DRAFT

MEMORANDUM

Date: November 22, 1999

To: The Honorable Chair and Members
Pima County Board of Supervisors

From: C.H. Huckelberry
County Administrator

Re: **Ranching in Pima County**

I. Background

One of the six elements of the Sonoran Desert Conservation Plan adopted in concept by the Board in March of 1999 is Ranch Conservation. By including ranch lands as a landscape form worthy of protection and preservation, the Board formalized Pima County's commitment to keep ranchers ranching as a way of achieving multiple community goals, including conserving natural and cultural resources, preserving open spaces, and defining urban form. Pima County has been involved in a number of successful ranch conservation efforts and retained ranchers as land stewards while preserving the land's scenic, wildlife and cultural resource values.

Empire-Cienega Ranch - In 1987, Pima County proposed to buy the Empire-Cienega Ranch to prevent development of some 30,000 homes within the Cienega watershed. The ranch was purchased in a cooperative effort by the Bureau of Land Management and made part of a National Resource Area, while a private ranching family took stewardship responsibility. In September of 1999, Congressman Kolbe submitted a legislative proposal in the House of Representatives to establish the Las Cienegas National Conservation Area. The National Conservation Area legislation provides the opportunity for Congress to consolidate public ownership and management of the watershed and set some specific management guidelines to ensure conservation of the riparian and grassland ecosystems. It also represents a milestone in the development of the Sonoran Desert Conservation Plan.

Empirita Ranch - In 1990, the Pima County Flood Control District purchased the Empirita Ranch along the lower Cienega Creek for its storm water and recharge values, and entered into a cooperative management agreement with a rancher who retains the traditional land use in balance with environmental needs of the land. The purchase has also served to protect the rich upland environment, open space and cultural resource values.

Posta Quemada Ranch - Similarly, Posta Quemada Ranch near Colossal Cave, also purchased for its watershed and quality riparian woodland values, is managed on-site by a rancher and offers educational opportunities through efforts of the Parklands Foundation.

Traditional ranching areas remain in Pima County and correspond with significant wildlife corridors in Altar Valley and in the Arivaca area, as well as in the Cienega Creek Valley and the Upper Santa Cruz Valley. The San Pedro and Avra Valley areas, along with the Tortolita Fan watershed also represent ranching and agricultural areas that serve as urban form makers.

II. General Report

The attached paper entitled *Ranching in Pima County, A Conservation Objective of the Sonoran Desert Conservation Plan,* describes the local history and current practice of ranching. The report looks back as far as the 1600's when cattle were first introduced in Pima County by Spanish explorers; it covers the history of local ranches, which began to be established approximately 150 years ago; it outlines federal and state public land laws, and it tells about the practical aspects of the industry and ranching life, too. The report places Ranch Conservation in the context of the overall Sonoran Desert Conservation Plan by detailing the values of the Ranch Conservation element of the Plan, such as: 1) defining the metropolitan urban boundary; 2) preserving western heritage and cultural resources; 3) maintaining a traditional industry and diversifying the local economy; and 4) preserving unfragmented natural open space, wildlife habitat and water resources.

III. Regional Importance of Ranching in Forming the Urban Boundary

With regard to defining the metropolitan urban boundary, the report describes the fact that ranches -- along with existing reserves like the Saguaro National park, Coronado National Forest, and Tucson Mountain Park -- actually define the urban boundary of Tucson. The report also shows how, on the urbanizing edge, ranches are vulnerable to market forces and government practices. The State Land Department, for example, has established 5 year time limits on 16 grazing permits for land along the urbanizing edge of Tucson. These permits, called Special Land Use Permits, apply to a land base that totals 52,555 acres. The Sonoran Desert Conservation Plan's regional community based planning effort -- which involves the ranch community -- should result in a better system of defining urban form than simply yielding to development pressure.

IV. Importance of Ranching in the Diversified Local Economy

With regard to maintaining a traditional industry and diversifying the local economy, the report makes a number of points, including that:

In Pima County, many ranches are relatively small operations with an average net cash return of $29,746. Of 419 farms and ranches in Pima County, 311 had sales ranging from $2,500 to $24,999; 51 had sales from $25,000 to $99,999; and 57 had sales over $100,000.

In 1992 there were approximately 51,000 head of cattle in Pima County (out of a statewide total of 930,000). By 1997, this number was reduced to 39,000 in Pima County (and approximately 822,300 statewide).

Of the 419 ranches, 294 (70 percent) are individually owned; 38 are owned by a family corporation; 9 ranches are owned by others in a corporation; and 24 are owned by a cooperative, trust, estate or institution.

V. Environmental Importance of Ranching

With regard to preserving unfragmented natural open space, wildlife habitat and water resources, the report describes the paramount role that ranch lands play in Pima County's open space landscape. In eastern Pima County alone, approximately 1.5 million acres of open space support ranching and agriculture. Of this, 214,000 acres are private deeded lands. Deeded property tends to be in some of the most important riparian areas. Another 26,000 acres are crop land. State Trust Lands make up 813,000 acres, while 185,000 acres belong to the Bureau of Land Management and 318,000 acres belong to the Forest Service.

VI. County Must Help Ranchers Keep Ranching

Ranching preserves the natural landscape and environment, archeological sites, prehistoric settlement systems, and traditional cultural places.

Traditional ranching areas are found in every valley system of Pima County. These areas define urban form and constitute much of our remaining open space. Development pressure and uncertain tenure threatens to fragment existing corridors that now protect numerous community values and resources. The Sonoran Desert Conservation Plan recognizes the contributions of ranching and the demonstrated and potential stewardship of ranchers in preserving what remains of natural and cultural landscape. Therefore, an important goal of the Plan is to identify the areas where this traditional land use is upholding and conserving sensitive habitat, wildlife and other natural and cultural resources, and find ways to keep these ranchers ranching for the good of the entire community. Perhaps the largest variable to sustainable ranching is the posture of the Arizona State Land Department to grazing leases on the urban periphery. The State Land Department has it within its power to either control or facilitate urban sprawl.

CHH/jj

Attachment

Ranching in Pima County, Arizona
A Conservation Objective of the Sonoran Desert Conservation Plan

Compiled by Linda Mayro
with contributions by
Micaela K. McGibbon

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COMPLETE TABLE OF CONTENTS

Ranching in Pima County, Arizona
A Conservation Objective of the Sonoran Desert Conservation Plan

Our common ground — our natural and cultural landscape, our sweeping open spaces, our recreational areas, our refuge from the city, and home to sensitive biological systems and traditional rural communities — is seriously threatened by the inexorable march of urbanization and leap frog development, which fragments the landscape and destroys the connectivity and the integrity of these open spaces. Much of this open space historically supported agricultural endeavors principally cattle ranching, an extensive rather than intensive use of the landscape, which respected the natural form of the land and has served to protect our common ground from the much greater impacts of intensive development. Comprised of a mosaic of land ownership, most ranches include a relatively small amount of deeded private lands and grazing allotments on lands owned by federal and state land management agencies. While cattle ranching in Pima County began in the 1690s with the first Spanish mission settlements, this mixed composition of ranch land dates back to the 1800s, continues today and typically accommodates multiple uses, such as recreation, hunting, mining, and timber harvesting.

With sound management practices and careful land stewardship, sustainable ranching can restore natural ecosystems, increase biodiversity, conserve water resources, and provide a "working landscape" for people living in rural communities. However, faced with rising land prices, development pressure, changing livestock markets, and increasing political uncertainty over access to grazing lands, many ranching families have been faced with the difficult choice of either continuing to ranch with the possibility of risking their financial well-being, or selling their private land holdings for development. Often the decision is to sell, especially where development pressure is high. If this trend continues, Pima County's open spaces will be increasingly subdivided and fragmented, resulting in the loss of habitat and the ability of the land to support a rich diversity of plants and animals and a working environment for its rural communities. As author and anthropologist Dr. Thomas E. Sheridan has noted, "Some human impacts can be reversed, but subdivisions are more or less forever." There is a growing movement in Arizona and the Southwest that understands that sustainable ranching is an important factor to conserve natural ecosystems and open space and to ensure the continuation and viability of a traditional way of life and economic pursuit. Ranch conservation is recognized therefore by the Sonoran Desert Conservation Plan as a key solution to preserving what remains of Pima County's vast natural and cultural landscape.

Part I. History & Current Practice

I. Introduction

The history of man and cattle in Arizona is pervasive and deep. It extends across more than four centuries, it reaches to every corner of the state, and has involved almost every cultural group. The Spanish explorers and missionaries brought the first cattle, horses, and sheep to Arizona in the 16th and 17th centuries and they remain a source of livelihood in the rural landscape. Cattle ranching has contributed greatly to the growth and prosperity of Arizona and Pima County since its earliest days. For some, it has been a part of subsistence living; for others the source of considerable wealth. Today, ranching faces considerable challenges.

This report is intended to be an overview of ranching and ranch conservation goals; consequently, it is necessarily descriptive and broad in scope. It does not attempt to undertake a comprehensive history of cattle ranching, nor does it provide a detailed examination and critical analysis of the cattle ranching industry in Arizona or Pima County; rather, it provides an introduction to the subject. Part I will describe the goals of ranch conservation in the context of the Sonoran Desert Conservation Plan, provide a broad historical overview to describe the overall context of the cattle industry over time, and a description of how ranching is practiced today. A second volume or series of reports will provide a closer look at ranching in each of the Pima County valleys, describing the land base, its productivity, the role of stewardship, and the challenges faced by the ranching community today. It will conclude with a discussion of recommendations, strategies, and incentives for preserving ranch lands in Pima County.

Sources for this information include both primary and secondary information derived from oral interviews, published ranching histories compiled by various authors, principally William S. Collins, Thomas E. Sheridan, and Nathan F. Sayre, as well as information from a number of agencies. Statistical summaries were derived from the USDA Census of Agriculture for 1992 and 1997, and GIS analysis was provided by Pima County. A listing of sources consulted and other relevant sources will be included as a bibliography on ranching at the end of this report. Historic and contemporary photos will identified and credited throughout the report.

I-1. Ranchlands in Arizona and Eastern Pima County

To provide some context for evaluating ranching in Pima County, this report begins with a brief overview of the current state of the cattle industry and ranching throughout the state. Raising cattle for meat or dairy products is a major industry in Arizona and provides a livelihood for many people. However, current trends in numbers of cattle produced in Pima County and statewide indicate some decline in production based on 1992 and 1997 statistics. This may be, in part, due to recent drought conditions that have caused ranchers to reduce their herds, but it largely reflects the statewide shift to a more urban economy and a loss of rangeland as population growth and urban development have accelerated in recent years. Still, the cattle industry remains a significant factor throughout Arizona and especially in the rural areas of the state that encompass private, federal, state, and tribal lands.

In 1992, there were nearly 930,000 head of cattle located throughout Arizona and about 51,000 head in Pima County. In 1997, the last year of the federal agricultural census, there were nearly 822,300 cattle in Arizona and about 39,000 cattle in Pima County. Though widely dispersed, they are found in all parts of the state, and there are few areas so arid that no cattle graze on them. If lands are not grazed, it is usually due to some legal or jurisdictional barrier, like a national park designation, or urban development, and encroachment of suburban areas.

Range land or grazing lands are not the only open spaces in jeopardy. Increasingly farm lands are also affected by urban development. Conversion of former croplands from farming to real estate is suggested by the decline in agricultural land statewide between 1992 and 1997, which crosses all jurisdictions, private, state trust, federal, and tribal lands. Of the state's 72,688,000 acres, the USDA reports that some 35,037,618 acres were committed to

agricultural uses in 1992 and that 84 percent of that land, or 29,431,599 acres, was characterized as pastureland or rangeland. In the 1997 USDA census, total agricultural land use declined to 26,866,722 acres, but the percent of rangeland increased from 84 percent to 88.1 percent of that land. This represents a 23 percent decline in agricultural land use overall, and a lower, 19.5 percent, decline in ranching and grazing lands. The percentage increase in rangeland suggests that the greatest decline in agricultural use was the loss of croplands.

In an arid region, land use is primarily determined by the availability of water. In the Phoenix area, for example, the development of irrigation systems for agriculture in the late 19th and early 20th centuries initiated the rural settlement and expansive development of the Salt River Valley. In the past 80-100 years, large numbers of new residents moving to the area increased commercial and industrial uses, and extensive urban and suburban residential development have significantly replaced agricultural activities. The Phoenix area has experienced exceptionally high urban growth, which it has been able to accommodate, because it is able to use water from large dams and lakes that impound water on the Salt and Verde rivers as well as Central Arizona Project water from the Colorado River. Water, however, is much more limited statewide, and there are large areas of Arizona that cannot support significant irrigated farming areas or highly populated urban centers. Where rainfall and groundwater are limited or too scarce to support other uses, ranching remains a viable use of the land provided that water can be captured in stock tanks and provided to livestock and wildlife using wells and water troughs spaced throughout the open range. While these wells and water sources are developed for the use of livestock, wildlife and birds also access this water, making otherwise marginal land available for other animals to use.

