agency self-perpetuation and Washington lobbies for the petrochemical business. Its national exposure brought attention to the more urban conservationist groups who questioned the safety and "non-target" claims of the government/business/rancher coalition. The power of the anti-poison ethic increased until 1972, when Compound 1080 was banned. On both a local and national level, this dialogue has not ended. Of all the resource conflicts in Aravaipa, livestock commodity vs. wildlife conservation values remain least resolved. Attempts by Defenders of Wildlife to pay ranchers for livestock killed by predators proved unworkable.

An important aspect of wildlife conservation in Aravaipa was the land's ruggedness. Neither mountain lions nor small fur-bearers were ever extirpated because of their inaccessible hideouts in the rugged canyons. From these "reproductive sanctuaries", the small fur-bearers (except beaver) recolonized areas accessible to trappers and hunters. In addition, the Galiuro Mountains are part of a string of ranges connected to Mexico and other mountains such as the Pinalenos. This allowed slower, but definite replenishment and introduction of species such as coatis, deer, and bear.

Finally, ethics concerning wildlife had many gray areas. Some ranchers utilized government predator control agents in which killing had no other commercial value, except livestock preservation. Others preferred to use local lion hunters, adding sport-hunting income and local employment to predator control. This is a clear choice between local reliance vs. reliance on external (federal government) control. Again, this debate between external vs. internal controls over ambiguously desirable or undesirable game has not been resolved. Similarly, it was local initiative that started the movement to return bighorn to Aravaipa. Here, historical memory motivated citizens to restore a species. This may never have occurred without a local resident's memories and initiative. When populations appeared large enough, sport hunting was anticipated. This led to a dialogue between preservationists, ranchers, sport hunters and state and federal agencies. Again, best management practices have never attained a consensus on the role of big game.

The gathering of wild plant resources of Aravaipa has not been fully studied. The Apache gave plants both a consumptive value (especially agaves and acorns) and a ceremonial value (pollen of tules and acorn meal). Traditional Apaches have retained these values but have found availability restricted by changes in land ownership and government controls. Their access has had three periods: prior to the 1890s, relatively unrestricted access; 1880s to 1920s, loss of abundance; and 1930s to present, limitations of access. The loss of abundance occurred from oak woodcutting for mining and firewood. During the 1920s to 1950s, Apaches made agreements or developed friendships with Aravaipans to gain access (Chapter IV). Control basically remained local. As government and private agency ownership increased, especially during the 1960s, they lost some of their access rights to the oak trees, agave (mescal), and other traditional gathering sites. The preservation ethic has confronted the Apache in a similar way that the imposition of a total ban on trapping or hunting has confronted certain Anglo-Americans. Again, conflict resolution concerning access to wild plants now includes non-resident government bureaucrats and conservationist organizations, whose policies do not necessarily include special waivers for Amerindian culture. Since acorns are a major food source for wildlife, the proper sharing of this resource remains unstudied.

Soil is the basic natural resource of farming and ranching and, ultimately, of wildlife production. It is the "natural capital" (along with minerals) supplied by Nature. Soil is a slowly renewable resource. It may take thousands of years to restore some soils and some may be rehabilitated but never restored. In Aravaipa, soil has not played a major role in the discussion of natural resources. Farmers, of course, wanted to retain their alluvial soils. But they rarely compromised landclearing to gain this end. This was, in part, because they did not know that large flash floods could become so severe and, in part, because they did not know that uprooting large trees might make the alluvial soils more vulnerable to erosion. Finally, Aravaipa's erosion was a watershed problem that may have begun as far upstream as the divide between the Sulphur Springs and Aravaipa Valleys. No watershed organization occurred in Aravaipa to coordinate upstream and downstream practices or to control erosion. In short, a "soil ethic" never evolved. Residents and others muddled through history, only vaguely paying attention to the sweeping changes that would impact the bottomland soils. There is still no government sponsored soil and erosion status survey of the area. This dialogue has hardly begun.

Soils on hillslopes have received even less attention, although ranchers understood that concentrating livestock increased erosion. Mining erosion has been obvious. At this point, the historical reasons for cultural undervaluation of bottomland and hillslope soils, as well as the actual ecological status of soils, needs further investigation.

The most utilized resource was rangeland. The bitter lesson of the turn-of-the-century droughts was that stocking rates had to be controlled. The question posed: Did this destructive lesson irreversibly limit the ability of the grassland to recover? One century later, the answer still appears to be that the grasslands cannot recover to historical productivity. Ranchers would have preferred sustainable productive grasslands. However, they had to continually juggle economics, limited knowledge, unpredictable weather, and, after the 1950s, other uses by other interest groups on pubiic lands. Ranching still remains as much an art as a science and, in this sense, the crude management strategies of the 1880s (with no destocking) have evolved into the more subtle art of the 1940s (with government regulations) to present management strategies which include conservation techniques. During each period, the question of acceptable stocking rates has recurred. Should a rancher push the stocking rate upward in hope of a good year of grass production and better economic returns? Should a rancher understock with the knowledge that dry and drought years are common? Does a rancher completely remove livestock in order to give the grassland two to seven years to return to historically more productive plant compositions? Should a rancher rehabilitate with exotic, drought-adapted species or restore with native bunch grasses? Should a rancher give rangeland two to five years to build up fine fuels and then burn it as a strategy for rehabilitation? Aravaipa has experienced the evolution from a monolithic, open-range strategy to increasingly refined, experimental, and diverse management strategys. Undoubtedly, there will be more experimental exclosures in the future.

In summary, with the exception of traditional Apache, there appears to have been no overall land ethic. The ethics have changed with increasing knowledge, urban vs. rural influences, government agency senses of purpose and funding, non-governmental organization intimacy or lack of intimacy with local conditions, and the energy of particular individuals (both resident and outsiders) to push for their own beliefs. The landscape of Aravaipa has softened these conflicts by providing abundant water, small irrigable land, rugged "sanctuaries" which relieved overhunting and trapping, and, until recently, a long-term residency based on multi-generational families. Still active areas of natural resource debate are wildlife management (including fish) and rangeland quality.

FURTHER UNDERSTANDINGS

Documents

This study was based on documents, oral history interviews, and direct observations. The most important documents were census records, water resource filings, homestead filings, photographs, and local newspapers. Because federal agencies shipped many of their older documents to central locations or discarded them, federal records for the period prior to 1970 were difficult to find. Mining records, even those filed with the Arizona Bureau of Mines, were very uneven since they relied on reporting by private operators. This limited the amount of information on excavation quantities, the times of excavation, and the location of mining wastes. Similarly, Arizona Game and Fish Department reports were uneven and rarely summarized trends or speculations concerning changes in various wildlife populations. Only rarely did AGFD have enough financing to do detailed work, and much of it is summarized by region -- a scale too large for local Aravaipa history. Finally, certain documentation was inconsistent or missing such as the local Weather Bureau data on temperature and rainfall. The authors had to rely on regional data or compare local and regional data in order to understand changing weather patterns.

To further the understanding of local environmental history, "retirement interviews" with long-term agency employees would be an excellent addition to future knowledge. On retirement, the agency would hire a historian to interview the retiree and/or create a form for a "memoir" of significant events on activities that occurred during his/her job period. Knowledge of local floods, range changes, wildlife populations, severe freezes and special events such as walnut cutting would be retained. In addition, before federal records are shipped for storage, a documentary summary of the material held in local offices would greatly help new administrators and field workers who enter a new district with little knowledge of previous natural resource use and protection.

Finally, although restricted to certain areas, the photographic documentation was extensive. Over seventy-five new photos were found. About twenty-five were landscape photos; another twenty-five were partial landscapes; and the last twenty-five were mostly portraits. Approximately forty-five of these photos came from the private collections of informants. A small project in which selected sites are re-photographed and then discussed with informants might add a great deal to the reconstruction of Aravaipa's environmental history.

Oral History

The oral interviews have proved more informative than anticipated by the authors. Many local residents were astute observers of their surroundings. Their interviews contributed to local history of agriculture in the Southwest, revealing economic and ecological aspects that had been previously unstudied or greatly underemphasized. The most dramatic history, one which could not have been retrieved from documents alone, was the extent of Aravaipa's goat ranching. Activities such as walnut cutting, the origin of various non-native fish and grasses, the size and location of mesquite bosques, trapping intensities, seasonal use patterns by livestock, creek bottom changes, fuelwood species and cutting dates, and the sequence of road building could not be retrieved from documents. Only oral interviews could flesh out these aspects of economic and environmental history.

Oral history is also the only way to track the changes in human values toward the environment. Interviews showed that there were no major ethnic differences in attitudes between settlers of Hispanic and Anglo-American origin, only differences in access to information, laws, and capital. Oral history demonstrated that Apache values are still active and cannot be ignored in considering future resource use. Oral interviews revealed an undervaluation of the importance of soil conservation -- a history that requires more attention.

Oral history is also an excellent way to integrate local history with state and national history. It is the only way to understand how the timing of events impacts specific small elements of local history, like the recovery process of wildlife populations, plantlife, and eroded surfaces. For instance, although the Angora goat industry was a small, subsection of the total Arizona economy, it had dramatic impacts on Aravaipa. These impacts ended about fifty years ago but may still significantly shape the abundance and distribution of some plants and the history of mule deer and bighorn repopulation. This time perspective on recovery, restoration, or rehabilitation is an important aspect of governmental and non-governmental resource management.

Oral interviews of forty individuals and over sixty hours of tapes may seem thorough, but the interviewer felt stymied by certain gaps in information. The two most immediate ethnoecological concerns were capturing the history of Apache land use before many elders passed away and completing Euroamerican family histories for the most important resident families.

The Apache ethnoecology has many dimensions. Culturally, there is a revival on the San Carlos Reservation of interest in Apache history and tradition. Many Apaches still use oak groves for acorn collecting and remember historic groves that were sacrificed for mining or firewood. The San Carlos elders retain significant living knowledge of the Aravaipa area before 1900, passed on to them by their ancestors. Their specialized knowledge cannot be duplicated by any other ethnic group. A future oral history study should be a joint effort between the Apache and an ethnoecologist, since many of the elders only speak Apache. The interviews will serve as a new cultural form for the transmission of traditional knowledge between generations.

Parallel to the Apache studies, complete family histories of the most important resident families of Aravaipa would greatly enrich ethnoecological knowledge. The Moragas, McNairs, Whites, Woods, Wootans, and Salazars are top priority, especially in view of their own personal interest in the history of the canyon. A future study could complete the time period from 1970 to 1990 and delve into details of ranching and the ways in which residents made choices concerning allocation, access, security, and use of natural resources. With the addition of photographs, these discussions would be revealing.

Observations and Future Studies

Observational information directly compliments any documents or oral interviews. Both documents and interviews are too abstract without actually walking or driving through the landscape under discussion. Observations allowed more detail questioning of residents. Observations posed many new questions such as: Has soil erosion been so extensive that recovery of more productive grasslands will be impossible? Were junipers recovering from woodcutting or were they invading because of rangeland degradation? How extensive were the oak woodlands before mining? How far downstream did mass wasting and mine wastes impact the tributaries to Aravaipa Creek? Were beavers, in part, responsible for the sandy bottoms of Aravaipa Creek which have subsequently washed out? Why do the northern tablelands have such an abundance of forbs? Even without grazing, why does the riparian understory remain dominated by exotics? Is a three- to five-year fine fuels buildup, with subsequent burning, a prerequisite for the recovery of grasslands from scrub? Can mesquites over two inches in diameter be eliminated by fire?