Cattle ranching in the arid Southwest is a land-extensive industry, and the raw statistics provided above on the numbers of cattle and total acreage used for grazing in Arizona suggest that there are about 35 acres available for each cow to graze. This is a misleading calculation, and in fact, it takes a far greater number of acres of open rangeland to support each animal. The missing factor is the amount of irrigated pasture producing feed, as well as grain and hay brought in for beef and dairy cattle, which allows the state to support more cattle in concentrated areas than open rangelands ever could. Typically, these irrigated lands occur in well-watered regions like Maricopa County, which supports nearly four times as many cattle as Pima County according to the 1997 USDA census of agriculture. Unlike Pima County ranches, which utilize natural open range, Maricopa County has a significant number of dairy farms and feedlots, which accommodate high numbers of cattle kept in large corrals and fed daily on hay, grain and other prepared feed rations. In open range settings, the number of acres required for each cow is highly variable and is dependent on the quality and quantity of forage and the availability of water. There is no single ratio or formula for how many acres it takes to support a cow. Because of diverse environmental factors throughout the state, the number of acres of open rangeland required to support an animal can range from 20 to 640 acres, and is variable from year to year depending on rainfall, range condition, and other factors.

Ranch and farm lands in eastern Pima County comprise nearly 1,240,000 acres of land currently dedicated to ranching and agriculture, including private and public grazing lands and agricultural crop lands. These are comprised of nearly 214,000 acres of private deeded lands in ranching and more than 26,000 acres of croplands. There are approximately 813,000 acres of State Trust lands, and 185,000 acres of BLM land. US Forest lands provide an additional

318,000 acres, which raises this total to about 1.5 million acres of open space used for agriculture in eastern Pima County. Because of the lack of water, irrigated farming comprises a small percentage of all agricultural lands, only 26,233 acres, and is generally restricted to limited areas of the Santa Cruz River floodplain. Ranching and grazing lands predominate.

It should also be noted that much of the main reservation of the Tohono O'odham Nation comprised of some 2,407,675 acres is grazed by cattle and horses owned by the tribe and its members, and portions of the San Xavier District comprised of 71,417 acres are also grazed. Irrigated agriculture once extensively practiced by the San Xavier District O'odham along the Santa Cruz River has declined with the down-cutting of the river channel; however, new and revitalized irrigated farms are being planned for both the main reservation and at San Xavier using water allocations from the Central Arizona Project.

Western Pima County in the vicinity of Ajo, to the west of the Tohono O'odham Nation also engages in ranching on private and public lands, with 12,480 acres in private ownership, about 1400 acres of State Trust lands, and 178,000 acres of BLM land. Other large land holdings in western Pima County include Organ Pipe National Monument at 331,253 acres, Cabeza Prieta National Wildlife Refuge at 375,583 acres, and the Goldwater Gunnery Range at 44,280 acres. The rough total acreage in western Pima County available for ranching or agricultural production is estimated at about 190,000 acres, excluding Organ Pipe, the Cabeza Prieta National Wildlife Refuge, and the Gunnery Range. Even with these exclusions, this estimate is probably much too high given the ruggedness of the terrain and the lack of water and forage in this lower desert region.

Table 1: Ranch & Farm Lands in Pima County

	Eastern County	Tohono O'odham	Western County	Total County
Private Ranch	213,539		12,480	226,019
Private Farm	26,233			26,233
State Trust	813,317		1400	814,717
Tribal	71,417	2,407,675		2,479,092
BLM	184,588		185,000	369,588
Forest	317,679			317,679
TOTAL	1,626,773	2,407,675	198,880	4,233,328*

*USDA 1997 estimates 2,913,607 acres

In all of Pima County, Table 1 suggests that the gross area of lands available for grazing could therefore be estimated to be as high as roughly 4,233,000 acres, but in fact this total is likely to be much less given the factors noted above. To put this in perspective, the USDA 1997 census estimates there are about 2,913,607 acres in Pima County in agricultural use, a more realistic figure when rugged terrain, water, and accessibility are considered throughout Pima County. Assuming the USDA farm acreage estimates are correct, simple analysis indicates that agricultural lands in Pima County (2,913,607 acres) comprise about 11 percent of the agricultural lands (26,866,722 acres) in the state.

Table 1 also illustrates the mixed composition of ranch and farm lands, with private lands accounting for about 16 percent, State Trust lands at 52 percent, and federal lands combined at 32 percent in eastern Pima County. Most Pima County ranches reflect this mix of public and private tenure. Typically, many ranches are comprised of a relatively small core of deeded land, often the original homestead claim, and various federal and state grazing permits, which allow the rancher to graze a number of animals per year. As shown in Figure 1, private, state, and federal lands are distributed unevenly across the county, and most ranchers lease grazing lands from a number of government jurisdictions.

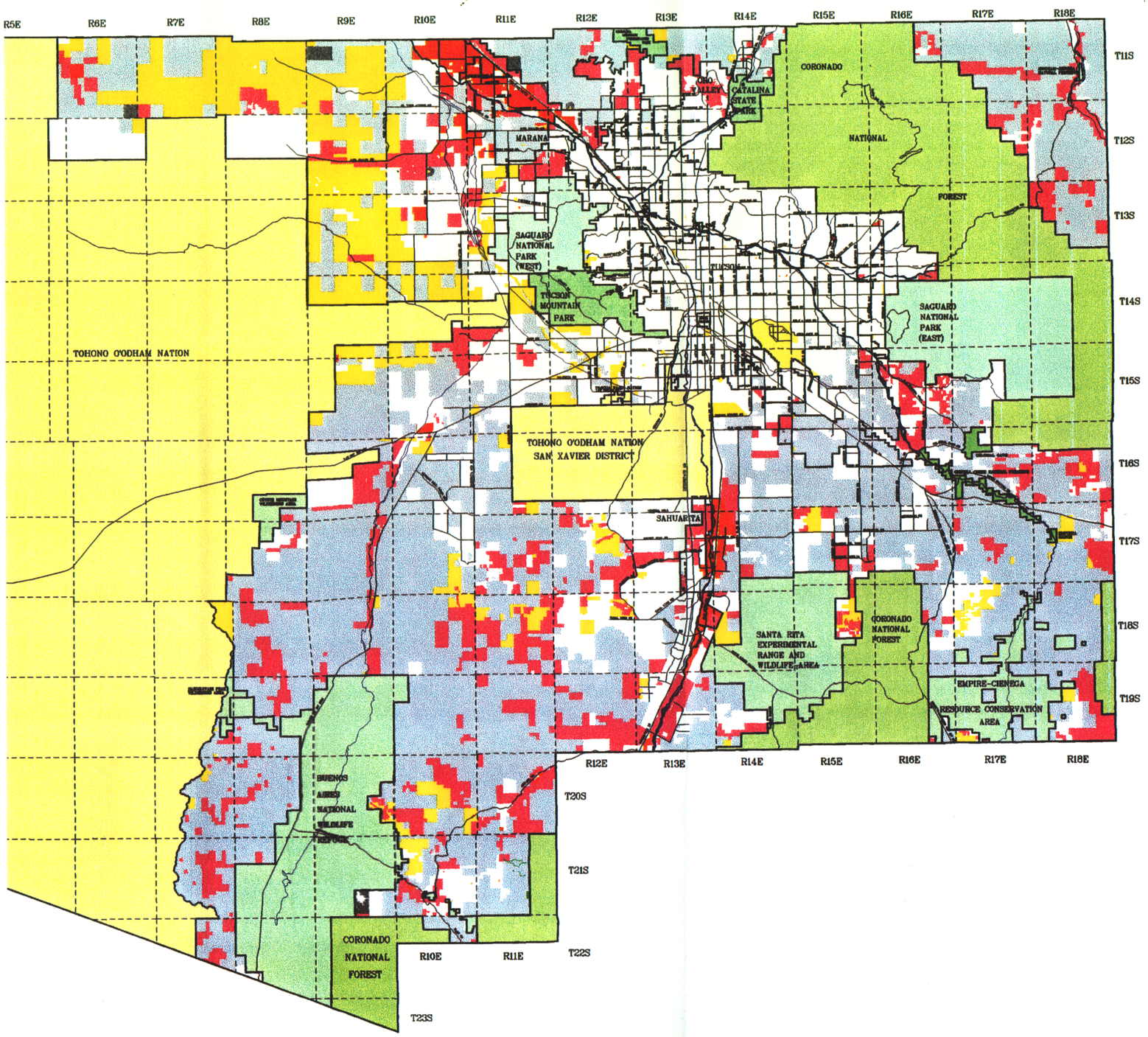
To administer and manage this "patchwork quilt" of land ownership, a system of grazing allotments has been super-imposed on the land to define grazing lease areas. At the present time, Pima County's ranch lands are comprised of 109 allotments of State Trust land and BLM land leases and about 25 allotments of Forest Service land as shown in Figure 2. The total acreage encompassed by these allotments for the entire county is about 1,615,152 acres. When tribal lands are added, this acreage increases to about 4,000,000 acres, which roughly approximates the totals shown in Table 1.

No matter how it is calculated, roughly 4,000,000 acres of open space remain, and about 75 percent of it is used for grazing and agriculture. Much of this land represents what is left of Pima County's vast, unfragmented landscape, which has a significant capacity to support a wide diversity of plants and animals, to provide connectivity and wildlife corridors that allow movement across entire valleys from mountain range to mountain range, and to provide a livelihood for the ranching community.

Environmentally, ranch lands in Pima County occur in a wide range of environmental zones ranging from higher elevation Forest Service lands to intermediate elevation grasslands typical of the Altar, upper Santa Cruz, and Empire-Cienega valleys, and in lower elevation desert scrub such as the Avra Valley. Agricultural croplands typically are found within floodplains and in riparian areas along the Santa Cruz River and the San Pedro River and near large flood-prone areas such as Brawley Wash.

It should be emphasized here that much of the deeded private ranchlands are located in some of the most environmentally sensitive areas, typically riparian areas or at spring sites, where original homestead claims dating to the late 1800s were made. Typically these private holdings coincide with well-watered areas that encompass the most productive, attractive, and biologically diverse lands in the region. Water, which is critical for all life in the Sonoran desert, was also critical for original homesteaders for domestic use and to ensure the agricultural productivity of their land claims. The large expansive areas between these original homestead claims that had no natural water sources remained in public ownership and were used as public grazing lands that supported the homesteaders' agricultural pursuits. Although initially unfenced and unregulated, grazing lands are today heavily managed to ensure the land's health and productivity. The capacity of these range lands to support vegetation suitable for grazing animals is, of course, variable and dependent on general range condition, elevation, rainfall, grass cover, climate, and the availability of water. Consequently, when ranches are sold for development, it is typically the most environmentally sensitive lands that sustain the most damage. Conservation of these private holdings and their supporting rangelands is therefore key to ensuring the continued capacity of these lands to sustain entire ecosystems and a diversity of wildlife.