For future understanding, the most important observational work needed is a soil and erosion survey. A search for "virgin" soil profiles should be made. Soil has been the most undervalued resource in the documented history of Aravaipa. Less is known of the impacts of livestock, farming, and mining on soils than on any other resource. Since the depth of soil and its quality limit the ability of certain bunch grasses to recover and encourages the maintenance of certain exotics, increasers, and invaders, soil study is crucial to both the past history and future history of livestock management.

Observational work combined with oral and documentary history pointed out the need for an integrated study of a single watershed using many techniques (soil surveys, tree rings, surveys of creekbeds and botanical composition). The present study was too general and covered too large an area to delve deeply into any individual watershed. Future work should try to provide a more complete picture of cumulative impacts in a particular place. High priority places include: the Aravaipa Creek bottom (terraces, plant composition, photo history of channel changes, etc.); Laurel Canyon with the Grand Reef Mine complex; Arizona Gulch with the Aravaipa mining complex; Turkey Creek with its special plant associations and longest documented history of human use; and Table Mountain with its relatively intact Juniper Savanna.

Particular experiments that would try to reconstruct historical landscapes include the re-introduction of sterilized beaver into Aravaipa Creek. This would prevent expansion of a species which might be destructive to cottonwood and willow. But it would also be the best way to see what kind of changes occur with beaver present. The restoration and maintenance of native fish has been long discussed and now requires difficult decisions because of the invasion of the red shiner. Nevertheless, this task may preserve one of the most biologically diverse streams left in Arizona.

In addition, a systematic inventory of archaeological sites in Aravaipa should be undertaken, in part to determine the extent and duration of Amerindian residence in the area. Since several of the early Euroamerican descriptions of Aravaipa are quite detailed, it may be possible to obtain some indication of the extent to which Amerindians altered their environment through a comparison of occupation sites with the written descriptions.

Finally, all of the structures remaining on the east end of Aravaipa Canyon are eligible for listing on the National Register of Historic Places. These scattered residences could provide future generations with a living museum of Southwestern rural life which could not be recreated in any other location in southern Arizona. All of the structures are more then fifty years old, are largely unaltered and have exceptional historic value. A cooperative effort at preservation and restoration of these buildings, undertaken by local ranch-owners, private conservationist organizations (TNC), and governmental agencies (BLM) would provide a significant service to history and might eventually prove to be self-supporting through rental or organizational utilization. Preservation of these buildings would commemorate the many fine Aravaipa families who are so justly proud of their heritage.

TABLE XII.A
EXOTIC PLANTS THAT HAVE INVADED, BEEN INTRODUCED AND SUBSEQUENTLY NATURALIZED

Common Chickweed
Common Lamb-quarters
Tumbleweed (Russian Thistle) (1892)
Annual Sow Thistle
Dandelion
Field Bindweed
Shepherd's Purse
Watercress
London Rocket
Storksbill (Filaree) (1866, 1880)
Wild Oats (1902)
Red Brome (1909)
Rescue Brome
Bermuda Grass (1891)
Jungle Rice
Stinkgrass
Wild Barley
Ryegrass
Dallis Grass
Kentucky Bluegrass
Rabbitfoot Grass (1891)
Mediterranean Grass
Horehound
Spearmint
Bur Clover
Sour Clover
Willow Smartweed
Cluster Dock
Curly Dock
Tree of Heaven
Tree Tobacco (1904)
Nightshade
Salt Cedar (Tamarisk) (1901)
Hairy bowlesia
Fennel
Puncture Vine

TABLE XII.B
PLANTS SPECIES KNOWN TO BE INCREASERS

Pigweed
Palmer's pigweed/Careless weed
Wooly tidestromia
Jumping cholla/Chainfruit cholla
Christmas cactus
Engelmann prickly pear
Cane cholla
Tumbleweed/Russian thistle*
Annual burweed
Bloodweed
False tarragon
Desert broom
Bahia absinthifolia
Sweet bush
Horseweed
Snakeweed
Haplopappus spinulosus
Burro bush
Hymenothrix wislizenii
Machaeranthera bigelovii
Tall goldenrod
Annual sow thistle*
Dandelion*
Cowpen daisy
Cocklebur
Field bindweed*
Shepherd's purse*
Yellow tansy mustard
London rocket
Finger-leaved gourd
Buffalo gourd
Painted spurge
Storksbill*
Dove weed

Aristida adscensionis
Aristida parishii
Wild oats*
Red brome*
Bermuda grass*
Fluff grass
Wild barley*
Ryegrass*
Mediterranean grass*
Horehound*

Catclaw acacia
Senna (*Cassia bauhinioides*)
Senna (*Cassia covesii*)
Sour clover*
Mesquite
Stick leaf
Sida filicaulis
Alkali pink
Trailing four o'clock
Red spiderling
Tree tobacco
Silverleaf nightshade
Salt cedar*
Puncture vine*

*Also an exotic

TABLE XII.C
PLANTS KNOWN TO BE EDIBLE TO GOATS
by Peter Sundt

PREFERRED FOOD PLANTS
Simmondsia chinensis [jojoba]
Ceanothus greggii [buckbrush]
Cercocarpus montanus [mountain mahogany]
Celtis reticulata [netleaf hackberry]

IMPORTANT
Rhus trilobata [squaw or skunk bush]
Baccharis sarothroides [desert broom]
Hymenoclea monogyra [burro brush]
Parthenium incanum [mariola] (important in San Luis Potosi; Aravaipa??)
Quercus turbinella [scrub oak]
Erodium cicutarium [storksbill]
Marrubium vulgare [horehound]
Acacia greggii [catclaw acacia]
Calliandra eriophylla [fairy duster]
Aloysia wrightii [organillo]

USED
Agave chrysantha and parryi (flowers, young infloresence)
Daslirion wheeleri (flowers, fruits, young infloresence)
Nolina microcarpa(flowers, fruits, young infloresence)
Yucca arizonica(flowers, fruits, young infloresence)
Amaranthus fimbriatus and palmeri
Tidestronia lanuginosa
Alnus oblongifolia
Amsinckia intermedia
Carnegia gigantea (fallen fruits)
Ferocactus wislizenii (fruits)
Opuntia acanthocarpa, O. phaecantha, O. spinosior, and O. fulgida (fruits)
Salsola australis (young tumbleweed)
Ambrosia ambrosiodes
Gutierrezia saothrae (fruits only) [sankeweed]
Haplopappus tenuisectus (fruits only) [burro weed]
Taraxacum officinale [dandelion]
Convulvulus arvensis
Cuscuta tuberculata
Ipomea coccinea
Arabis perennans
Capsella bursa-patoris
Lesquerella purpurea
Sisymbrium irio [London rocket]
Juniperus deppeana (fruits) and monosperma (fruits)
Ephedra nevadensis
Arctostaphylos pungens (fruits, not leaves)
Euphorbia sp. [a spurge]
Quercus arizonica and emoryi
Fouqueria splendens
Garrya wrightii [silk tassel]
Graminae (all grasses when young, much less when mature or dormant)

TABLE XII.C (Cont'd)

Krameria grayi [white ratany]
Acacia constricta (fruits only)
Dalea formosa and pogonthera
Medicago hispida [burr clover]
Mimosa biuncifera (rarely) [wait-a-minute-bush]
Prosopis glandulosa/velutina (pods only)
Robinia neo mexicana [locust]
Alium macropealum (onion)
Dichelostemma pullchellum [blue dick]
Janusia gracillis [desert vine]
Sphaeralcea laxa [globe mallow]
Proboscidea arenaria and/or parviflora [devil's claw]
Morus microphylla [mulberry]
Plantago insularis and or purshii [indian wheat]
Eriogonum abertianum and wrightii
Clayonia perfoliata [miner's lettuce]
Portulaca suffretescens
Clematis drummondii
Rhamnus californica
Populus fremontii
Lycium excsertum [wolfberry] and Lycium pallidium
Tamarix pentandra
Typha domigensis
Celtis pallida
Vitis arizonica
Tribulus terrestris [puncture vine]

NOT EATEN
Rhus radicans [poison ivy]
Berberis haematocarpa
Echinocereus engelmannii and fasiculatus
Mammilaria microcarpa
Opuntia bigelovii and Opuntia leptocaulis
Canotia halocantha
Ambrosia deltoidea [triangle burr sage]
Baccharis salicifolia
Encelia farinosa
Ericameria laricifolia [turpentine bush]
Rorippa nasturtium-aquaticum (goats avoid cress in water)
Cucurbita digitata and Cucurbita foetidissima
Croton texensis [dove weed]
Juglans major
Lupinis palmeri
Mentzelia pumilia [stick leaf]
Fraxinus pennsylvanica [velvet ash]
Argemone platyceras [prickly poppy]
Pinus monophylla
Platanus wrightii [sycamore]
Zizyphus obtusifolia [gray thorn]
Dodonaea viscosa [hop bush]
Ailanthus altissima [tree of heaven]
Datura meteloides
Nicotiana glauca and trigonophylla
Larrea tridentata

TABLE XII.D
PLANTS POISONOUS TO LIVESTOCK

Chokecherry [*Prunus*]
Larkspur [Water Hemlock]
Lupine (?) [Copperweed]
Scrub Oak [Milkweed]
Poison hemlock
Sneezeweed
Broom snakeweed
Desert marigold or Cloth of Gold
Ergot (*Clavicipes* spp.)
Agave spp. (sheep only)
Groundsel/Senecio
Mesquite (leaves in large amounts)
Juniper (in extreme drought only)
Sacahuista/Beargrass/Nolina (Flowers and fruits)
Yellow Tansy mustard

(?): Not known if Aravaipa species is poisonous to cattle.

[ ]: Poisonous species not collected by Warren (Johnson 1980) or species not identified as poisonous although genus has poisonous species within it.

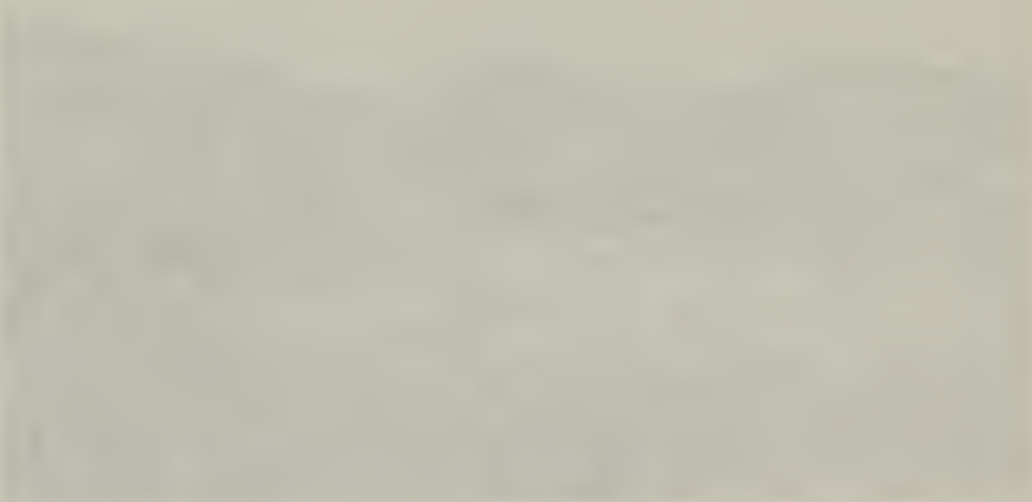
TABLE XII.E
EXOTIC ANIMALS THAT HAVE INVADED OR BEEN INTRODUCED

English/House Sparrows
Starlings
Chukars
Rock Dove (pigeon)
Coati*
Bighorn Sheep**
Green Sunfish
Mosquito Fish
Yellow Bullhead
Largemouth Bass
Red Shiner

*Natural invader from south
**Present historically. Present population introduced.

Trail's End Ranch (Vail, Buzan, Flieger, Wagoner, etc.)
by Darwin Van Campen, 1965. (Joe Flieger Collection)

Approximate Same View, 1990.



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APPENDIX I

SCIENTIFIC NAMES OF PLANTS AND ANIMALS OF ARAVAIPA FOR SPECIES MENTIONED IN REPORT

SELECTED LIST OF ARAVAIPA PLANTS

Century Plant, mescal	*Agave chrysantha*
Century Plant	*Agave parryi*
(Agave Family)	*Agave toumeyana*
Sotol	*Dasylirion wheeleri*
Bear Grass	*Nolina microcarpa*
Soap Weed	*Yucca arizonica*
Pig Weed	*Amaranthus Fimbriatus*
Palmer's Pig Weed, Careless Weed	*Amaranthus palmeri*
(Amaranth family)	*Tidestromia lanuginosa*
Poison Ivy	*Rhus radicans*
Squaw Bush, Skunk Bush	*Rhus trilobata*
Red Barberry	*Berberis hamematocarpa*
Arizona Alder	*Alnus oblongifolia*
Jojoba	*Simmondsia chinesis*
Saguaro	*Carnegiea gigantea*
Hedgehog Cactus	*Echinocereus engelmannii*
Hedgehog Cactus	*Echinocereus fasciculatus*
Barrel Cactus	*Ferocactus wislizeni*
Pincusion Cactus, Fishhook Cactus	*Mammilaria microcarpa*
Buckhorn Cholla	*Opuntia acanthocarpa*
Teddy Bear Cholla	*Opuntia bigelovii*
Jumping Cholla, Chain Fruit Cholla	*Opuntia Fulgida*
Christmas Cactus	*Opuntia leptocaulis*
Engelmann Prickly Pear	*Opuntia phaeacantha*
Cane Cholla	*Opuntia spinosior*
Tumbleweed	*Salsola austrates*
Canyon Ragweed	*Ambrosia ambrosioides*
Triangle Bursage	*Ambrosia deltoidea*
(Sunflower Family)	*Artemisia ludoviciana*
False Tarragon	*Artemisia dracunculoides*
Seepwillow	*Baccharis salicifolia*
Desert Broom	*Baccharis sarothroides*
Brittle Bush	*Encelia farinosa*
Turpentine Bush	*Ericameria laricifolia*
Snakeweed	*Gutierrezia sarothrae*
Burro Weed	*Haplopappus tenuisectus*
Burro Brush	*Hymenoclea monogyra*
Mariola	*Parthenium incanum*
Dandelion	*Taraxacum officianale*
Cocklebur	*Xanthium saccharatum*
Field Bindweed	*Convolvulus arvensis*
Dodder	*Cuscuta tuberculata*
Scarlet Morning Glory	*Ipomoea coccinea*
Rock Cress	*Arabis perennans*
Shepherd's Purse	*Capsella bursa-pastoris*
Gordon Bladder Pod	*Lesquerella gordoni*
Bladder Pod	*Lesquerella purpurea*

Water Cress	*Rorippa nasturtium-aquaticum*
Finger-Leaved Gourd	*Cucurbita digitata*
Buffalo Gourd	*Cucurbita foetidissima*
Alligator Juniper	*Juniperus deppeana*
One-Seed Juniper	*Juniperus monosperma*
Mormon Tea	*Ephedra nevadensis*
Manzanita	*Arctostaphylos pungens*
Dove Weed	*Croton texensis*
Spurge	*Euphorbia albomarginata*
Spurge	*Euphorbia florida*
Spurge	*Euphorbia capitellata*
Painted Spurge	*Euphorbia heterophylla*
Spurge	*Euporbia melanadenia*
Spurge	*Euphorbia pediculifera*
Arizona Oak	*Quercus arizonica*
Emory Oak	*Quercus emoryi*
Scrub Oak	*Quercus turbinella*
Ocotillo	*Fouquieria splendens*
Silk Tassel	*Garrya wrightii*
Storksbill	*Erodium cicutarium*
Bent Grass	*Agrostis semiverticillata*
Wild Oats	*Avena fatua*
Blue Stem	*Andropogon barbinodis*
Needle Grama	*Bouteloua aristidoides*
Spruce-top Grama	*Bouteloua chondrosioides*
Side-oats Grama	*Bouteloua curtipendula*
Blue Grama	*Bouteloua gracilis*
Hairy Grama	*Bouteloua hirsuta*
Red Brome	*Bromus rubens*
Plains Lovegrass	*Eragrostis intermedia*
Tanglehead	*Heteropogon contortum*
Curly Mesquite	*Hilaria berlangeri*
Wolf Tail	*Lycurus phleoides*
Dallis Grass	*Paspalum dilatatum*
Rabbitfoot Grass	*Polypogon monspeliensis*
Mediterranean Grass	*Schismus barbatus*
Arizona Walnut	*Juglans major*
White Ratany	*Krameria grayi*
Horehound	*Marrubium vulgare*
Arizona Sage	*Salvia arizonica*
Chia	*Salvia columbaria*
Fern Acacia	*Acacia angustissima*
White Thorn Acacia	*Acacia constricta*
Catclaw Acacia	*Acacia greggii*
Fairy Duster	*Calliandra eriophylla*
Senna	*Cassia bauhinioides*
Senna	*Cassia covesii*
Indigo Bush	*Dalea formosa*
(Pea Family)	*Dalea pogonathera*
Lupine	*Lupinus palmeri*
Bur Clover	*Medicago hispida*

Wait--a-minute Bush	*Mimosa biuncifera*
Mesquite	*Prosopis velutina*
Onion	*Allium macropetalum*
Bluedicks	*Dichelostemma pulchellum*
Stick Leaf	*Mentzelia pumila*
Desert Vine	*Janusia gracilis*
Caliche Globe Mallow	*Sphaeralcea laxa*
Devil's Claw	*Proboscidea arenaria*
Devil's Claw	*Proboscidea parviflora*
Texas Mulberry	*Morus microphylla*
Trailing Four O'Clock	*Allionia incarnata*
Red Spiderling	*Boerhavia coccinea*
Velvet Ash	*Fraxinum pennsylvanica*
Lowell Ash	*Fraxinus lowelli*
Yellow Wood Sorrel, Chanchaquilla	*Oxalis stricta*
Prickly Poppy	*Argemone platyceras*
Pinyon Pine	*Pinus monophylla*
Indian Wheat	*Plantago insularis*
Indian Wheat	*Plantago purshii*
Sycamore	*Platanus wrightii*
Herba de Alacran, Pitillo	*Plumbago scandens*
Wild Buckwheat	*Eriogonum abertianum*
Wild Buckwheat	*Eriogonum arizonicum*
Wild Buckwheat	*Eriogonum wrightii*
Miner's Lettuce	*Claytonia perfoliata*
Spring Beauty	*Claytonia rosea*
Purslane	*Portulaca suffrutescens*
Virgin's Bower	*Clematis drummondii*
Larkspur	*Delphinium nelsoni*
(Buck Thorn Family)	*Ceanothus greggii*
California Buck Thorn	*Rhamnus californica*
Gray Thorn	*Zizyphus obtusifolia*
Mountain Mahogany	*Cercocarpus montanus*
Star Leaf, Zorillo	*Choisya arizonica*
Hop Tree	*Ptelea trifoliata*
Turpentine Broom	*Thamnosma montana*
Fremont Cottonwood	*Populus fremontii*
Bonpland Willow	*Salix bonplandiana*
Hop Bush	*Dodonaea viscosa*
Soapberry	*Sapindus drummondi*
Fendlerbush	*Fendlera rupicola*
Tree-of-heaven	*Ailanthus altissima*
Jimson Weed, Thorn Apple	*Datura meteloides*
Wolfberry, Desert Thorn	*Lycium exsertum*
Rabbit Thorn	*Lycium pallidum*
Tree Tobacco	*Nicotiana glauca*
Desert Tobacco	*Nicotiana trigonophylla*
Nightshade	*Solanum douglasii*
Silverleaf Nightshade	*Solanum elaeagnifolium*
Nightshade	*Solanum heterodoxum*
Nightshade	*Solanum americanum*

Salt-cedar	*Tamarix australis*
Cattail	*Typha domingensis*
Desert Hackberry, Granjeno	*Celtis pallida*
Net Leaf Hackberry	*Celtis reticulata*
Oreganillo	*Aloysia wrightii*
Canyon Grape	*Vitis arizonica*
Creosote Bush	*Larrea tridentata*
Puncture Vine	*Tribulus terrestris*

ARAVAIPA FISH

Longfin dace	*Agosia chrysogaster*
Speckled dace	*Rhinichthys osculus*
Spikedace	*Meda Fulgida*
Roundtail Chub ("Arizona trout")	*Gila robusta*
Loach minnow	*Tiaroga cobitis*
Mountain sucker ("catfish")	*Pantosteus clarki*
Sonoran sucker ("catfish")	*Catostomus insiguis*
Yellow Bullhead	*Ictalurus natalis*
Largemouth bass	*Micropterus salmoides*
Mosquitofish	*Gambusia affinis*
Red Shiner	*Notropis lutrensis*

REPTILES AND AMPHIBIANS
Aravaipa

Colorado River Toad	*Bufo alvarius*
Woodhouse's Toad	*Bufo woodhousei*
Great Plains Toad	*Bufo cognatus*
Western Box Turtle	*Terrapene ornata*
Desert Tortoise	*Gopherus agassizi*
Gila Monster	*Heloderma suspectum*
Collared Lizard	*Crotaphytus collaris*
Lesser Earless Lizard	*Holbrookia maculata*
Greater Earless Lizard	*Holbrookia texana*
Tree Lizard	*Urosaurus ornatus*
Side-blotched Lizard	*Uta stansburiana*
Arizona Coral Snake	*Micruroides euryxanthus*
Massasauga	*Sistrurus catenatus*
Western Diamondback Rattlesnake	*Crotalus atrox*
Black-tailed Rattlesnake	*Crotalus molossus*
Mojave Rattlesnake	*Crotalus scutulatus*
Tiger Rattlesnake	*Crotalus tigris*
Arizona Black Rattlesnake	*Crotalus viridis cerberus*
Banded Rock Rattlesnake	*Crotalus lepidus klauberi*
Twin-spotted Rattlesnake	*Crotalus pricei*