Ranch and Agricultural Land Use with State & Federal Land



State Owned Land.....813,317 acres

BLM and other Federal Land...201,018 acres

National Forest.....317,679 acres

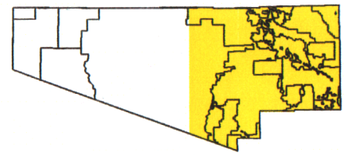
Ranch Property.....213,539 acres

Agricultural Landuse.....26,233 acres

Wildlife Refuges, National Parks, Reservation, Air Force Base, State Parks

Figure 1

Pima County Index Map



Index Map Scale 1:1,500,000

Scale 1: 160,000

PIMA COUNTY DEPARTMENT OF TRANSPORTATION
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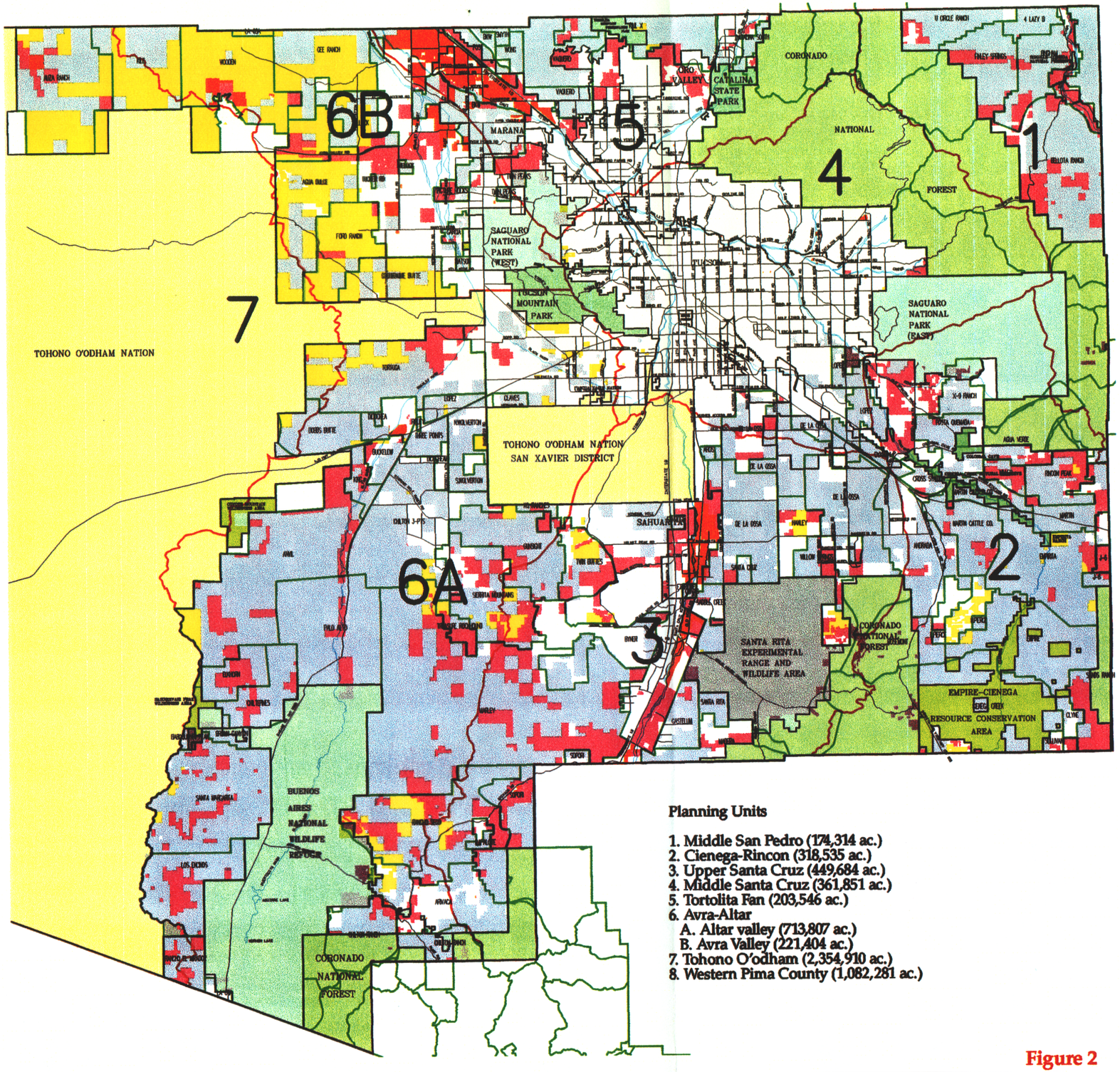
/pygmyowl1/projects/mayro/ranches3.aml

Plotted: 11/10/99

Grazing Allotments, Ranch and Federal Land Ownership in Pima County

- Major Roads And Streets
- Major Washes
- Grazing Allotments
- Sonoran Desert Conservation Planning Boundaries
- Ranch Lands
- Agricultural Lands
- Bureau Of Land Management (BLM)
- State Trust Lands
- Wildlife Refuge / Conservation Area
- Coronado National Forest
- Tucson Mountain Park / State Park
- Goldwater Gunnery Range
- Tribal Lands
- National Monument
- Clenega Creek / Colossal Cave

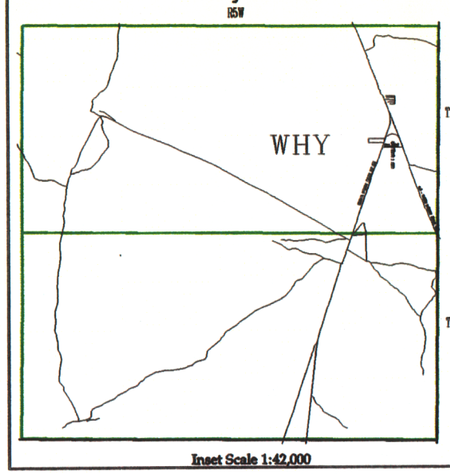


Planning Units

1. Middle San Pedro (174,314 ac.)
2. Cienega-Rincon (318,535 ac.)
3. Upper Santa Cruz (449,684 ac.)
4. Middle Santa Cruz (361,851 ac.)
5. Tortolita Fan (203,546 ac.)
6. Avra-Altar
   - A. Altar valley (713,807 ac.)
   - B. Avra Valley (221,404 ac.)
7. Tohono O'odham (2,354,910 ac.)
8. Western Pima County (1,082,281 ac.)

Figure 2

Why Inset



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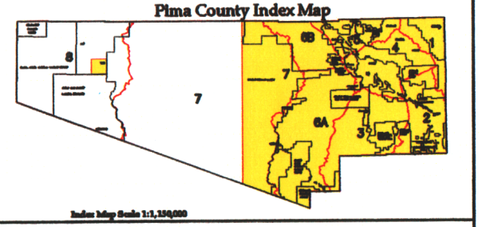
Pima County Index Map



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/pygmyowl2/sonora/ranch/allot/amls/allot_urban.aml Plotted: 11/12/99

I-2. Cattle & Farming in the Arizona Economy and in Pima County

The Land Base:

As shown in Figure 3, land used for agriculture in Arizona in 1997, some 26,866,722 acres, is dominated by pasture and rangeland comprising some 23,669,582 acres, or 88.1 percent, used for grazing. It was also noted earlier that in 1992, there were nearly 930,000 head of cattle in all of Arizona and about 51,000 head in Pima County. In 1997, the last year of the federal agricultural census, there were nearly 822,300 cattle in Arizona and about 39,000 cattle in Pima County. While this represents a five year decline in cattle of 11.5 percent statewide, the decline in Pima County is much greater at 23.5 percent. This five year decline may be, in part, attributed to recent drought that has caused ranchers to reduce their herds to maintain sustainable range conditions, but other factors may be at play, such as climatic variability, market conditions, economic cycles, increasing development pressure, personal decision, and other factors. These factors help to explain why USDA statistics indicate a decline in total farm and rangeland in Pima County from 3,472,248 acres in 1992 to 2,913,607 acres in 1997, representing a decline of 558,641 acres or 16 percent. Despite this decline, approximately 50 percent of the entire land base of Pima County is still used in agriculture, and Pima County ranks 3rd of all counties in land in agricultural use.

Cattle & Ranching:

Regardless of the current trend shown by these numbers, cattle ranching remains an important industry in the state and in Pima County. Market statistics for cattle place the industry's overall economic value in relation to the greater livestock industry, agriculture in general, and total state production. Of the total $680,517,000 of livestock sold in Arizona in 1997, all but 6.1 percent was related to cattle. Sale of fattened cattle accounted for $243,625,000; sale of calves and other cattle accounted for $112,966,000; and dairy products contributed another $282,415,000 for a total of $639,006,000 in the state's economy.

This represents an increase of 10.4 percent overall in value of livestock since 1992 then valued at $616,141,000 despite a decline in livestock numbers between the 1992 and 1997 census. Of the agricultural sector, cattle represent 35 percent of the state's total market value of agricultural products sold contributing just over $1.9 billion in 1997.

In Pima County, the total market value of agricultural products sold increased some 21 percent from $38,576,00 in 1992 to $46,861,000 in 1997. Crops sales accounted for $37,751,000, or about 80 percent of agricultural products, and livestock sales account for about 20 percent. Sale of fattened cattle accounted for $306,000, and sale of calves and other cattle accounted for $7,007,000. Statistics for dairy operations were not available; however, the cattle industry in Pima County accounted for at least $7,313,000 of agricultural sales. Of all livestock sales, including cattle, poultry, hogs, horses, and other animals in 1997, totaling some $9,111,000, cattle accounted for 80 percent of all livestock sold in Pima County.

The units of agricultural production, ranches and farms, are scattered across the state whose locations are generally the result of early homesteading and land claims made in the 1800s.

1997 Arizona Land Use

Total Acres = 26,866,722

Data gathered from the 1997 census of agriculture shown in Table 2 provides a view and some insights about how ranching is done and who is involved. Statewide, the 1997 USDA census reports there were 6135 farms in the state, of which 2881 reported having cattle. Over half this number or 58 percent, had less than 49 head of cattle each. These 1660 farms had a total of 27,011 head. This compares to the 937 intermediate sized farms having between 50 - 499 head each who managed 161,557 cattle, and the 284 largest farms with more than 500 head each who managed 633,705 cattle. Approximately 10 percent of Arizona's farms manage more than 77 percent of the total inventory of cattle in the state; however, this category includes feedlot operations and dairies, which handle thousands of animals within a year. The vast majority of farmers and ranchers who raise cattle, some 2597 farms, hold only a modest number of cattle, providing a modest income, and only a very few ranches depend exclusively on the cattle business for their entire annual income.

Table 2. Size and Number of Arizona Farms by Head of Cattle Managed

Size of Farm:	1-49 head	50-499 head	500+ head	TOTAL
Number of Farms:	1660	937	284	2881
Head of Cattle:	27,011	61,557	633,705	822,273
Avg. Cattle/Farm	16	172	2231	285

Statewide, the sales of cattle and calves for 1997 amounted to 688,560 head from 2639 farms, and the total value of these sales was $356,617,000. The majority, some 1764 farms, of those holding less than 49 head sold 24,797 head of cattle worth about $12,842,000. This averages about $7280 per farm. In comparison, the 163 largest farms with more than 500 head sold 557,593 cattle worth some $288,833,174. This averages to a gross of about $1,771,983 per large farm before expenses.

While this appears to be a large monetary return to a relatively small number of the very largest farms, this figure is distorted by feedlot operations, which fall into the large farm category but probably should be considered separately from farms or ranches. Feedlots operate differently from farms and ranches that raise cattle by aggregating and feeding many thousands of head of cattle in a given year before they are sold for slaughter. This distorts the inventory and sales number shown for large farms and ranches. Feedlot operations result in a very high number of cattle sold each year, boosting the overall average considerably higher than what might be expected for a cattle ranch that raises cattle. A large ranch with 500 head that raises cattle for sale is very different from a feedlot operation that might fatten and sell 50,000 head in a given year.

It should also be noted that the foregoing discussion did not consider the costs of running a ranch or farm. The numbers cited above are only gross returns for the sale of cattle and do not reflect the net return after the costs of running a ranch are considered. Statewide, the USDA reports for 1997 that out of $1.9 billion in the market value of agricultural products sold, total farm production expenses were nearly $1.5 billion, or nearly 78 percent of the gross sales, leaving a net return of $423,695,000 for all of the state's agricultural businesses. Property taxes accounted for $20,199,000 of expenses, or an average of nearly $3700 per farm.

In Pima County, USDA statistics indicate the total value of all agricultural sales in 1997 was about $46,861,000 and that total farm production expenses were $34,648,000, or nearly 74 percent of gross sales, leaving a net return of $12,464,000. Without going into considerable analysis, the net return to all 419 farms and ranches in Pima County is modest when operational costs are considered. When all farms and ranches in Pima County are considered, the USDA reports that $29,746 was the average net cash return in 1997 from agricultural sales for the average farm unit in Pima County. Property taxes paid in Pima County for farm and ranchlands totaled $1,258,000, or an average of approximately $3420 per farm.

When the cattle industry is examined further for Pima County, the USDA reports, as shown in Table 3, that there was a total of 166 farms or ranches that had cattle, with a total inventory of about 39,000 head. In 1997, sales of all livestock totaled $9,111,000, and the total value of sales of cattle and calves was $7,007,000. The number of cattle and calves sold amounted to 17,504 head. As with the state trend, the majority of ranchers, numbering 103, of those holding less than 49 head sold 2021 cattle worth about $809,000. The average return to each farm is about $7855, which is very close to the state return for this size farm. Large farms in Pima County with more than 500 head numbered only 11, and these farms sold some 9233 head of cattle for an approximate value of $3,696,000.

Table 3. Size and Number of Pima County Farms by Cattle Sold

Size of Farm:	1-49 head	50-499 head	500+ head	TOTAL
Number of Farms:	103	52	11	166
Cattle Sold:	2021	6250	9233	17,504
Value: Cattle Sold	$809,000	$2,502,000	$3,696,000	$7,007,000
Average Gross:	$7855	$48,115	$336,000	$42,210

Table 4 shows that out of the Pima County total of 419 farms and ranches, the majority of 311 farms had sales in the range of less than $2500 to $24,999; 51 farms had sales of $25,000 to $99,999; and 57 farms had sales of $100,000 or more. It must be remembered that, unlike Maricopa County and other counties in the state with very large feedlot and dairy operations, Pima County currently has no feedlots or meat processing plants that would boost the inventory and sales value numbers overall. The sales and average net returns therefore are a more accurate reflection of Pima County ranchers who are involved in raising cattle on open rangelands.