Great Egret	*Casmerodius albus*
Turkey vulture	*Cathartes aura*
Golden eagle	*Aguila chysaetos*
Bald eagle	*Hilaeetus leucocephalus*
Northern goshawk	*Acciper gentilis*
Black hawk	*Buteogallus anthracinus*
Zone-tailed hawk	*Buteo albonotatus*
Osprey	*Pandion haliaetus*
Caracara	*Polyborus planus*
Peregrine falcon	*Falco peregrinus*
Bobwhite	*Colinus virginianus*
Montezuma quail	*Cyrtonyx montezumae*
Gambel's quail	*Callipepla gambelli*
Chukar	*Alectoris chukar*
Turkey	*Meleagris gallopavo*
Rock dove (pigeon)	*Columbia livia*
White-winged dove	*Zenaida asiatica*
Elegant trogon	*Trogon elegans*
Yellow-billed cuckoo	*Coccyzus americanus*
Buff-collared nightjar	*Caprimulgus rigwayi*
Belted Kingfisher	*Ceryle alcyon*
Common flicker	*Colaptes auratus*
Vermillion Flycatcher	*Pyrocephalus rubinus*
Willow flycatcher	*Empidonax traillii*
Beardless flycatcher	*Captostoma imberbe*
Cliff swallow	*Hirundo pyrrhonota*
Starling	*Sturnus vulgaris*
American redstart	*Setophaga ruticilla*
European house sparrow	*Passer domesticus*

Allen's Big-eared Bat	*Idionycteris phyllotis*
Beaver	*Castor canadensis*
Big Brown Bat	*Eptesicus fuscus*
Black Bear	*Ursus americanus*
Black-tailed Jack Rabbit	*Lepus californicus*
Brazilian Free-tailed Bat	*Tadarida braziliensis*
Coati	*Nasua nasua*
Collared Peccary (Javelina)	*Dicotyles tajacu*
Cottontail	*Sylvilagus sp.*
Desert Cottontail	*Sylvilagus audubonii*
Eastern Cottontail	*Sylvilagus floridanus*
Coyote	*Canis latrans*
Fringed Myotis	*Myotis thysanodes*
Gray Fox	*Urocyon cinereoargenteus*
Gray Wolf	*Canis lupus*
Hoary Bat	*Lasiurus cinereus*
Hog-nosed Skunk	*Conepatus mesoleucus*
House Mouse	*Mus musculus*
Man	*Homo sapiens*
Mastiff Bat	*Eumops sp.*
Mountain Lion	*Felis concolor*
Mountain Sheep (Big Horn)	*Ovis canadensis*
Mule Deer	*Odocoileus hemionus*
Muskrat	*Ondatra zibethicus*
Raccoon	*Procyon lotor*
Ringtail	*Bassariscus astutus*
Striped Skunk	*Mephitis mephitis*
Townsend's Big-eared Bat	*Plecotus townsendii*
Western Mastiff Bat	*Eumops perotis*
Western Spotted Skunk	*Spilogale gracilis*
White-tailed Deer	*Odocoileus virginianus*

APPENDIX II

LOCATIONS OF SPECIAL INTEREST

LOCATIONS OF SPECIAL INTEREST

Bureau of Land Management personnel selected the following locations as areas of particular interest resulting from vegetation communities, the types of impacts which occurred, or an unusual history of occupation. The little vignettes included in this section mention only the most important impacts. A complete land-use study for any of these areas would require a vegetation survey, an on-ground archaeological survey, a search through surveyors' records for earliest detailed descriptions, more extensive oral history interviews, a title search to ascertain the sequence of land-ownership, and an analysis of fence lines and cattle/goat grazing patterns. A full land-use history would occupy up to a chapter per location. Several additional significant locations are described elsewhere. The Aravaipa Bottomlands and Turkey Creek are described in Chapter XII; the Painted Cave Ranch and Dry Camp Ranch are described in Appendix III.

TABLE MOUNTAIN

Major springs in the Table Mountain area include Pipe Springs, Oak Springs, Bear Springs, Lion Springs, the Greenhouse Spring, and Bleak Springs. Prior to the 1930s, canyons on the slopes of both Big Table Mountain and Little Table Mountain had a large number of small springs, many of which have dried up (M. Cosper 1990). Table Mountain supported large populations of squirrels, wild turkey, and white-tail deer, and had more bear than other areas near Aravaipa (M. Cosper 1990). Bear watered at Bear Springs, from which it derived its name (F. Wood 1989). Large groups of up to fifty coatimundis passed through the area after the 1950s (C. McNair 1990).

Significant human impacts occurred on Table Mountain through mining, goat and cattle ranching. Although mines were located during the 1870s, the major development occurred during the 1880s and 1890s, when the

Table Mountain Mining Company excavated a large shaft in the side of Big Table Mountain and constructed several buildings and a road (1897) connecting the mine with the right-hand fork of Four Mile Canyon. Steam boilers at the mine consumed large quantities of cedar and oak wood; and wood cutting was extensive throughout the area. Fuelwood had to be packed to the mine on burros, indicating impacts from large numbers of burros. Prior to 1900, pioneer resident James Sanford noted that at that time there was already evidence of previous fuelwood cutting in the Table Mountain area. Sanford observed very large stumps of both oak and mesquite. The Table Mountain boilers consumed oak, which wood haulers stacked in big ricks. When mining was abandoned abruptly around 1900, hundreds of cords of fuelwood remained neatly piled in rows, seventy-five to eighty feet long. After the early 1970s, when Adolfo Salazar completed a road (known locally as the "Rug Road") connecting Table Mountain with the San Pedro River near Mammoth, visitors carried away most of the wood, although the remains of some fuelwood can still be seen.

The Table Mountain area is considered better "cattle country" than other parts of the Aravaipa Area. Army scout Tom Horn reported that cattle were present in the area by the mid-1880s. Horn pursued the Apache Kid through the Table Mountain District, one of his favorite hide-outs, and noted that the Atchley ranch and the Diehl ranch were located in the district. By 1900, Wyley Morgan ran cattle on Table Mountain, and his son, Sam Morgan, had cattle in the area at a later date. The ranch headquarters located closest to Table Mountain was the Oak Grove Ranch, originally settled by an old man (possibly named Wise), and aquired by the T-Rail. After 1900, the T-Rail built corrals and cowboy camps near several of the springs. Fred Wood homesteaded Bear Springs during the 1930s. The Woods and later the Whites had cattle north and west of Table Mountain. The Bleaks and Wootans were the closest settlers on the east side.

Large numbers of goats and cattle ranged the area between 1900 and 1930. The area's earliest goat ranchers included William Wootan, who had a homestead east of Table Mountain. His son, Dick Wootan, had goats in Oak Grove Canyon. Rube Wootan and Rob Wootan settled toward Turkey Creek. Other goat ranchers included Rulan Moody and Dick Moffat on the San Pedro side; James Bleak at Bleak Springs; Jim Bleak at the Greenhouse; Jed Bleak at Lion Spring; and Joe and Lon Bleak at the Bleak Ranch on the San Pedro slope of Table Mountain, each in their own house. These early goat ranchers accessed Table Mountain from three directions: Turkey Creek on the east, the San Pedro River on the west, and the west end of Aravaipa Canyon on the north. A goat trail is still visible, connecting the west end of Aravaipa Canyon (near Sam Baker's place) to Table Mountain.

Impact patterns are most clear for the area around Bleak Springs in Virgus Canyon, originally named Burgess Canyon for John Burgess, the developer of Table Mountain Mine. The springs are on the northeast side of the two "table tops." In 1912, James Bleak and his second wife, Mary Reynolds Bleak, moved to Bleak Springs and acquired the homestead title in 1916. When Bleak arrived, the site already had an abandoned goat camp, indicating prior occupation. James Bleak formed a partnership with his older sons, Joe, Lon, Jim, and Jed and ran several thousand goats. They found that the oak brush made excellent feed, particularly during the winter when snow was on the ground. Part of the Bleaks' original homestead overlapped the abandoned mine, but later owners of the mine took those forty acres. The Bleaks used abandoned equipment and building materials from the nearby mine to construct their house, including the old boiler from the mine, which became their fireplace, and still marks the site of their home. They constructed a wire goat corral across the creek from their house, planted a garden and orchard with peach trees and plums, and piped water to a small tank located in the front yard. The grave of a member of the Bleak family is near the ruins of their house. A cave immediately behind the ranch house was full of bat guano, which was used on the orchard and garden. At the homestead, the Bleaks had goats, cattle, hogs, and chickens. The Bleak children did some small animal trapping. Bears and lions killed a few calves. During the 1930s, the Bleaks gradually sold off the goats and replaced them with cattle (M. Cosper 1990).

The McNairs purchased the ranch in 1943, initially in a partnership with Carl Bleak, who sold his interest to the McNairs during the early 1950s. The present house at Bleak Springs was constructed by the McNairs during the 1950s below the ruins of the original Bleak house. The McNairs found that stronger feed on Table Mountain supported fifteen head to the section, in contrast to the usual ten to the section. They were able to operate the entire area as one pasture (C. McNair 1990). The 2,000 acres on Table Mountain controlled by the McNair ranch had sixteen permanent springs, with five or six springs in each canyon. The largest were the two springs at Bleak Spring, one at the Bleak house and a smaller spring 200 feet south of the house. Other substantial springs included the Basin Springs in Virgus Canyon, the spring at the fork of "Nigger" Henry and Sycamore Canyons, and two more springs in Parson's Canyon, on the edge of the range.

In early years, the Turkey Creek-Table Mountain area was considered to be a single unit. Many residents of the canyon thought of the area as "Mormon country," because the Browns and the Bleaks, the major residents of the area, were members of the Church of Jesus Christ of Latter Day Saints. Between 1910 and 1940, approximately eight separate families lived in the area, for varying periods of time. Actual residence in the area diminished rapidly after the early 1940s, when Carl Bleak sold his ranch, which he considered to be too small to make a good ranch. Since the 1950s, there has been no permanent resident in the area. (Information for this section supplied by Mildred Blake Cosper, Claude McNair, Durward Sanford, and Table Mountain and John Burgess files AHS.)

OAK GROVE CANYON

Oak Grove Canyon, between Turkey Creek and Table Mountain, was settled by Dick Wootan between 1900 and 1910. His cabin is still standing at Oak Grove Springs. Wootan ran cattle and goats in the area and had a goat corral by the cabin. He raised an extensive garden, and was known for his cabbages. Wootan died there and his remains had to be removed from the remote area for burial by pack animal.

The spring at Oak Grove is one of the best most consistent springs in the area, and pastures near Oak Grove Spring are considered to be excellent, with strong grasses and a large amount of filaree. Oak Grove Canyon contains seven small springs, and during the rainy season all the little draws run water. Extensive erosion in Oak Grove Canyon, immediately below the Wootan Cabin, occurred slowly through the years. It suddenly became severe at some time during the 1970s. No one observed the event which caused the extreme down cutting, but it is assumed to have been a heavy rain accompanied by flooding.