Table 4 . Number of Pima County Farms and Sales of Products

Size of Sales:	0-$24,999	$25,000-$99,999	$100,000 +
No. of Farms:	311	51	57

This brief state and county analysis is provided to illustrate the different ways that cattle ranching contributes to the state's economy and the local economy. For most of the people involved in cattle ranching, the sales of cattle represent a fairly modest income and perhaps only a supplement to other income. The typical ranch is a small operation. Statewide, of the

6135 farms and ranches, about 68 percent, or 4178 farms, are individually held or family owned and operated. Of these, 2881 reported having cattle, and 2068, or nearly 72 percent, were individually or family owned. The balance were either considered a partnership or owned by a corporation that can be either family-held or held by others. Statewide, the greatest sales of cattle can be attributed to family-held corporate ranches accounting for $236,834,000 or 66 percent of all sales. When individual and family owned ranches are added, family ranching operations account for some 80 percent of cattle sales in the state.

In Pima County, this trend is similarly evident. Out of 419 farms and ranches in 1997, the majority, 294 farms, or 70 percent, were individually or family owned, 54 were owned by a partnership, 38 were held by a family corporation, 9 were owned by others in a corporation, and 24 were owned by a cooperative, trust, estate, or institution. Of the 2,913,607 acres of farm and ranchland in Pima County inventoried in 1997, the USDA reports only 367,849 acres, or 13 percent, were owned or in the tenure of individuals and families. While this acreage number initially appears to significantly depart from the state trend of family owned farms and ranches, the amount of farm land held by the Tohono O'odham Nation as an institution greatly distorts this first view. When the area of the reservation is subtracted from this total, approximately 85 percent of agricultural lands were owned or managed by an individual or family, family corporation or family partnership.

Looking at the number of Pima County farms and ranches by size or numbers of acres is also consistent with the predominance of family ownership. In 1997, the average farm size is indicated at 6954 acres; however, this again is skewed by the large Tohono O'odham reservation. When this is considered, the median size of only 20 acres gives a better indication of the relatively small size of Pima County farms. Further examination of 1997 USDA statistics as shown in Table 5 indicates that 162 farms or nearly 39 percent of all farms had between 1-9 acres; 137 farms or 33 percent, had between 10-179 acres; 28 farms or 7 percent had between 180-499 acres; 19 farms or 4 percent, had between 500-999 acres; and 73, or 17 percent including the Tohono O'odham reservation, had more than 1000 acres. Figure 4, a profile of the state's agricultural sector in 1997, is included to illustrate some of the foregoing discussion.

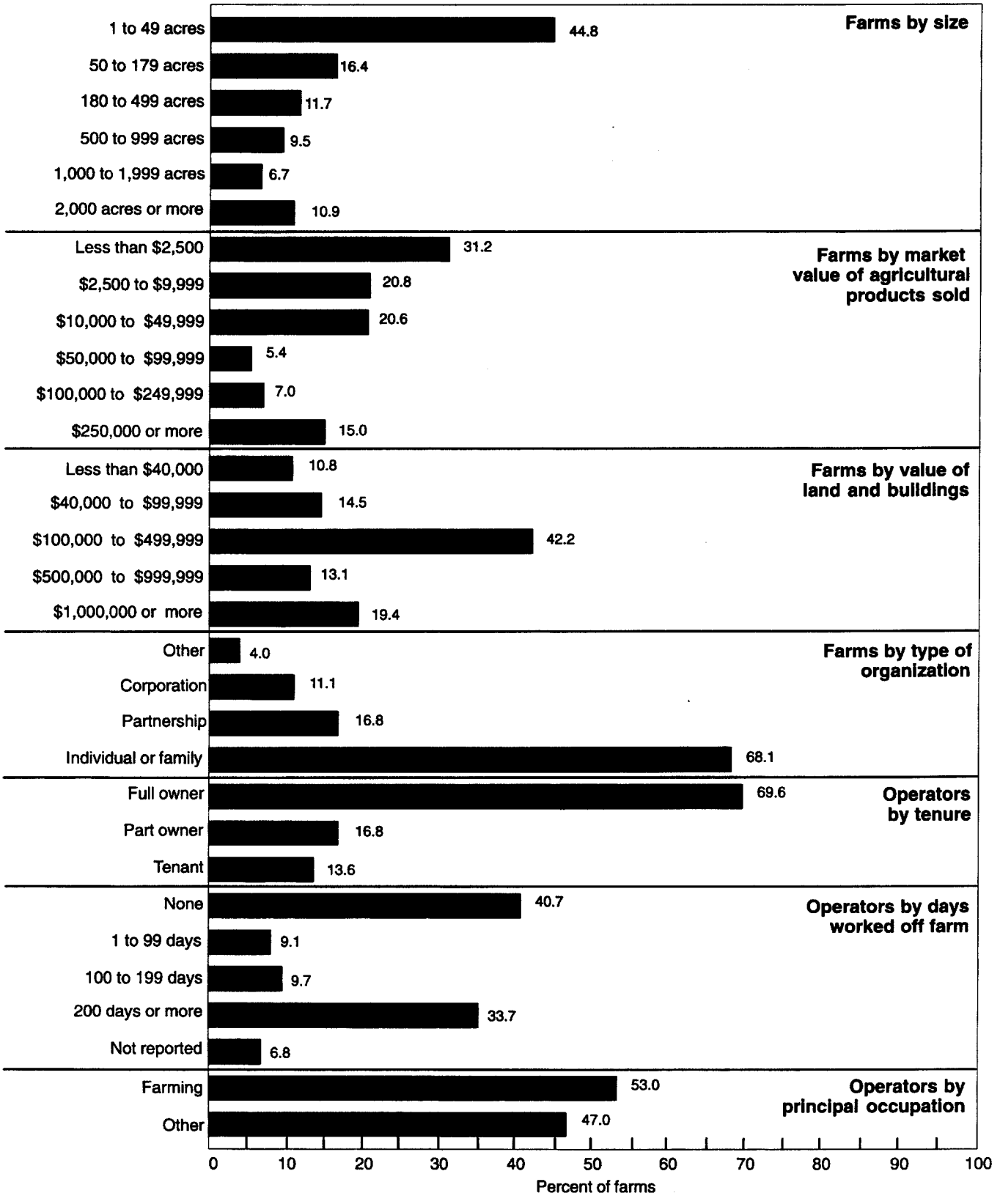
Table 5 . Size and Number of Pima County Farms by Acres

Size of Farm:	1-9 acres	10-179 acres	180-499 acres	500-999 acres	1000+acres
No. of Farms:	162	137	28	19	73

We can also examine the distribution of ranches and cattle operations throughout the state to evaluate the role of Pima County's ranching and agricultural industry in the context of the state industry. Of the 15 Arizona counties, Pima County ranks 3rd in 2,913,607 acres dedicated to agricultural uses. This represents 50 percent of the entire Pima County land base.

Figure 5 illustrates the relative ranking of land by county. Moreover, when the market value of agricultural products sold in the state is considered, some $1.9 billion state-wide, Pima County ranks 7th but still in the second highest tier of productivity as shown in Figure 6.

1997 Profile of Arizona's Agriculture



1997 CENSUS OF AGRICULTURE

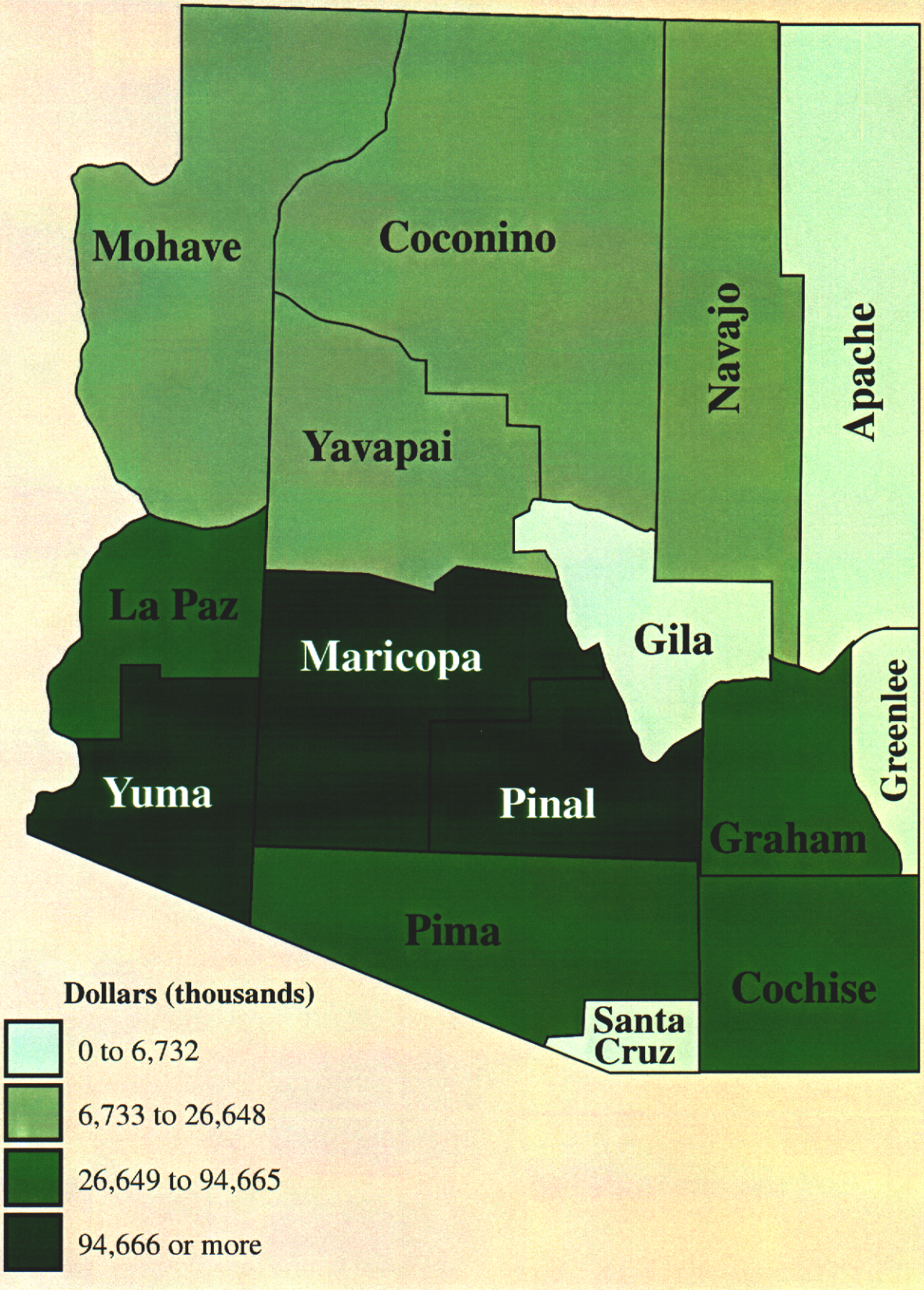
Figure 4

1997 Arizona Land in Farms by County

1997 Census of Agriculture

Figure 5

1997 Market Value of Products Sold by County



1997 Census of Agriculture

Figure 6

Outstripped by irrigated crop production and feedlot and dairy operations in Maricopa, Yuma, and Pinal counties, Pima County accounted for some $46,861,000 in the market value of agricultural products sold. And when the cattle industry is considered, Pima County ranks 6th out of the 15 counties for the total inventory of cattle and calves in Arizona in 1997. As with the market value of agricultural products sold, Maricopa and Pinal counties have significantly higher inventories of cattle compared to other counties due to the availability of water for irrigated lands for pasture, hay and grain production, livestock feedlots, and the higher number of dairy operations. Similarly, when the number of cattle ranches, some 2881 state-wide, are considered, Pima County again ranks 6th in the state with 166, with Maricopa County again taking the lead with 487 ranches and farms.

If USDA data are consulted to examine past years, it becomes apparent that Maricopa County once contained the largest portion of ranches and land in agricultural production, but now ranks 9th in total land in production. With the tremendous urban expansion of the Phoenix metropolitan area, land once used for crop production and for cattle ranching has increasingly changed to urban uses. While similar in overall size to Pima County, Maricopa County uses only 12 percent of its land base for agricultural purposes compared to 50 percent in Pima County. The difference is water, which allows the intensification of agricultural production.

Despite this urbanization, Maricopa County still remains important to the agricultural industry, but this is significantly attributed to more intensive use rather than extensive use of the available land for agricultural production. Population growth, urbanization, and sufficient water to accommodate urban expansion will continue to reduce land available for agriculture and will continue to threaten the agricultural industry in Maricopa County.

In contrast to the decline of agricultural and ranching properties in Maricopa County and state-wide, ranching in the southeastern portion of the state has remained comparatively stable from 1992 to 1997, with the smallest declines in the number of farms and ranches in Cochise County, followed by Santa Cruz, Pima, and Greenlee counties. Only Gila County showed a slight increase in the number of farms and ranches.

Croplands:

It has been noted earlier that well-watered areas of the state are able to support greater intensities of agricultural activities, and certainly croplands and irrigated lands illustrate this point clearly. Throughout Arizona, croplands in 1997 accounted for 1,277,169 acres, down some 5 percent from 1,344,091 acres in 1992. Irrigated lands, however, increased 6 percent statewide from 956,454 acres to 1,013,902 acres, reflecting an overall loss of lands in production but greater intensification of use. As might be expected, Maricopa County ranked first in croplands with 340,563 acres in production and first in irrigated lands with 287,636 acres in cultivation, followed by Pinal, Yuma, and La Paz counties. All four counties showed increases in land in irrigation.

In comparison, Pima County had about one-tenth the cropland of Maricopa County with 36,043 acres in 1992 and approximately 26,233 acres in 1999. This represents a 27 percent decline over seven years. Even more dramatic, however, is the decline of irrigated croplands

that were under cultivation from the 1930s to the 1980s. Figure 7 indicates locations where there were once about 87,835 acres in cultivation over the past 50 years. This has dwindled to 29,497 acres in 1997 and to only 26,233 acres in 1999, a decline of nearly 70 percent! This decline can be largely attributed to the City of Tucson purchase of more than 22,000 acres of irrigated farmland for water rights in the Avra Valley that began in the 1970s. This cumulative decline in Pima County's farm land is substantial, and may be attributed to significant urban growth in the Tucson metropolitan area. Figure 8 shows lands currently in irrigation in 1999. The total value of crops sold in Pima County in 1997 was $37,751,000. As with land, this is approximately one-tenth the value of crop sales in Maricopa County.

Farm & Ranch Land Values:

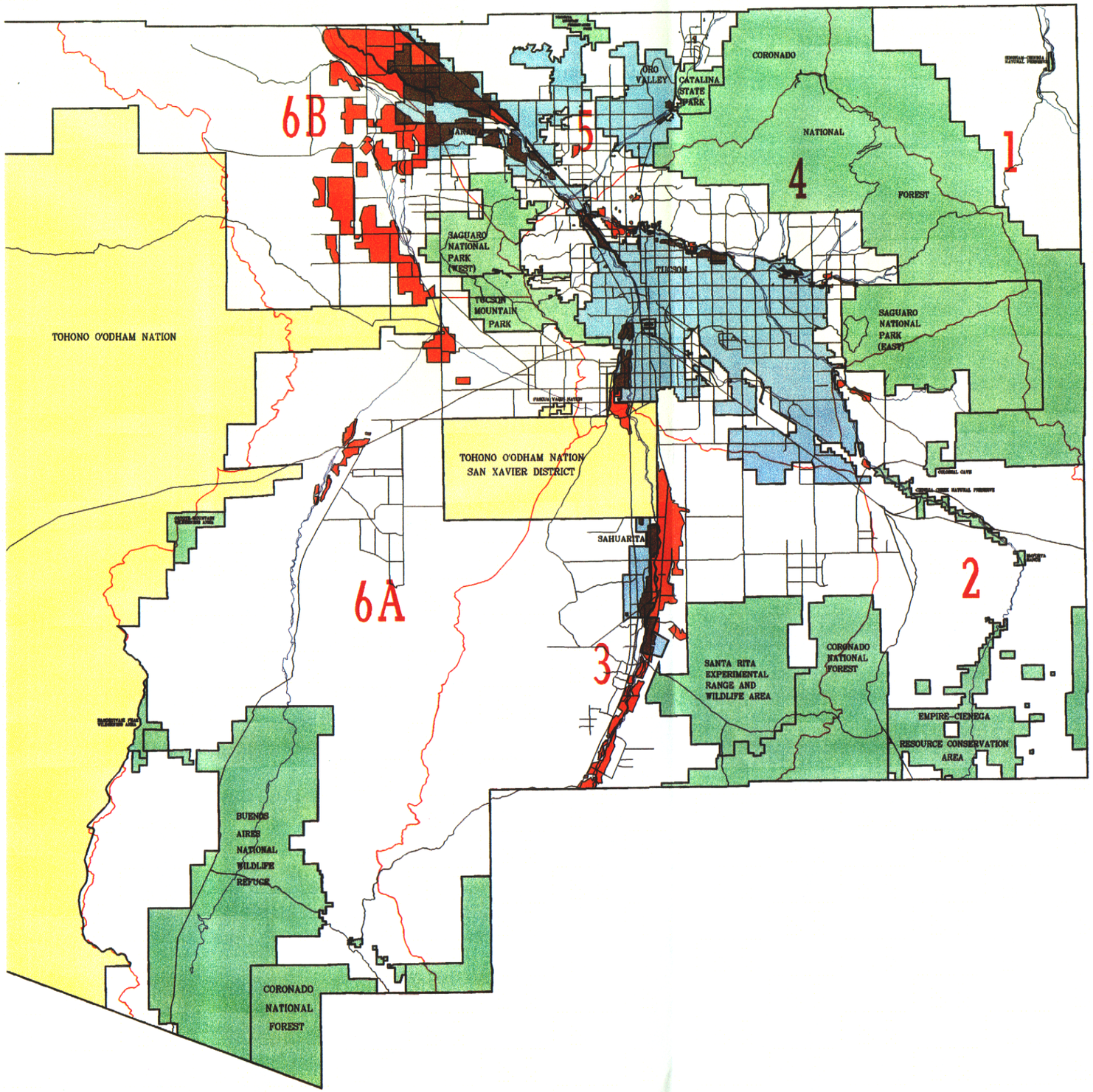
Another means of comparing Pima County farms and ranches to other counties throughout the state is the value of land and improvements used for agriculture and how this value has changed over the last five years. It is important to note that land values have increased at a higher rate than other measures of the agricultural industry. If statewide historical data are reviewed over the last 33 years from 1964 to 1997, there has been a 632 percent increase in the market value of land and buildings for all farms and ranches, averaging $53 per acre in 1964 to $388 per acre in 1997. When compared to the total market value of agricultural products sold during the same 33 year period, there has been only a 329 percent increase in the value of agricultural products sold. This differential when viewed in the context of increasing costs of production, lower net return, and increasing demand for land for urban expansion provides substantial insight into the conversion of agricultural lands to real estate.

Similar historical data are not readily available for Pima County; however, just in the five years between 1992 and 1997, land values have more than doubled from $161 per acre in 1992 to $340 per acre in 1997, an increase of 111 percent. The total market value of all agricultural products sold in Pima County also increased from $38,576,000 in 1992 to $46,861,00 in 1997, but this represents only a 21 percent increase. This growing differential in land and production values is really the key to the conversion of ranchlands to real estate. Land once valued for its productivity, which actually is increasing, is more and more being valued for its development potential. Table 6 compares the change in numbers of farms and ranches and land values in Arizona and southern Arizona counties between 1992 and 1997. Pima, Cochise and Graham counties approximated the state-wide average value of agricultural lands. While other counties showed increases in land value, Greenlee and Pima counties far exceeded the percent increase in land value for any of the other counties.

Table 6 . Comparison of Southern Arizona Farms & Land Values per Acre 1992-1997

State-County:	Arizona	Pima	Cochise	Graham	Greenlee	Pinal	Sa.Cruz	Maricopa	Yuma
1997 Farms:	6135	419	824	281	99	541	156	1643	465
1992 Farms:	6773	448	831	317	107	611	164	1856	528
1997 Value/ac.	$ 388	340	348	377	749	760	838	2944	4496
1992 Value/ac.	$ 316	161	318	247	322	977	743	2809	4349
Percent Change:									
Farms:	-9%	-6%	-1%	-11%	-7%	-11%	-5%	-11%	-12%
Value/ac.	+23%	+111%	+9%	+52%	+133%	-22%	+13%	+5%	+33%

Historically Irrigated Agricultural Land from 1930's to Present



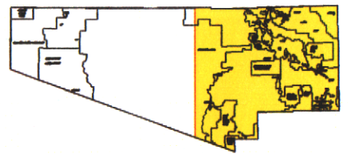
- Irrigated Agricultural Lands (87,835ac)
- State Parks,Monuments,Forest,and Conservation Areas
- Tribal Lands
- Incorporated Cities
- Administrative Boundaries
- Major Streets
- Major Washes
- Planning Unit Boundaries

Planning Units

1. Middle San Pedro (174,314 ac.)
2. Cienega-Rincon (318,535 ac.)
3. Upper Santa Cruz (449,684 ac.)
4. Middle Santa Cruz (361,851 ac.)
5. Tortolita Fan (203,546 ac.)
6. Avra-Altar
   A. Altar valley (713,807 ac.)
   B. Avra Valley (221,404 ac.)
7. Tohono O'odham (2,354,910 ac.)
8. Western Pima County (1,082,281 ac.)

Figure 7

Pima County Index Map



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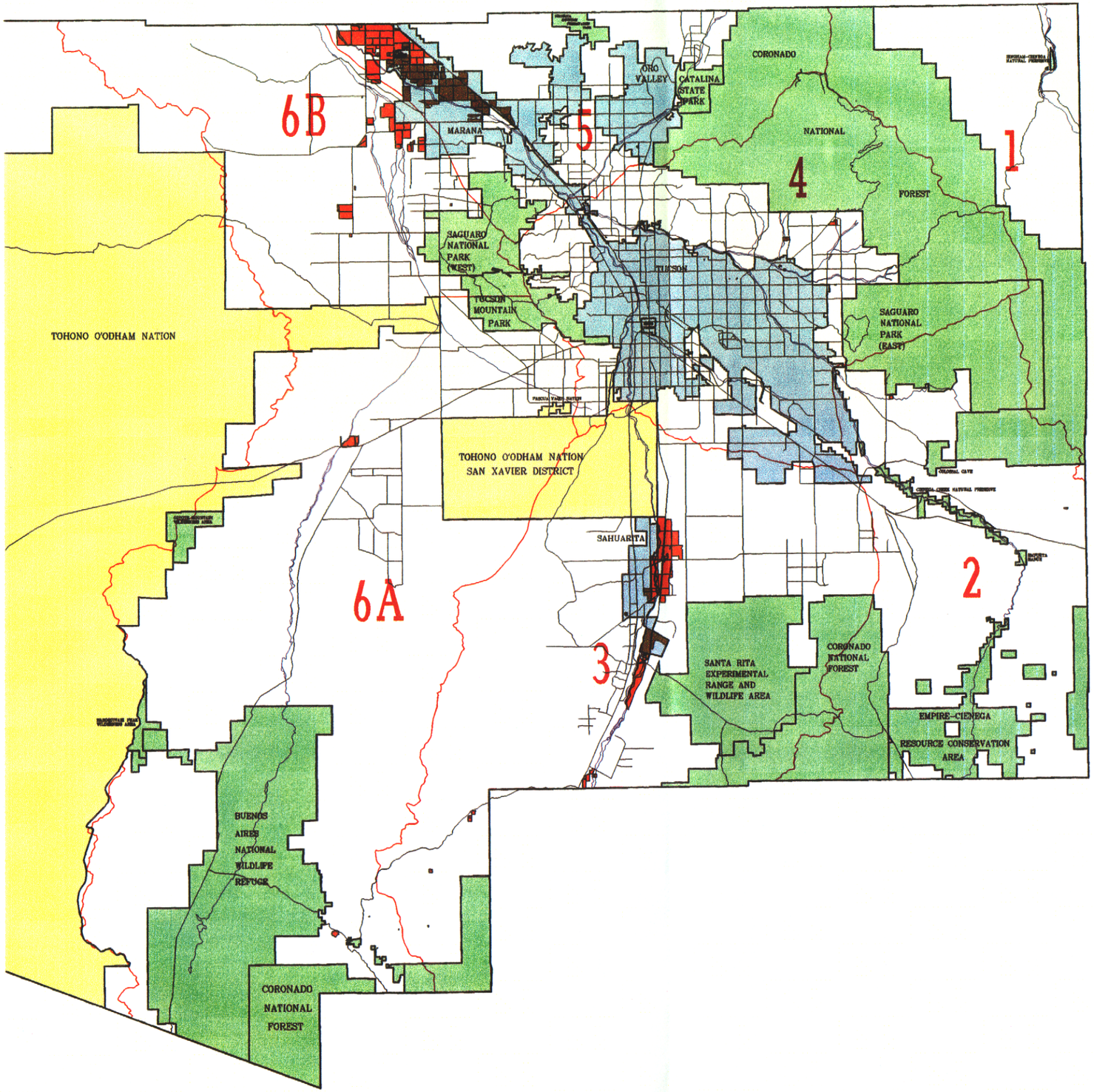
/daffy/markp/sonora/lindam/ag/irrig_all.aml

Plotted: 11/08/99

Irrigated Agricultural Land from 1999 Sources



- Irrigated Agricultural Lands (26,233ac)
- State Parks,Monuments,Forest,and Conservation Areas
- Tribal Lands
- Incorporated Cities
- Administrative Boundaries
- Major Streets
- Major Washes
- Planning Unit Boundaries

Planning Units

1. Middle San Pedro (174,314 ac.)
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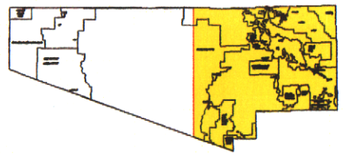
Figure 8

Pima County Index Map



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/daffy/markp/sonora/lindam/ag/irrig_99.aml

Plotted: 11/08/99

Elsewhere in Arizona, the market value of agricultural products sold also rose proportionately, but the increase in the value of agricultural land rose most dramatically in Greenlee and Pima counties. Land values were relatively stable in Maricopa and Yuma counties, and some counties like Pinal actually experienced declines. The remaining counties experienced more moderate increases in value.