The cattle ranch in the Oak Grove Canyon area included homesteads at Oak Grove, the Greenhouse, and Parson's Grove. At various times, the Oak Grove area was owned by the T-Rail, the Bleaks (the Greenhouse), Connie Neglie, Virgil Mercer, the Salazars (1947), Defenders of Wildlife, and The Nature Conservancy (Information for this section supplied by Tex Salazar.)

PARSON'S GROVE

Prior to 1900, George W. Parson homesteaded and operated a ranch at Parson's Grove in conjunction with a partner. While Parson lived at the homestead and took care of the cattle, his partner worked for the mine at Sombrero Butte. Parson had cattle only in the immediate area of his homestead and was surrounded by the land controlled by T-Rail Ranch. Informants remember Parson as an eccentric hermit with a long beard, reluctant to converse. He had no family, never spent any money, and was rumored to have buried money somewhere on the ranch, which led to considerable digging on the property. The story of Parson's life reads like an adventure book. Son of a New England whaler, he was born in 1859 on the Pribiloff Islands off the Alaska coast. During the late 1870s, he came to Fort Grant as a wagon guard and later worked on Wyley Morgan's ranch in Aravaipa. His varied career took him to Tombstone in the 1880s, China, the South Seas, the Klondyke gold rush, the Philippines in the Spanish American War, the Boer War, and to the Panama Canal construction. He worked in the Sells Floto Circus and as a painter's model (*Prescott Gazette* 1/5/1944). He returned to his homestead for a quiet old age.

Parson constructed all the pasture fences and corrals near the house out of small rocks. Some of these extensive rock walls are still in place on the property. The abundant spring at Parson's Grove supplied water for his garden and small orchard. Above the house in Parson's Grove, between the Grove and the Greenhouse, was a large goat corral used either by the Bleaks or the Wootans. Members of the Wootan family purchased Parson's Grove Ranch and later sold it to the Salazars in 1947.

Don Feliciano Samaniego, a former T-Rail cowboy who married into the Moraga family, lived for several years in a rock house at Don Feliciano Spring near Parson's Grove, where he had a small garden. He used maguey stalks to pipe water to his garden from the spring which bears his name.

After the Salazars acquired the property, they developed and deepened the large spring at Parson's Grove, reinforcing the banks of the creek near the spring with concrete and stone. Although they constructed a new house, the barn is from an earlier period. While the Salazars had the ranch, considerable erosion occurred in the immediate area of Parson's Grove. The erosion washed out all the land near the upper corral and a new corral which they had constructed below it. Parson's Grove has large amounts of foxtail grass, and an extensive stand of acacia is located on the road between Oak Grove and Parson's Grove. Black hawks nest in the sycamores above the spring at Parson's Grove. (Information for this section supplied by Tex and Bill Salazar.)

STONE CABIN

The house at Stone Cabin, for which the surrounding area is named, was built by two prospectors named Kermit and Jamison during the 1880s. Kermit and Jamison trapped and had mining claims but evidently did not have cattle or goats. At the turn of the century, Safford banker J. N. Porter ran cattle near Stone Cabin while Kermit and Jamison were still living there. The prospectors had to pack all of their provisions up to the cabin, since there were no roads. The one room house was constructed of local stone and portions of it had port holes for shooting, presumably placed in the cabin for protection against Indians. The builders used a cow hide to pull the rocks from a nearby quarry to build the cabin. Martin Wood, Cliff and Fred Wood's father, knew Kermit and Jamison and relayed information about them to his sons (C. Wood 1990).

A man named "Cattle King" (Bill) Smith, who had been an Indian scout and a cowboy, and for whom the nearby Bill Smith hills are named, occupied the house at a later date. Rumor holds that Indians killed his partner (possibly a man named John Harvey) and that Smith moved away as a result. It was also rumored that the two prospectors had located a gold mine. However, in his last years, Smith, who had no family, was impoverished and lived on the west end of Aravaipa without a permanent home. He did odd jobs and rode around Aravaipa on a horse selling soap. One of the Bleak brothers from Table Mountain was accidentally shot and killed at Stone Cabin as a youth, while trapping. Members of the Wood family filed the first homestead claim on Stone Cabin, later exchanging the land with the Whites for holdings on the Rim Rock. In this way, the Wood family consolidated the large area now owned by The Nature Conservancy (C. Wood 1990).

The area around Stone Cabin and Stone Cabin Basin have the reputation for being good cattle and goat country with every type of browse and grass. Large amounts of canaigre or "sourdock" grows at Stone Cabin Basin. The area supported large numbers of cattle from the 1880s through the 1940s. The T-Rail had cattle in the area, built the original fences, and probably constructed several temporary camps for their cowboys. Stone Cabin also had many goat herders. A goat trail from Aravaipa Canyon up the east side of Virgus Canyon to Stone Cabin can still be seen today. The Wootans, the Whites, and the Browns all had goat camps near Stone Cabin. The goats from La Trasquila (the shares) Goat Camp (belonging to Hipolito Roman, Dolores Gutierrez and Chico Gutierrez), across from Parson's Canyon in Aravaipa, were herded in the Stone Cabin area on occasion.

Several habitation sites in the general area of Stone Cabin received heavy impact as a result of homestead activities. (1) Tin Cabin at Tin Cabin Tank was the site of a formerly perennial spring which has dried up. A house still standing when the Whites arrived in 1920 may have been built by the Wootans or possibly by the T-Rail. (2) A cave in Stone Cabin Canyon was occupied by the Waldrips who herded goats for the White family. It is located in the canyon just below the Stone Cabin. The Waldrips built a shelter in front of the cave and constructed a goat pen around the cave which can still be seen. (3) Another nearby cave was occupied by J. Willie Brown, an educated easterner who lived in the area briefly during the 1920s, possibly for health reasons. (4) Rim Rock Cave was homesteaded and occupied by Abe White during the 1920s. He lived in the cave for six months every year until the 1940s and herded his goats throughout the Rim Rock country and the Stone Cabin area. (5) Across from the Rim Rock cave is a large corral built by Genie Brown for his horses.

The road to Stone Cabin was built after 1945 with a bulldozer. In some areas the terrain was so difficult that blasting was required. The large dirt tank near Stone Cabin, Woodrow's Tank, named by government surveyors was built in 1951 by the Woods who always called it Stone Cabin Tank. The area is considered to have excellent feed and is better cattle country than the lower elevations near the west end of Aravaipa. (Information for this section supplied by Jep White, Tex Salazar, and Cliff Wood.)

BRANDENBURG MOUNTAIN

Brandenburg Mountain was named for the James Brandenburg who arrived in Aravaipa in 1881 and was one of the earliest settlers on the west end of the canyon. Brandenburg squatted and later homesteaded in the area near this prominent landmark, and developed two large fruit farms. Although named for Brandenburg, he probably did not impact the mountain extensively since he did not have goats, and the terrain on the mountain was not suitable for the Brandenburg cattle (J. White 1990). George Swingle, who was herding cattle on the Aravaipa at the time of the 1887 earthquake, noted that during the earthquake the bluffs on the top of the mountain changed significantly. Several large boulders fell from the top of the mountain (Jane Swingle Dorsey 1990).

Subsequently Brandenburg Mountain was used as cattle and goat range by the Wood and White families. The Woods used the range on the mountain from 1920 until the 1940s, when they traded it to the Whites for their homestead on the Rim Rock. Abe White built goat pens at the site of the present AGFD bighorn sheep watering tank in a small canyon at the center of the canyon directly above the White's headquarters. The remains of the posts of the goat corral can still be seen. A small seep spring in this canyon, which supplied water for the goats, is presently piped into the bighorn water tank. Abe White constructed a second goat pen on the north side of the mountain during the 1940s. He did not build a goat shed on the mountain but brought the goats down to the canyon for shearing and kidding. During the depression, a relative of the White's lived at Cooper Springs on the north side of Brandenburg Mountain, cut off from the rest of his neighbors with no road access. Although Sam Baker frequently herded his goats on the mountain, "Clabber" Warner considered it to be his burro pasture. A dispute resulted in which Baker shot and wounded Warner.

The first road up the mountain was built by Joe Flieger to the corrals on the back (north) side of Brandenburg Mountain during the 1960s. Goat trails from Aravaipa Canyon on the south side of the mountain are still visible today. (Information for this section supplied by Joe Flieger, Jep White and Sam Baker.)

THE DRY CAMP RANCH

Dry Camp, located north of Aravaipa Creek, received its name *campo seco* from Mexican cowboys, because the ranch headquarters initially had no natural spring or water source. Later occupants put up a windmill on a well that went down to bedrock, but the well went dry sometime before 1922.

Prior to 1900, the first known occupant was Joe Basco, who squatted (but did not homestead) on the land and built a small board cabin, the area's first structure. Basco probably had goats since later residents found goat sheds with roofs attached to trees below the cabin. An additional goat shed and goat herder's shack were located at the "Goat Camp" north of Cement Tank. Prior to 1900, Charles and John McPeters also ran goats and horses in the area between Dry Camp and the Painted Cave Ranch. Shortly after 1900, Elmer Gardenheier, a T-Rail cowboy, homesteaded at Dry Camp. He ran cattle in the adjacent area, although he did not have it fenced separately. Like many other homesteads in the Aravaipa area, Dry Camp was completely surrounded by the T-Rail Ranch.

In 1922, the Sanford brothers, James and John, purchased Dry Camp from Elmer Gardenheier for $150, moving there from their 450-acre ranch on Aravaipa Creek which they had acquired from Jeff Clayton and Pat

Cassidy. Initially, the Sanford brothers operated both ranches in a partnership and had a third ranch near Stanley (Mineral Strip). After 1923, they ran the ranches separately, with Jim at Dry Camp and John on the Stanley ranch. In 1929, when the T-Rail was sold in parcels, the Sanfords acquired adjacent land and expanded their rangeland in Dry Camp considerably.

When the Sanfords first moved to Dry Camp there was no road to the headquarters. All supplies had to be packed in by horse. When first at Dry Camp, the Sanfords carried water to the house by horseback in three gallon cans. The WPA built the first road in 1936-37 using local labor for the construction crew. Until a small cement dam was constructed in a side canyon about one quarter of a mile below the headquarters, livestock drank from potholes. The first big well was drilled in 1939 or 1940. Durward Sanford and his wife Georgia McNair Sanford moved permanently to the Dry Camp ranch in 1945 and stayed there until 1976, when it was sold to members of the Allred family.

Before the Taylor Grazing Act (1934), the ranch ran many more cattle than the subsequent permit allowed. Prior to fencing, possibly 1,000 head grazed the area later contained in the Dry Camp Ranch, moving by themselves whenever it rained. After the Taylor Act established Grazing Districts, Dry Camp had a permit for 250 head. During droughts and dry years, the Sanfords often sold a portion of their herd and used the money from the sale to purchase supplemental feed for the remaining cattle. During the drought of 1934, James Sanford sold fifty or sixty head as part of the government purchase program. The Sanfords had rented a feeding ground from John Ditmer at the confluence of Turkey Creek and Aravaipa Creek, where they brought hay from Safford to feed their starving cattle. However, some of the cattle were too weak to save and were driven into a flat where government agents shot them.