Summary:

This broad overview of cattle ranching in Arizona and Pima County provides us with a number of general observations:

- As a state industry, cattle ranching has been historically important and remains an important source of wealth for the state.
- Statewide, much of that wealth is produced by relatively large ranches, including feedlot operations and dairies, owned and controlled by family groups rather than outside corporations.
- Farm production expenses tend to be more than 70 percent of gross market value of agricultural products sold.
- In Pima County, many ranches are relatively small operations and probably only produce supplementary income for their owners, with an average net cash return of $29,746.
- Where the pressure of growth and rapid urban expansion is taking place, the number of ranches and farms are in decline.
- While cattle ranching is generally an extensive use of the land, requiring many acres to support a single cow, the availability of water and irrigated hay and feed production allows more intensive use of the land, where numerous cattle can be supported on a small acreage.
- Water also allows rapid urban expansion to support high human populations and accelerates the conversion of ranchlands to real estate.
- While experiencing some declines, the number of ranches in Pima County outside the Tucson metropolitan area and in southeastern Arizona have remained relatively stable.
- The total market value of agricultural products sold in Pima County increased by 21 percent from $33,163,000 in 1992 to $46,861,000 in 1997.
- The market value of farm and ranch lands increased in Pima County at a far greater rate of 111 percent compared to the increase in value of agricultural products sold.
- The rate of increase in agricultural land value in the Tucson metropolitan area is probably much greater than the countywide average of 111 percent, and is a significant cause of the transition of ranchlands to real estate.

I-3. Growth in Eastern Pima County

To explore further the threats to ranching and ranchlands, it is helpful to first review what has been published previously regarding growth and the potential for growth in Pima County. The following section is summarized and portions excerpted from the draft Sonoran Desert Conservation Plan Concept Report dated October 21, 1998. Eastern Pima County and the Tucson area have been one of the fastest growing regions in the United States over the last three decades and will remain a fast growing metropolitan region. The combination of climate, natural beauty, and economic opportunity has contributed to past sustained population growth. Table 7 shows population statistics for Tucson, Pima County, and Arizona from 1950.

Table 7. Population Statistics for Tucson, Pima County, and Arizona

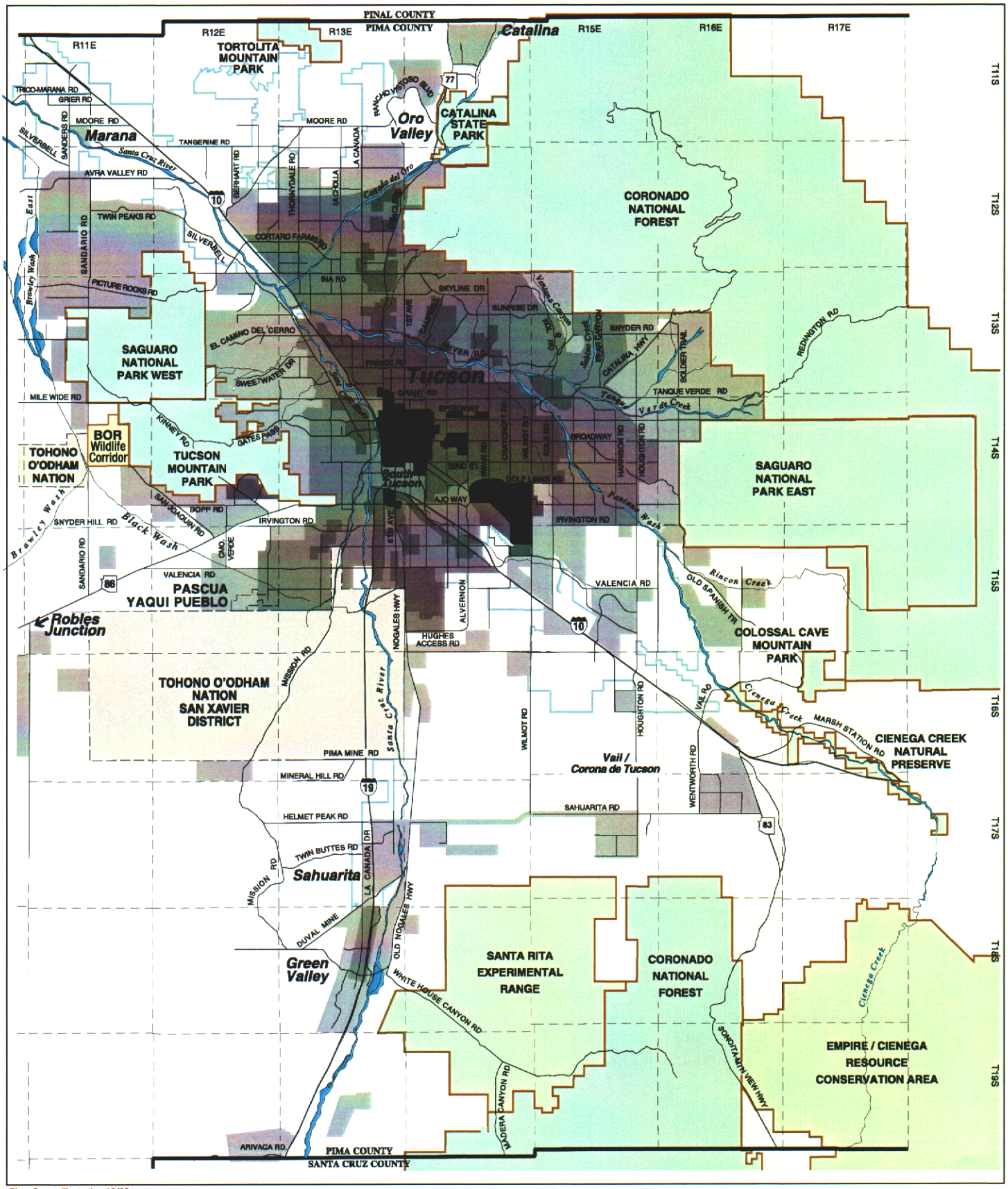
Year	City of Tucson	Pima County	State/Arizona	Pima Co. as Percent
1997 Estimate	455,085	799,375	4,595,375	17.4
1990 Census	405,390	666,880	3,665,228	18.2
1980 Census	330,537	531,443	2,718,425	19.6
1970 Census	262,933	351,443	1,775,399	14.8
1960 Census	212,892	265,660	1,302,161	20.4
1950 Census	45,454	141,216	749,587	18.8

Population growth has urbanized most, if not all of the original Tucson Valley, bounded on the north by the Santa Catalina Mountains, on the east by the Rincon Mountains, and on the west by the Tucson Mountains. Figure 9 graphically depicts the urban expansion of metropolitan Tucson from 1940 to the present. Urban growth has consumed significant land areas in the past and will continue to do so in the future.

Future population projections indicate that most urban growth will occur in the undeveloped areas of the county rather than through the redevelopment of existing urban areas or substantial infill development. Table 8 lists past population growth and projected future growth in all of Pima County that includes the City of Tucson and unincorporated Pima County. Continued population growth will occur in Pima County, generally in undeveloped or under-developed areas.

Table 8. Past and Projected Future Growth by Location

Year	Pima County	City of Tucson	Unincorporated Area	Unincorporated %
1960	265,660	212,892	45,764	17.2
1970	351,667	262,933	82,514	23.5
1980	536,100	330,537	193,230	36.0
1990	666,800	405,390	247,540	37.1
2000	854,329	474,467	328,192	38.4
2020	1,206,224	589,899	462,689	38.4



Pima County Illustration 10/98

Urban Expansion in the Metropolitan Tucson Area

1940 1960 1985 1990

Figure 9

Regardless of the shift in population between cities and towns and the unincorporated area, Pima County will play a major role in implementing regional conservation measures, implementation of which, will encourage infill development in incorporated areas where infrastructure currently exists, curtail sprawl, and provide more balance to where growth is distributed.

Given population growth identified above, the number of housing units to accommodate this population growth will also increase and add to urban expansion, which will include both housing and commercial centers. Development patterns in Pima County have been classified at the low end of typical urban densities. For example, population density has declined over the last few decades from approximately 5200 persons per square mile in 1953 to 2400 persons per square mile today. Given this trend and the market desirability of low density urban development, it is likely that large land areas will be consumed by increasing population expansion and urbanization.

The current regional population of approximately 790,000 people is located in about 342,000 housing units. Since 1990, the region grew by approximately 121,500 new residents and 44,000 new housing units. This translates into approximately 17,000 new residents each year, and approximately 7000 new housing units annually.

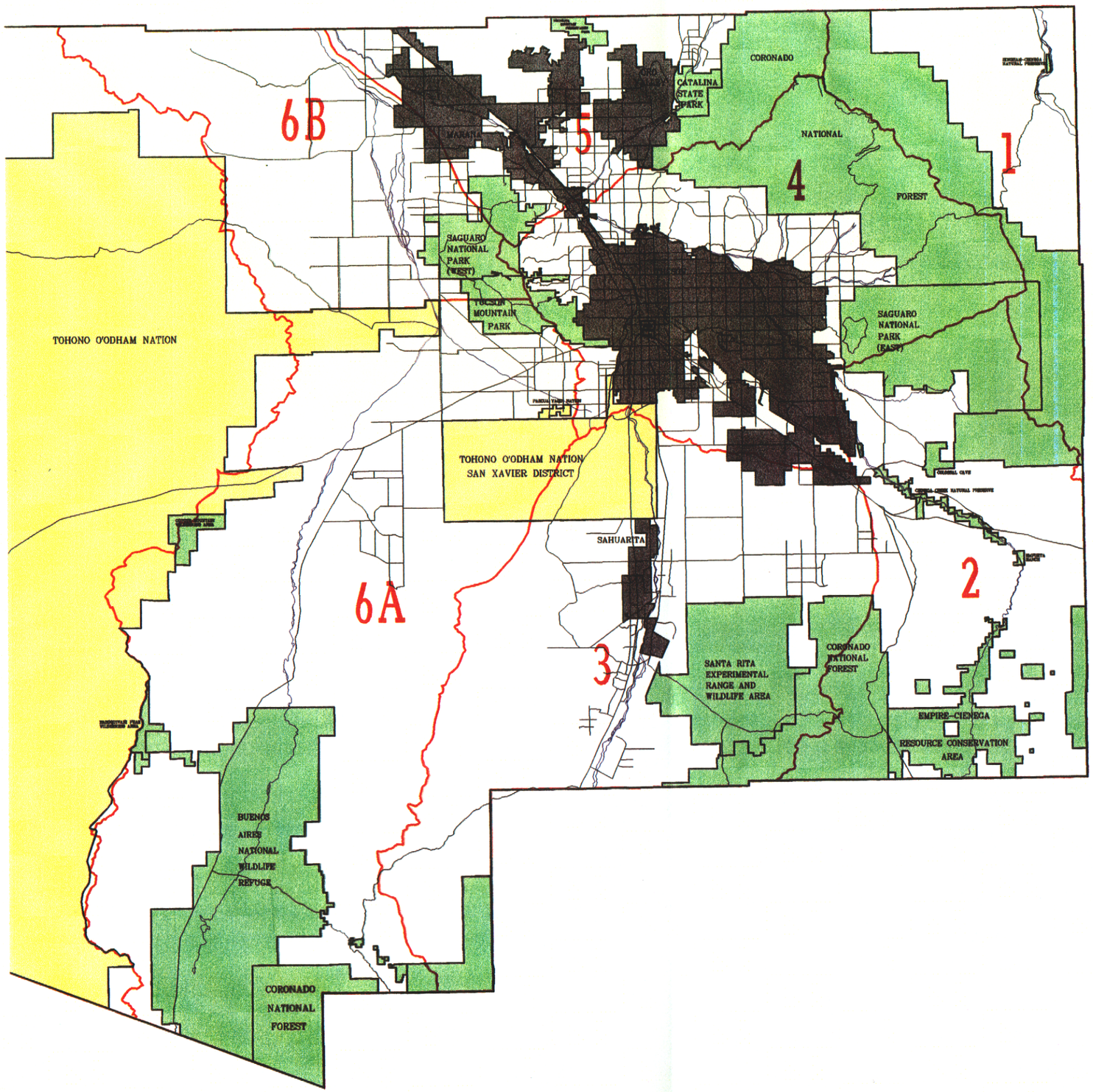
Given continuing low urban density and considering streets and other support services, 7000 new residential units per year will consume approximately 7.2 square miles or 4608 acres per year. Another graphic way to consider urban growth in the metropolitan Tucson area is that **every day nearly 13 acres are consumed for development, at the rate of 0.5 acre every hour.**

If present low residential density trends continue, approximate 160 square miles of urban area and 180,000 new housing units will be needed to accommodate this population growth by 2020. This area is equal to the approximate same size of the current corporate boundaries of the City of Tucson, resulting in an urban core that is twice the size of the incorporated area of Tucson today.

I-4. Ownership of Land in Eastern Pima County

During this period of population expansion, specific lands were set aside by Federal, State, and local governments for resource conservation, open space, and natural park preservation. Figure 10 indicates the historical development of significant land reservations in eastern Pima County, beginning in 1872 and continuing to the present. These past reservations established a framework for future land preservation and structured where urban development would occur in the Tucson Basin.

In western states with large national forests, Indian and military reservations, national monuments and parks, and other Federal ownership, concern has been expressed over continued governmental acquisition of private lands. In Pima County, Federal, State, and local governments own significant amounts of land. Table 9 lists land area ownership for all of Pima County and for eastern Pima County, which is defined as all lands east of the Tohono O'odham Nation. For comparison with Pima County, a similar breakdown of ownership is provided for Maricopa County and the State of Arizona.



Land Reservations In Eastern Pima County

- State Parks,Monuments,Forest,and Conservation Areas
- Tribal Lands
- Incorporated Cities
- Administrative Boundaries
- Major Streets
- Major Washes
- Planning Unit Boundaries

Planning Units

1. Middle San Pedro (174,314 ac.)
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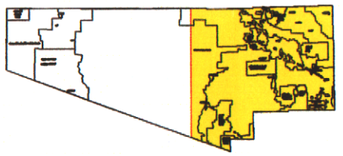
Figure 10

Pima County Index Map



Index Map Scale 1:1,500,000

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/daffy/markp/sonora/lindam/ag/land_res.aml Plotted: 11/12/99

The statistics in Table 9 suggest that governments own a majority of the land in Pima County, as well as in eastern Pima County. However, State Trust lands are held in trust for specific public institutional beneficiaries, and because of the mandate of the State Land Department to maximize revenue for its beneficiaries, State Trust lands can be sold or leased for private commercial and residential development. Some State Trust land in eastern Pima County will eventually be sold or leased for private development, but other State Trust lands should be preserved and protected to preserve natural open space and allow traditional uses of the land. Much of that land is currently used as ranchlands.

Table 9. Comparison of Land Ownership

	Eastern Pima Co.		All of Pima County		Maricopa County		State/Arizona	
	%	Sq. Mi.	%	Sq. Mi.	%	Sq. Mi.	%	Sq. Mi.
Federal	27	1103	29	2661	53	4924	41	47,571
Tribal	9	336	42	3868	5	422	28	31,404
State	33	1280	15	1383	13	1202	13	14,958
Private	31	1214	14	1271	29	2668	18	20,015
TOTAL		3933		9183		9216		113,948

Arguments have been made in the past that governmental action to conserve lands only decreases the amount of taxable private land, and that these conservation efforts should be avoided when only 18 percent of the land in Arizona is private. However, the table shows that in eastern Pima County, where 64 percent of the land is either developable private or State Trust Land, significant conservation measures can be taken without affecting the tax base. In eastern Pima County, where nearly two-thirds (64 percent) of the land or nearly 1.6 million acres of lands could be developed in the future, conservation efforts are needed now.

Because 33 percent of the land area in eastern Pima County is State Trust Land, it is obvious that the State, through the State Land Department, will play a major role in any future urban growth of Pima County. The State will also be instrumental in assisting with the preservation and protection of lands threatened by urbanization that are of significant environmental, cultural, or historic value. Numerous planning efforts over the years have indicated the importance of State Trust lands in open space planning. Pima County's first open space bond issue focused primarily on the acquisition of private and State Trust lands in what was then known as Rancho Romero, which created Catalina State Park. In the 1986 bond issue, funding was provided to acquire State lands surrounding Colossal Cave Mountain Park.

Although passed by voters in 1998, "Growing Smarter," or Proposition 303, has not yet been implemented. This proposition will provide approximately $220 million to purchase State lands that are threatened by urbanization and contain significant or unique environmental, cultural or historic resources. This plan will help identify those State lands in eastern Pima County that could be preserved and identify the County's priorities for State land protection. Because acquisition and conservation of State lands through Growing Smarter and other conservation strategies will take many years to implement, conservation compatible land uses that include sustainable ranching and grazing should be promoted on these State lands.

I-5. Urbanization and the Transition of Ranch Lands to Real Estate

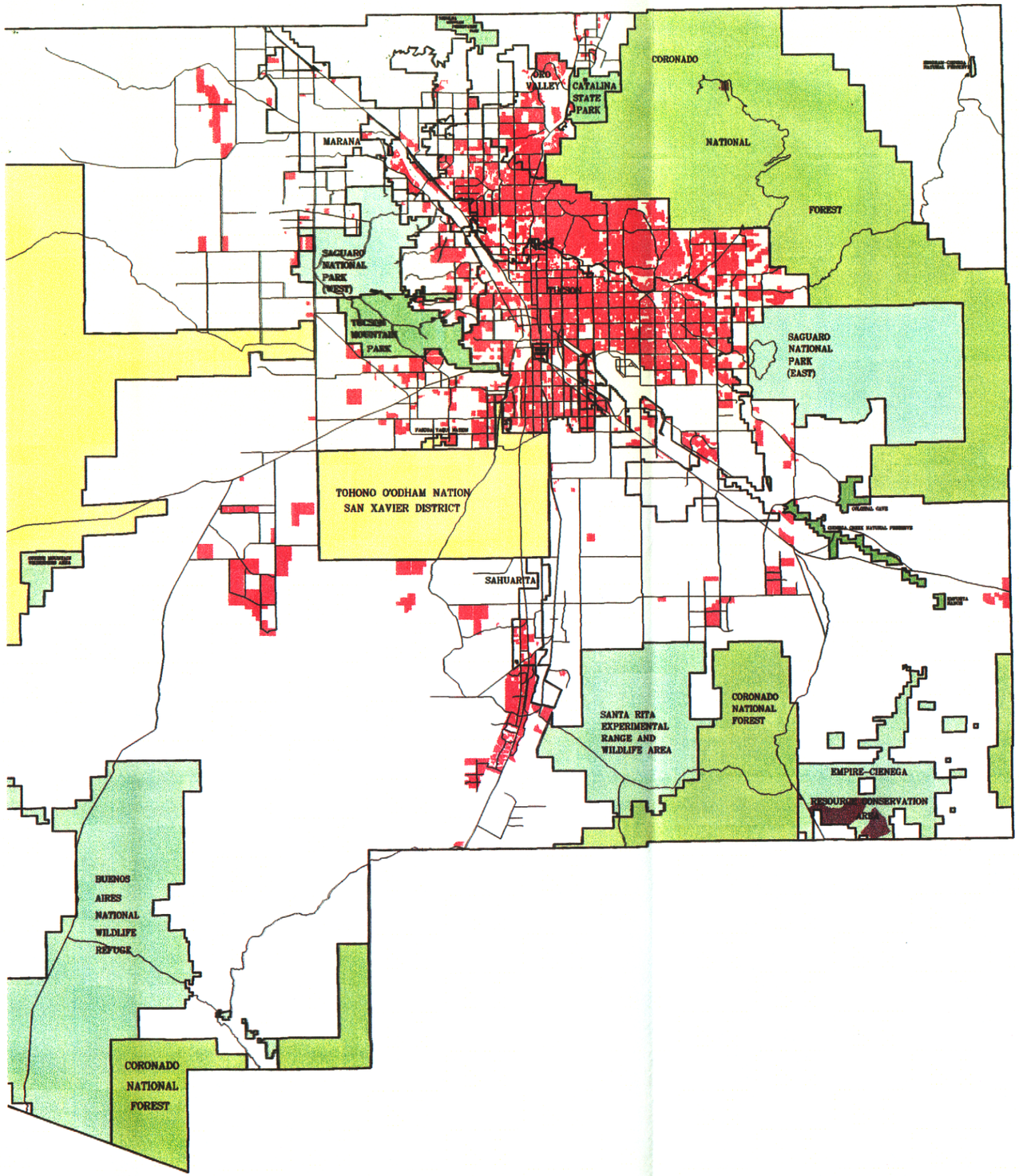
As will be discussed later in the section describing the history of ranching, the transition of ranchlands to real estate began in the period following World War II with the start of phenomenal population growth in Arizona, particularly in the Phoenix and Tucson areas. In 1972, the Arizona *Daily Star* noted that Arizona's population grew almost 74 percent from 1950 to 1960, and another 36 percent during the 1960s. Nearly 75 percent lived in the Phoenix or Tucson metropolitan areas. Between 1970 -1997, the *Daily Star* reported in 1998 that the state population increased by an additional 257 percent, and again nearly 77 percent of the population live in the Phoenix and Tucson areas.

This population boom began the transformation of the state's economy from a rural extractive base derived from cattle, cotton, and copper to an urban commercial economy. With the effective marketing of Arizona's climate and cheap land, people flooded to Arizona beginning in the 1950s with new hopes and new capital, and the real estate market and development exploded. Land now became valued, not for its natural productivity that might support ranching or farming, but for its higher value potential for development for residential or commercial uses. Furthermore, because land tends to be "cheaper at the edge," developers have sought to buy former ranchlands at the outer limits of the built metropolitan area and have created new subdivisions and even new communities, following real and created market demand for "new" rather than "used" housing. Thematic development has focused on different kinds of living experiences such as retirement communities, golf resorts, exclusive gated access communities, equestrian facilities, and "ranchettes." Ironically even new communities, touted to espouse the "new urbanism" ethic, have also been built on the edge to take advantage of "raw" and cheaper land. Rather than attempt reinvestment and redevelopment of the urban core, the development industry has taken the lower risk, lower cost strategy of suburban and exurban investment, uniform product development, and long-term land speculation. Consequently, the Tucson metropolitan area has experienced rapid expansion of its suburban areas pushing its urban limits ever outward.

Regulated and Unregulated Development:

Much of this suburban growth to accommodate the huge influx of population in the period from about 1960 to the 1990s has been in the form of regulated or platted subdivisions as shown in Figure 11. To date, there are 4742 legal subdivisions in eastern Pima County, which accounts for 160,844 acres of development.

The rezoning and subdivision platting processes are typically the means used to review new development projects, and this regulated process allows all affected parties to examine the impact of the proposed development through a public hearing process. It also allows the local government to ensure that adopted code requirements are met and the impact of the development is mitigated to the extent allowed. The regulated development also protects the consumer or buying public by ensuring that facilities exist to serve the new development including adequate and safe water, wastewater facilities, legal road access and capacity, flood control, utilities, schools, and that other zoning and safety standards are met. The responsibility and expense of planning, design and engineering, and actual construction of these improvements are costs initially paid for by the developer, not the county.



Regulated Subdivisions in Eastern Pima County

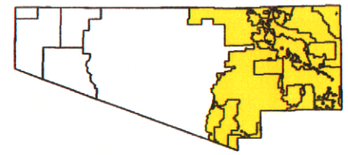
Platted Subdivisions

Major Streets

Administrative Boundaries

Figure 11

Pima County Index Map



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/pygmyowl1/projects/mayro/archaeology/urban_1.aml Plotted: 11/09/99

Most development corporations active in the Tucson area tend to nearly always follow the regulated zoning and subdivision platting process to ensure the value of their product and to give the public and the buyers of these homes important assurances that their development has met a variety of environmental and regulatory standards. Moreover the new home buyers can expect that their homes and neighborhood will hold their value, having been designed and built to certain standards that will be maintained. For example, public roads within a regulated subdivision must be first built by the developer to county standards and then deeded to Pima County. It is only when the county actually owns the road right-of-way that the county can take responsibility to maintain it. Private roads are not the responsibility of the county or any local government to maintain.