Wild horses and burros concentrated on the ranch, watering in man-made tanks (e.g. McPeters Tank). The wild horses had made it difficult to run cattle, consuming a lot of feed, preventing cattle from getting to salt, and occasionally keeping cattle away from water. The stud horses sometimes killed calves. During the 1930s, approximately 300 wild horses and seventy-five to 100 feral burros were removed from the ranch. Altogether there may have been as many as 500 head of wild horses on the ranch, many of them were gathered on the adjacent Painted Cave Ranch.

The Dry Camp Ranch encompasses Booger and Paisano Canyons both of which are tributaries to Aravaipa Creek. The ranch formerly extended into the Mineral Strip area, but that portion of the ranch was returned to the San Carlos Reservation during the early 1970s. The closest permanent springs to the Dry Camp headquarters are Juniper and Cottonwood Springs on the Mineral Strip and Booger Springs in Booger Canyon, the best spring on the ranch. Oak Springs near the headquarters dried up. Before fencing, cattle used springs on the Mineral Strip, including McKinney Springs, Red Rooster Spring, Anderson Spring, Warm Springs, and Painted Cave Spring. Jackson's Grave, located on the northern part of the ranch, is the burial place of R. L. Jackson, a T-Rail cowboy, who was hit and killed by lightning, along with three of the horses he was driving. When he failed to arrive at the round-up camp at Bull Basin on the Mineral Strip, other T-Rail cowboys went to look for him and buried him on the spot.

The T-Rail had made some range improvements prior to 1929 when the Sanfords purchased the ranch, including a large stock water at Cement Tank in Horse Camp Canyon. In 1920, the T-Rail hired Charles Firth, son of the supervisor of the Aravaipa Mine, to construct a dam in Horse Camp Canyon fifteen feet high. It backed up water into a large sized pond. During the late 1930s, the Sanfords raised the dam even higher. The Sanfords constructed many other improvements on the ranch. During the 1930s, they used a mule team and scraper to build several stock tanks. Dirt Tank dates from the early 1930s. One mile above the tank, John Cope drilled a well (100 feet deep, later increased to 200 feet) and water was piped into the tank. Booger Dam was built in 1936 in Booger Springs Canyon, fifteen feet high. Jack's Tank in Paisano Canyon was constructed at this time. In 1939, Chet Peck enlarged Dirt Tank using a big bulldozer. At the same time, he built Chet Tank and he improved the road leading to these tanks. Double Tanks, or Twin Tanks, were built by Eddie Lackner during the mid-1960s. On Mineral Strip, the Red Rooster Spring, used by the Aravaipa Apache when traveling from San Carlos, had a very old dam and trough. However, it was undependable. Also on the Mineral Strip, Ash Creek had a dam twenty-two feet high, and McKinney Springs had smaller improvements.

When the Sanfords acquired Dry Camp, the ranch had two fenced pastures. The T-Rail had fenced a holding pasture in Booger Springs and a horse pasture below the Dry Camp headquarters. Jim Sanford fenced the outer limits of the ranch after purchasing it. Immediately after moving to the ranch in 1945, Durward and Georgie Sanford began fencing to make holding pastures at Deer Creek, Cement Tank and Dry Camp pastures.

No rotation was necessary on the ranch and none was ever practiced since the Sanfords kept their numbers at the permit level of 250 head.

The best spring feeds on Dry Camp were filaree, clover, and pea vine; fox tail during the winter; and during the summer curly mesquite, purslane, careless weed, side oats grama, and three or four other varieties of grama grasses. Durward Sanford observed no significant change in the quantity of bunch grasses on Dry Camp during the time his family operated the ranch (1922 to 1976). The strongest feed was in Paisano Canyon and extended to the northwest corner of the ranch. South of Dirt Tank, as the soil became thinner with more rocks on the surface, the grasses became progressively thinner and weaker.

During the 1950s, bighorn sheep were reintroduced onto the Dry Camp Ranch. All of the Booger Springs pasture, one and a half sections in size, fenced by the T-Rail, had been underused for years. It was so rough that only the wildest cattle would go to the spring; gentle cattle were afraid of lions. Durward Sanford, a big game hunter and expert taxidermist, invited the Bighorn Sheep Project director Johnny Russo to come to Dry Camp to investigate moving sheep into the area. Sanford had discovered skulls and horns of bighorn sheep in caves on the ranch years before and Jim Sanford had discovered an ancient set of bighorn horns in a cave in the Deer Creek box. Observing sheep droppings in the same caves, Russo confirmed that bighorn had formerly inhabited the area. Shortly after the Sanfords opened these negotiations, the Arizona Game and Fish Department contructed a "sheep enclosure" in the old T-Rail holding pasture and bighorn sheep were successfully reintroduced into the Aravaipa area. See Chapter X for more details. (Information for this section supplied by Durward and Georgia Sanford.)

GRAND REEF MINE

The Grand Reef mine in Laurel Canyon operated intermittently from the 1890s through the 1940s. During the early phase of mining, the area underwent extensive development, with a ball mill and four large lumber buildings approximately twenty by sixty feet in size on the site. The original (1890s) mining and ore processing machinery operated with steam power, consuming large amounts of fuelwood. During the 1920s, new owners redeveloped the mine and set up a flotation concentrator in Klondyke. By the late-1920s, the Grand Reef was the second largest lead producing mine in Arizona. Through the 1930s, a large pile of wood for the steam engines still stood at the mine and mill site. The mine had a horizontal entry which penetrated 300 yards into the hillside, with a subsequent maze of tunnels. Many cubic yards of earth, removed from the shaft, were dumped into Laurel Canyon near the mine site. Inside the mine, pillars had been left to support the ceiling. During the 1930s, miners "robbed" the pillars and made the mine unsafe for further use, finally forcing the operators to explode the mine shafts and close down the entire operation.

During the early 1930s, after Harry Hendrickson closed down large scale mining, "Red" Felsrud and members of the Turnbull family ran the mine on a limited scale, milling the ore at the Klondyke mill or shipping it to El Paso in trucks. After they gave up the operation, Charles "Pickle" Clark, who previously had a cucumber farm and processed pickles on the Haby Ranch, mined the Grand Reef in an even more limited capacity, hauling ore out in a burro train for shipment to El Paso.

At the entrance to Laurel Canyon, or Reef Canyon as it was called, near the junction of the Klondyke road, Charlie Chambers operated a store in a large adobe building later occupied by the Rubal family. Chambers had a moderate-sized herd of goats which browsed near the mine in Laurel Canyon.

The oral history of the area and the appearance of the grasslands nearby indicate extensive impacts from both livestock and man. Through the 1930s, Laurel Canyon had running water during nine to ten months of the year in the area near the mine. Water ran the entire length of the canyon only during the rainy season. The water was used in mining and milling processes. Between 1900 and 1920, the Aravaipa Apache from the San Carlos Reservation frequently camped in the Reef canyon, going to the area to gather acorns (V. Tapia 1989). Most of the oak trees in the area have been cut, the ground around the mine shows evidence of extensive clearing, and nearby land is badly overgrazed. (Information for this section from Clay Turnbull, Victoria Tapia, and Arizona Bureau of Mines Grand Reef file.)

QUINN MINE

From shortly after 1900 to the mid-1940s, the Quinn Mine was operated intermittently by members of two generations of the Quinn family. The mine was productive, but it was one of the smaller mines in the area and has little documentation. Located on the slopes of the Santa Teresas, it is completely surrounded by the Weathersby ranch. One of the Quinn brothers was manager of the Grand Reef Mine. When operations started at the Quinn Mine large amounts of equipment were brought in. The mine had a hoist and fly wheel, pulled by a big twelve-inch one-cylinder engine. Large ore chutes and tailing piles indicate some type of mill operation. A powder magazine for the mine was located in Powder House Canyon. Water for mine operations was caught in a cistern, and when inadequate, the Quinns hauled water from Klondyke. The mine had a three-room lumber house. Members of the Quinn family lived at the mine, and the children attended school in Klondyke during the late 1930s, riding horses from the mine. The road to the mine, originally constructed as a wagon road, was improved during the 1930s. The Dog Water Mine, between the Quinn and the Grand Reef, was operated as part of the Grand Reef complex. Between the Quinn and the Dog Water Mine, another small mine at the junction of Spring and Laurel Canyons was operated by José Rubal.

The Weathersbys had a goat camp below the Quinn Mine, where Round Boulder Canyon and Quinn Canyon come together. At this goat camp, the Weathersbys installed a 365-foot well and pump. Until the 1940s one of their herders lived there most of the year with a herd of approximately 2,000 goats. Bootleggers had liquor buried in large barrels in Quinn Canyon, and several years ago the stills and barrel hoops could still be seen. (Information for this section supplied by Neuel Weathersby.)

SALAZAR HOMESTEAD ON OLD DEER CREEK

In 1913, Lupe Salazar moved to the Salazar homestead at the confluence of Old Deer Creek Canyon and Aravaipa Canyon. Lupe was born in 1894 in Aravaipa in the home of his parents Epimenio and Crespina Salazar, two of the earliest, if not *the* earliest, settlers in the canyon. In 1907, Lupe began herding goats for Charles Chambers near the Grand Reef Mine. He later worked as a cowboy for Burt Dunlap, William Wooten, Braz Wooten, Gif Allaire, and the T-Rail Ranch. In 1911, he went to work at Copper Creek carrying the mail by buggy from Mammoth. In 1912, he married Teresa Moraga, daughter of Laureano Moraga, another of the earliest settlers in the canyon. The following year the couple moved to the homestead. However, formal filings on the land were not made until April 26, 1940, when a claim of 240 acres was granted.

The Salazars built a three-room adobe and lumber house with adjacent corrals, and cleared approximately five acres for irrigated fields. They planted an orchard and raised vegetables, corn, and a limited amount of feed crops. They put in irrigation ditches a half-mile long during the 1920s to carry water to the fields and orchard.

Access to the homestead was mainly by horse and went directly down the creekbed in Aravaipa Canyon. Although it was possible to take a Model-T to the homestead, the Salazars never did any extensive road work but simply removed large obstacles from the creek bottom. The Salazars raised three sons and four daughters at the homestead. The children rode horses to school through the canyon. The homestead at Old Deer Creek was the closest occupied area to the Aravaipa Box and the closest home to the west end ranches. (Information for this section supplied by Bill Salazar, Lola Acevedo and Tex Salazar.)

ARAVAIPA TOWNSITE AND CLARIDGE RANCH

Aravaipa townsite, approximately nine miles north of Klondyke, was developed as a mining area. After mining ended, the abandoned townsite became part of the Claridge Ranch. (More details can be found in Chapter V and Chapter VI.) During the 1870s, mining began near the Aravaipa Mine in the center of the area which became the Aravaipa townsite. Aravaipa rancher W. C. Bridwell prospected in the area, as did Burt and Horace Dunlap. Early prospectors found remains of an old Spanish/Mexican-style smelter on the site, and Bridwell may have built another small smelter of this type. Extensive development did not begin until the mid-to- late-1880s, when the Aravaipa Mining Company purchased prior claims and did extensive development work. Aravaipa experienced three "boom" periods: the first during the 1890s; the second during the 1920s, when Lewis Douglas leased the mines; and the third between 1943 and 1957, when the area was mined for zinc by an Arkansas company. Productive mines included the Head Center, Iron, Cap, Grand Central, and the Arizona Shaft.

At the height of the 1890s mining activity, the townsite had over thirty buildings, a population of approximately 300 people, and a bi-weekly stage from Willcox. During the brief boom of the 1920s, the townsite grew even larger. (See photos following Chapter V.) The mines produced lead, zinc, and small amounts of copper. The Aravaipa townsite had a mill which operated intermittently through the 1920s located on top of a hill south of the Number One shaft, with an adjacent tailing pile. The foundations can still be seen today (1990).

During the third period of activity, in the 1940s and 50s, the settlement at the townsite remained small. The townsite had approximately twelve structures, including the owners' house, a bunkhouse, and a boarding house which served meals for the miners. A second small settlement was located by the Head Center mine. Ore was hauled to the mill in Klondyke fifteen miles from the mines, where the assay office, lab, garage, and repair shop were also located. In Klondyke, the ore was separated into loads of lead and zinc and then hauled to Bylas on the railroad for shipment to Fort Smith. The mine briefly employed up to 100 workers during the late 1940s; however, numbers were usually much smaller. Electricity came from a generator behind manager Harvy Horton's house and was later brought from the mill. The workers' dwellings only had intermittent electricity and no inside bathrooms.

During the first and second periods of activity, both drinking and mining water for the Aravaipa townsite came from Tule Springs, a series of five springs in Tule Canyon, a tributary of Stowe Gulch. It was hauled in large water tanks by wagon to the townsite. The town also had a shallow well above manager Harry Firth's stone house (still standing in 1990). The well and Tule Springs provided an adequate amount of water during the first and second periods of activity. However, the third mining phase required more water, and the well at the Aravaipa townsite was supplemented by hauling water in trucks from a large well at the Klondyke mill. It was deposited in large storage tanks across the road from the manager's house. The mines were de-watered directly into the nearest water course. Water from Head Center mine was used for drilling in that mine and other mines.

The area around the townsite was heavily impacted by mining and associated human uses between 1892 and 1957. The major road from Klondyke was constructed as a wagon road before 1900; secondary roads connected individual mines to the townsite. All of the roads in the area were improved during the late 1940s and early 1950s. Mining excavation was extensive at five to eight mines, and more limited excavation occurred at many smaller mines and prospects. Large areas of land were cleared for houses and mine buildings. Milling took place at the townsite, and tailings piles collected in water courses. Many trees were cut for fuelwood.

The area around and including the Aravaipa townsite has been impacted by cattle grazing and a limited amount of goat grazing since the early open range period of cattle ranching. T-Rail cattle and cattle belonging to several smaller ranches grazed near the townsite. It became part of the Claridge Ranch during the 1930s, at which time, the first range fencing was done. Several localized floods have occurred at the Aravaipa townsite. During the late 1940s, a flood washed away two rooms from one of the houses and carried away a truck. In 1963, a big rainstorm hit Landsman Camp and washed away a car. The severe December snowstorm of 1968 killed large numbers of quail and javelina near a townsite. (Information for this section supplied by Wilfred Claridge and the Arizona Bureau of Mines Aravaipa file.)

APPENDIX III

CATTLE RANCHES
EAST AND WEST ENDS OF ARAVAIPA

RANCHES IN THE ARAVAIPA AREA

RANCHES ON THE SAN CARLOS MINERAL STRIP

The San Carlos Mineral Strip, a piece of land north of Aravaipa Canyon forty miles east-west, and two to fifteen miles in width, was included in the San Carlos Apache Reservation by the Executive Orders of November 9, 1871 and December 14, 1872. Twenty-five years later, pressure from non-Indian mining interests brought about its removal from reservation status through the Appropriations Act of March 2, 1895 (28 Stat. 876), which authorized negotiations for cession. The agreement was ratified June 10, 1896 (29 Stat. 360) removing approximately 232,320 acres from the reservation, for "occupation, location, and purchase under the provisions of the *mineral land laws only*." Prior to cession, many non-Indian miners had prospected the area and several mines were producing ore.

Several years before its cession from the reservation, non-Indian ranchers began grazing their cattle and goats and squatting near springs on the Mineral Strip. Throughout the period prior to the 1930s, non-Indian ranchers ran livestock on the Mineral Strip. In 1931, based on insignificant financial returns realized by the tribe, the Department of Interior withdrew the Mineral Strip from all forms of entry or disposition, pending enactment of legislation for restoration of the land to the tribe. However, on February 14, 1936, portions of the Strip were incorporated into a grazing district created by the Taylor Grazing Act. The Bureau of Land Management took over administration of the area from the Tribe and Indian Bureau, issuing leases to ranchers so that they could continue to graze their cattle on allotments which were being fenced. In 1963, the San Carlos tribe recovered mineral rights on the strip (Order No. 2874, 28 F.R. 6408) and in 1969, Secretary of the Interior Stewart Udall issued an order (34 F. R. 1195, January 24, 1969) restoring surface rights to the Tribe. The order affected 12,000 acres of Coronado National Forest land and a 199,561 acre area administrated by the Bureau of Land Management. Some of the original cession had been otherwise disposed of, as State of Arizona "school sections," "indemnity lieu lands," "miners hospital grants," and "county bond grant lands." Approximately 11,000 to 12,000 acres had been included in the Coronado National Forest; 6,340 acres were patented under homestead laws; and only a tiny portion, 640 acres, had been correctly patented under the mineral land laws as expressly stated in the 1896 agreement. After 1969, non-Indian ranchers continued to live on the Strip, leasing land from the San Carlos Apache Tribe rather than from the Bureau of Land Management (Bureau of Indian Affairs, San Carlos Reservation file).

During the years of non-Indian occupation, both individual ranchers and cattlegrowers associations attempted to clear non-Indian land titles on the "Strip". Since both cattle and goat ranches operated on the Strip, periodic resolutions for clearing titles appeared in the records of Arizona Cattlegrowers and the Arizona Mohair Growers Association. During the early period of Anglo-American settlement, Bud Ming, Oscar Webster, Jim Hinton, George Upshaw, and Skeet Bowman operated large ranches on the Strip. Ranches were situated far apart, and the Strip had few roads. The San Carlos trail remained a major route of communication. Klondyke could only be reached by horseback since no road was ever constructed. Graham County established an accommodation school at the Copper Reef Mine, at the center of the ranching district. The mining camp at Stanley, abandoned during the 1920s, served as a social center for many east end ranch families. Frequent visits were made to pick fruit from the abandoned orchards on Stanley Mountain, where the fruit was packed out on burros (Junietta Claridge 1975: 405-23).

In 1973, after years of political pressure and litigation between the tribe and non-Indian lessees (Bowman *v*. Udall, Hinton *v*. Udall), the superintendent of the San Carlos Apache Agency sent eviction notices to twenty non-Indian ranchers. Many of the ranchers who received notices were descendants of the original settlers. They included Skeet Bowman, Keith Smith (on the Oscar Webster-Zola Webster Claridge ranch), Glen Layton, Dan and Jack Hinton, Huston Hinton, Lewis Ellisworth, Wheeler Reece, Fred Upshaw, Fred T. Ash, Mary Cluff, Frank Parish, Joe Flieger, Ted Lee, Wilford Claridge, Dave Miller, D. B. Sanford, E. W. Bundrick and Elbert Alder. The eviction affected entire ranches in several cases. However, the majority of non-Indian ranchers only lost a portion of their range. All permanent non-movable improvements, including wells, roads, catchment tanks, and fences were included in the order and were reposed by the Tribe (*Eastern Arizona Courier* 2/28/1973; Bureau of Indian Affairs records; Keith Smith 1990; Joe Flieger 1990).

RANCHES EAST AND WEST ENDS

Two ranches have been selected as examples of the slightly different pattern of ranching that existed on the east and west end of Aravaipa. For an additional discussion of east end ranches, see Dry Camp Ranch in Locations of Special Interest.

WEST END - PAINTED CAVE RANCH

When Joe Flieger arrived in Aravaipa in 1929, he spent his first winter inside a cave near the McPeter's Tank. Coming from a background of rodeo and wild west shows, he got his first jobs in the area as a horse breaker. After the Taylor Grazing Act, he worked for Ed Bowman and helped Bowman and other ranchers on the Mineral Strip gather wild horses. Flieger, like many of his predecessors, built up a substantial cattle herd from ten Mexican cows and one bull. He often worked roundups for other ranchers in the area and took his pay in cattle, eventually building up a herd of pure-bred Santa Gertrudis cattle. He acquired the Painted Cave Ranch and portions of the T-Rail range after the T-Rail sold out.

Joe spent his first year in the Aravaipa area, living inside the Painted Cave. A landmark on the San Carlos Trail, the cave contains ancient petroglyphs and is located several miles north of the Vail/Buzan farm on the creek. After his marriage to the Aravaipa school teacher, Joe and his wife Gussie, built a house in front of the cave without disturbing any of its painted portions, and used the largest section of the cave (which contains extensive pictographs) for their living room. Prior to 1962, there was no road to the cave. The Fliegers built the house and barn without the benefit of a road, using the San Carlos Trail to reach the ranch. They packed in all their furniture and building materials for the house and barn. While digging up the area where the present corrals are located, Joe discovered two full human skeletons (Buchanan 1988: 145-49).

The Painted Cave Ranch incorporated the former portions of the T-Rail Ranch purchased by Ed Haskins in 1929. During the 1920s, several herds of goats, including those owned by the McPeters brothers, grazed on the northern (Mineral Strip) section of the ranch. In later years, the ranch also included the Vail/Buzan farm on Aravaipa Creek and the leased land on which the Buzans had run approximately 150 head of cattle. The Painted Cave extended into the Mineral Strip area and contained considerable rough, remote rangeland. The

T-Rail portion of the ranch constituted the largest pastures. Several hundred head of wild horses were removed from that area during the early 1930s.

During the 1940s and 1950s, the Fliegers built five dirt tanks and four cement tanks, constructing the early tanks with a fresno and three mares. In later years, they used a tractor. The first of the dirt tanks was built west of Painted Cave in 1940; two tanks toward Black Mountain in the Red Basin were built during the late 1940s with a tractor; another tank on top of Black Mountain was constructed at approximately the same time. Flieger built one cement tank in Javelina Canyon, one at Painted Cave Canyon near McPeters tank, and one in the northern section of his ranch near the San Carlos Reservation. In 1973, the ranch lost two sections of land to the San Carlos Tribe. The Fliegers constructed the road from Aravaipa Canyon to Painted Cave and the road to the north portion of Brandenburg Mountain during the 1950s. During the late 1960s, Joe sold the ranch. It has had a series of subsequent owners, including the Ashes, the Wagners, the Colemans, and Philip DeNormandy.

On the Painted Cave Ranch as on other west end ranches, spring feed was best, and ranchers sold their calves in the spring. Before fencing, cattle usually wintered down on the creek and as the summer rains began, they started drifting east (J. White 1990). Cattle drives were made to Tucson, as described in Chapter VI. (Information for this section supplied by Joe Flieger and Jep White.)

EAST END - SALAZAR RANCH

Lupe Salazar, whose early life is described in the previous Appendix, "Locations of Special Interest," was responsible for putting together a large ranch on Aravaipa's east end. The ranch included the Aravaipa Box and extended from Turkey Creek to the boundary of the Wood and White ranches on the west end.

After he homesteaded at Deer Creek in 1913, Lupe continued to work as a cowboy on the ranches in the canyon. In 1917, working for the T-Rail Ranch, he bought his first bull from William Wootan; in 1920 he bought an additional ten Hereford heifers from Drew Wilson, one of the T-Rail owners. In 1929, when the T-Rail owners sold their ranch in Aravaipa, Lupe purchased the undetermined remnant of the herd (usually wildest cattle) for $1,000, and gathered over 100 head which had not been picked up at the time of the sale. This gave him the opportunity to expand. At the time of sale, Lupe also purchased some of the T-Rail brands, including

Elias Jones's "Campstool" [ ] brand (later sold to Virgil Mercer), the T-Rail brand and the 6 X, both of which are still used by the Salazar family. Dan Ming's original brand, DM, seems not to have continued in the area (C. Whelan 1990, C. McNair 1990).

During the Depression, Lupe expanded his ranch, purchasing property from John Ditmer at the junction of Turkey Creek and Aravaipa. After Lupe and his family moved to the two-story Ditmer house at the head of Aravaipa canyon on the Ditmer property, his son Bill Salazar continued to live at the old Deer Creek homestead for a number of years. Lupe's friend John "Nosey," a former Apache Scout, visited the family frequently and described the Apache massacre which had occurred near their new home above the junction with Turkey Creek. The Salazars used a large cave in the south wall of the canyon behind the former Ditmer house for a barn and hay storage. A second house, slightly upstream on Aravaipa Creek, was later occupied by Bill Salazar. During the subsequent years, Lupe purchased parcels of land and range rights from the Bleaks, Whites, and Mercers, including the Wootan place on Oak Grove Canyon, the Bleak place at the Greenhouse, and Parson's Grove. By 1947, Salazar had a substantial ranch.

While still living at the homestead, the Salazars began to put in corrals and other improvements on their expanding ranch, concentrating on the area of the tablelands and not the area within the canyon, which is too narrow to support many cattle. The earliest tanks were made by hand and fresno; among these, Bill's Tank was constructed during the 1930s in the Deer Creek Pasture close to Virgus Canyon. Members of the Salazar family are among the few informants who mentioned conflict with goat herders, stating that Lupe objected to the use of Bill's Tank by goats (either the Copes' or the Upchurches' goats). During the early 1940s, they built the Turkey Creek cement dam, the Number One Tank in Wire Corral Draw below the wire corral, the Number Two farther down Wire Corral Draw, and Arceliano Tank one-and-a-half miles below it. All the later tanks were built after 1950 using bulldozers; they include Woodrow's Tank, Dead Cow Tank, Browns' Tank, Moore Tank, Ralph's Tank, and Pat's Tank. Red Tank on the pipe line was constructed by Bear Creek Mining Company. In 1952, Lupe installed a two-inch galvanized pipeline three-quarters of a mile long from Aravaipa Creek to the rim to bring water to dry stock ponds. Water was pumped up 2,500 feet to the tanks from Aravaipa Creek with a belt system activated by an old automobile wheel. The pipe was replaced in 1970 and from that time was connected to a portable pump. The Salazars occasionally burned out batamotes along the pipe line road, where they were particularly thick.

Most of the fences on the Salazar Ranch were already in place, since the Salazars acquired pieces of property from other ranchers. The Salazars improved the road from Turkey Creek to Parson's Grove. Bear Creek Mining Company built the pipe line road during the 1960s. Adolfo Salazar, Lupe's son, built the "Rug Road" from Table Mountain to Mammoth during the early 1970s so that he would have faster access to the canyon from his home near the west end of Aravaipa. However, the road, even with the addition of old pieces of carpet samples, is so difficult to drive that he did not significantly decrease the time required to reach the east end settlement.

APPENDIX IV

GOAT RANCHES

INDIVIDUAL GOAT RANCHES

Brief histories of several of the larger long-term goat ranches will illustrate some of the impacts brought about by goat ranching. The descriptions attempt to mention the areas of significant goat concentration and related cultural impacts.

WEST END

White Ranch: Abe White arrived in Aravaipa from New Mexico in 1920 and acquired a goat herd on shares from members of the Upshaw family. He remained in the mohair business until 1942. He ran two herds of goats with approximately 1,500 head in each herd. White herded one group of goats himself and employed herders, including members of the Waldrip family and several Mexican herders, for the second herd. Abe rotated among several separate goat pastures: the Aravaipa Box during the summer; a pasture east of Stone Cabin, where he built a cabin; Brandenburg Mountain in the winter; and his homestead at the Rim Rock camp, his favorite goat camp where he lived in a large and comfortable cave. The Waldrips lived in a cave in Stone Cabin Canyon. Several of the Mexican herders rotated goat camps frequently in the same general area. The Whites' shearing shed and pens were on the main west end road above the school house (J. White 1990).

Wood Ranch: Although not originally a "goatman," Martin Wood acquired a herd of goats in 1924 when prices on the cattle market were low. He purchased the original band from Vivian King in the Kingman area and acquired more goats from Nealie Brown and Les Whittaker in the Aravaipa area. He eventually had a herd of approximately 3,000. He kept the goats until 1932, when he traded the herd for eighty head of cattle. Interested in quality production, the Woods had a number of registered bucks. All three sons in the family sheared for other neighboring goat ranchers. At the peak of their shearing activities, they sheared between 20,000 and 30,000 goats during one fall.

Baker Ranch: Joe Baker's family moved from Silver City, New Mexico to Aravaipa in 1920. Baker had heard about Aravaipa from early resident Sam Satethite whom he had met in Winkelman. Drought and National Forest policy had forced J. Baker, nearly seventy years old, to leave the Burro Mountains in New Mexico. He herded his goats all the way to Aravaipa on horseback, assisted only by a couple of grandchildren. Leaving with 2,300 goats, he arrived with approximately 1,400 goats. He purchased the West place on the south side of Aravaipa Creek, supplementing his income from the goats with the sale of fruit from the Wests' old orchard. Baker was unsuccessful in the goat business. In 1932, a partner who had taken his goats on shares stole the herd. Baker then turned the rest of his herd over to his son, Sam, who ran a herd of approximately 800 goats between Aravaipa Creek and Table Mountain for a few years. He sold them to Les Whittaker and switched to the cow business because it was "less trouble" (S. Baker 1990).

EAST END

The Weathersby Angoras: Three generations of the Weathersby family operated the largest long-term goat ranch on Aravaipa's east end. Jake Weathersby arrived from Texas in 1887 and moved to Klondyke during the early 1890s, where he initially ran a small store in a tent. About 1900, he began herding goats for Oscar Webster, acquiring goats on shares from Webster and members of the Claridge family. During the next thirty years he built up one of the best goat herds in the state, running a separate herd of registered Angoras and specializing in the sale of registered bucks. He usually had between 7,000 and 15,000 goats. Near Klondyke, he maintained five or six goat herds of approximately 2,000 goats, each with a separate herder. During his years in business, Jake started many other goat ranchers on shares, including John Ditmer, Rob Wootan, and members of the Bleak family. Eventually the Weathersbys put together a large ranch east of Klondyke on the slopes of the Santa Teresas. The Weathersbys added cattle to their operation during the 1930s but kept a portion of their goat herd until 1951 (N. Wethersby 1990).

The Weathersbys had goats at Buford Camp, Deep Well Camp, Summer Camp near the Quinn Mine, Lamb Camp, and Mariano Camp. Each goat herder ran his own camp and determined the feeding patterns for his goats. Herders included Adam Bless, Pilar Montoya, Soto, and several parolees from the prison at Fort Grant who served out their murder terms in the Weathersbys' isolated goat camps and subsequently continued working on the ranch. The Weathersbys maintained their own shearing pens at Jake Weathersby's homestead and occasionally sheared at other stations as well. For the first few days after shearing, the Weathersbys kept their goats in a tin-roofed shearing shed to protect them from the cold. The main shearing sheds held 2,000 goats, and even in the coldest weather, the roof steamed in the morning from the goats' body heat. The Weathersbys practiced careful rotation, which prevented overgrazing and contrasted with other areas where traces of goat-induced environmental degradation remained for years (e.g. Norton and Smith's camp near Crazy Horse Canyon). The imprint of the Weathersby goats was limited to a few trails leading out from the goat camps (N. Weathersby 1990).

TURKEY CREEK

Rob Wootan: Several members of the Wootan family raised goats in the Aravaipa area from the turn of the century until the late 1920s. Most of the Wootans had both cattle and goats and some operated substantial ranches. The story of Rob Wootan, one of the smaller livestock operators in the family, offers an example of the types of goat impacts which resulted from the smaller goat ranches. Rob Wootan started in the goat business in 1920, acquiring 800 goats from Will Allbritton, who had run a large herd in Turkey Creek since before 1900. Alma Brown Wootan married Rob and arrived in Turkey Creek in that same year. She recalled intensive goat impacts in the Turkey Creek-Jackson Spring-Oak Grove Canyon area. The Allbrittons had their main goat camp near Black Butte and were beginning to phase out their goats. Several members of the Brown and Bleak families were also running goats between Turkey Creek and Table Mountain as well. The Wootans shared a three-room lumber house in Turkey Creek with another family of goat herders. The house had a small orchard and garden. They penned their goats under the over-hang on the cliff in Oak Grove Canyon, in the pen formerly used by the Allbrittons and subsequently used by the Ditmers (A. B. Wootan 1990).

The Wootans moved their goats to Table Mountain in 1920 or 1921, where they lived in an abandoned T-Rail shack with a dirt floor and grass roof. They constructed a cedar-post goat corral and a mud-plastered ocotillo kidding shed. They hauled building materials from the abandoned Table Mountain Mine to improve their house. Their closest neighbors were the Bleaks and the Whites. During their first winter on Table Mountain they sheared their goats at the Bleak place, borrowing all their shearing equipment from the Bleaks. During the late spring a snow and hail storm caught their freshly sheared goats on the range with no protection. The goats panicked and stampeded back to the corral, where many of them were trampled. The following year, the drought of 1921 put them out of the goat business (A. B. Wootan 1990).

SAN CARLOS MINERAL STRIP

Webster-Claridge Goat Ranch: Oscar Webster began operating a large goat ranch on the Mineral Strip shortly after 1900. He had one of the biggest goat operations in the state (7,000 - 15,000) and was a mohair buyer for the Aravaipa district as well. After his death, his daughter and son-in-law took over both operations. Between 1919 and the mid 1930s, Mark and Zola Claridge had a herd of 7,000 Angoras at the UB Ranch in Hawk Canyon. The Claridges' ranch was similar to other goat ranches in the Aravaipa area. They employed a number of Mexican herders who stayed out in goat camps, and provided a commissary at their headquarters to supply the herders. The herders were relatively independent, choosing the goats' daily routes and grazing places. They practiced rotation between goat camps and had a shearing pen by the headquarters in Hawk Canyon. The combination of drought, depression, and new grazing regulations which limited the number of goats on lease land, put the Claridges out of the goat business. In 1938 they sold their ranch (Junietta Claridge 1975: 405-23).

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