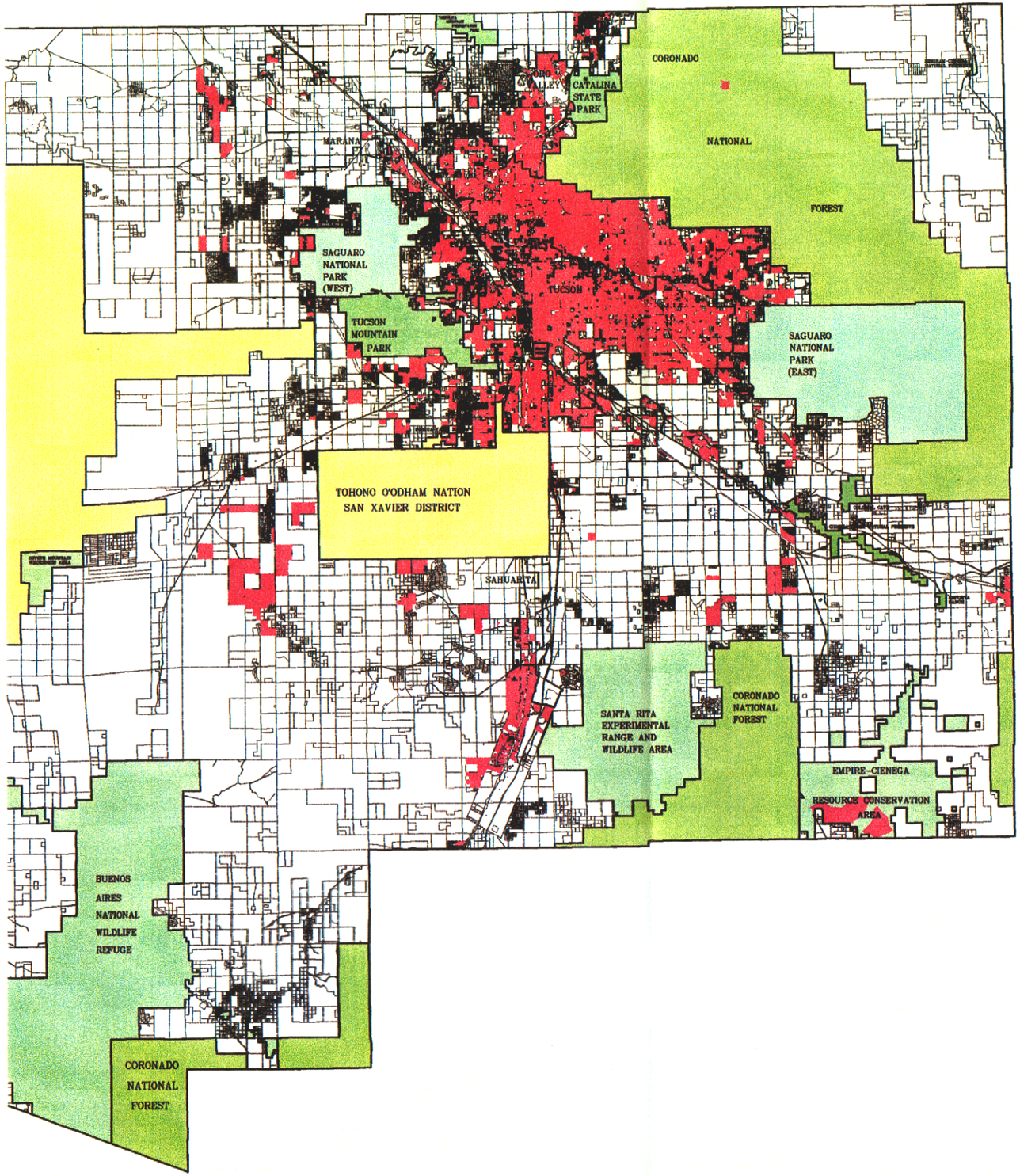
In contrast to regulated development, unregulated development or wildcat subdivision is unfortunately becoming more common in the areas outside the metropolitan area. This further contributes to sprawl, often devalues property, and can create significant hardships and sometimes real hazards for its residents. This kind of development is generally defined as the proliferation of new residential parcels without the benefit of subdivision regulation, which ensures certain standards are met. Unlike regulated development, wildcat areas are often devoid of any basic infrastructure or improvements typically paid for by the developer.

Despite its negative implications, wildcat subdivision, or lot splitting, is allowed by State law, which maintains that a minor parcel division of less than six splits is not considered to be a "subdivision," and it prevents the county from denying approval or requiring a public hearing. What is often not realized is that lot splitting can proliferate into many more "splits" of the same parcel. For example, if a property owner of 100 acres were to first lot split his parcel into five 20 acre parcels, each of the five subsequent owners would also have the right to lot split their 20 acre parcels again five times, so that now there are 25 property owners of four acres each. Depending on the minimum zoning, which could be as small as one acre per house, these four acre parcels could be again split, perhaps resulting in a "wildcat" subdivision of as many as 80-100 parcels and perhaps 200 or more residents, all without basic improvements. Moreover, there is little legal recourse for homeowners who experience access and site deficiencies.

Where regulated subdivisions require the developer to provide basic improvements like paved roads, adequate and safe water, drainage and flood control, utilities, and wastewater facilities, these are essentially absent in wildcat subdivisions. Frequently the residents of these areas are not aware that these have not been provided by the seller or developer and often expect that the county should provide these same services that regulated areas enjoy. To do so, significant investments in these improvements must be made, and if done, it is as the expense of every other taxpayer in Pima County.

Unfortunately, there is a growing trend for some private ranchlands and other rural holdings in Pima County to be developed as wildcat subdivisions as the value for land for development increases. For example, in 1997, a total of 3729 new residential dwelling units received permits in unincorporated Pima County. Of this total, 1525 or 41 percent of the new units were not part of platted subdivisions. Most of these were issued in "ex-urban" areas, or rural areas outside the metropolitan area. Figure 12 shows where land has been lot-split into numerous parcels, which indicates generally where unregulated development is occurring in comparison to where the 4742 regulated subdivisions are platted.

Regulated Subdivisions and Parcel Boundaries in Eastern Pima County



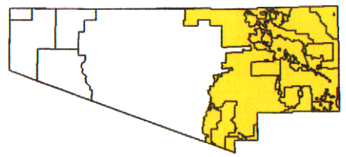
Platted Subdivisions

Parcel Boundaries

Administrative Boundaries

Figure 12

Pima County Index Map



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pygmyowl1/projects/mayro/archaeology/urban.aml Plotted: 11/09/99

Not only is wild-cat development causing significant impacts to the quality of life of its residents, but it devalues the land. Studies conducted by Pima County based on assessor records have shown that property values in lot split areas are usually significantly less than that in regulated subdivisions. As shown in Table 10, tax records reveal that the average full cash value per square mile (640 acres) of regulated development land is $17.2 million, while the value for unregulated developments amounts to only $4.7 million. When the improved full cash value of land is considered, the disparity is even greater, with regulated development averaging $38.5 million per square mile and unregulated development averaging only $8.1 million. Both the lack of improvements and lower population density in unregulated developments are contributing factors to this disparity in land values.

Table 10. Values of Regulated and Unregulated Development

Average Land Values per Sq. Mile	Average Improved Land Values per Sq. Mile
Regulated = $17.2 million	Regulated = $38.5 million
Unregulated = $4.7 million	Unregulated = $8.1 million

With the increase in agricultural land values more than doubling since 1992 county-wide, land once valued for its natural productivity is now being valued for its potential for development. While agricultural productivity has increased, attesting to the better management of the land by ranchers and farmers alike, this healthy increase in value of products sold is far outstripped by the increase in land values. When this differential in land value becomes sufficiently attractive, ranchlands are sold and are converted to real estate.

With as many as 3729 new residential units in unincorporated Pima County and 41 percent of these new units in wildcat subdivisions, the trend is clear — property owners are either selling out to large, corporate developers who tend to file regulated subdivision plats, or property owners are instead lot-splitting their parcels themselves and avoiding the regulated process. Both kinds of development impact and fragment the natural landscape in the areas outside the urban metropolitan area, and as was noted earlier much of this private property being converted to real estate development comprises some of the most biologically sensitive lands often including natural spring sites and riparian areas.

The following section will briefly address how ranch conservation will contribute to the goals of the Sonoran Desert Conservation Plan and how the Plan will benefit ranchers who are committed to sustainable and ecologically sound ranch management practices.

II. Ranch Conservation and the Sonoran Desert Conservation Plan

As noted elsewhere, the principal goal of the Pima County Sonoran Desert Conservation Plan is to protect and conserve the natural environment using long-range planning to ensure that our natural and urban environments not only coexist but develop an interdependent relationship, where one enhances the other. The Conservation Plan will guide already approved public bond investment, conservation, and preservation actions, and it will help to establish federal program and funding priorities and establish preference for our region's expenditure of State funds to preserve and protect State Trust lands threatened by urbanization.

II-1. Defining the Metropolitan Urban Boundary:

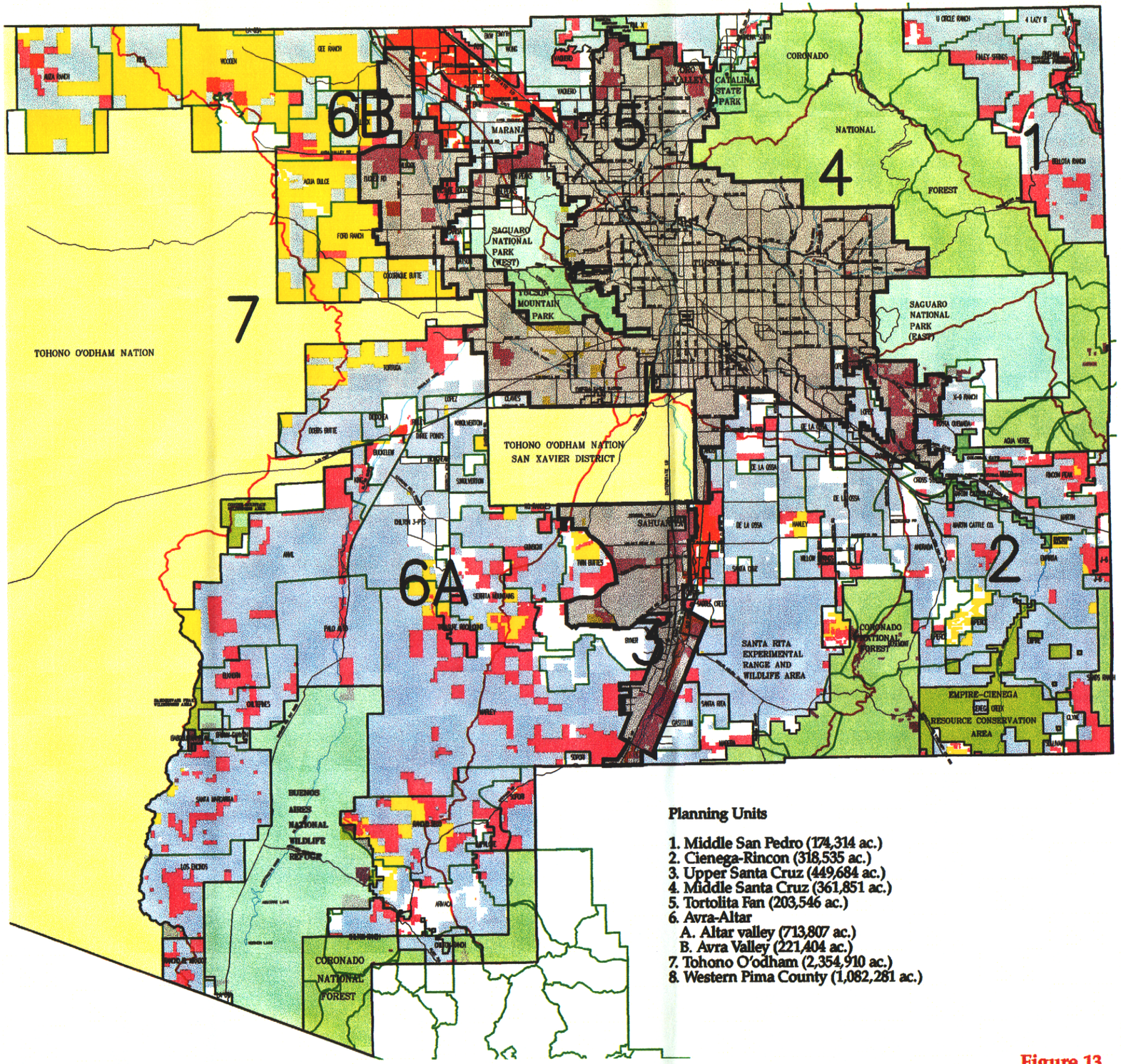
Earlier sections of this volume described the uneven distribution of State Trust lands throughout Arizona and the high and disproportionate amount of State Trust lands in eastern Pima County. When combined with private land ownership, fully 64 percent of eastern Pima County could be developed, given the mandate of the Arizona State Land Department to derive maximum revenue from its lands through sale or lease for its beneficiaries. This amounts to 2494 square miles or nearly 1.6 million acres. If this entire area were to be developed, the Tucson urban area would be nearly 16 times greater in size than it currently is! Sprawl will have found its natural limit with no additional land to develop, and the several natural reserves that today encircle the urban area would be left as mere islands of natural open space.

While this dire description of a completely developed eastern Pima County is probably not likely to occur because of other limitations, it does speak to the possibility of ever-expanding development and the loss of natural open space. Ranch conservation is one important mechanism to help define the urban boundary, preserve natural open space and habitat values, and allow the sustainable use of the land for grazing to continue. Because the greatest majority of ranchlands are State Trust grazing leases, the 109 allotments or grazing lease areas essentially show where operating ranches have remained viable. In addition to the existing land reserves such as Saguaro National Park, Coronado National Forest, and Tucson Mountain Park among others, operating ranches and their public land grazing leases currently define the urban/suburban boundary as shown in Figure 13.

However, it is just those ranches and grazing leases that adjoin the urban area that are most vulnerable to development. With increasing land values in these areas and higher development potential, the State Land Department has established 5 year time limits on 16 grazing permits called Special Land Use Permits (SLUPs) in anticipation of sale of these lands for commercial use or residential subdivisions. These 16 grazing permits totaling some 52,555 acres are located throughout the current metropolitan area, as shown in Figure 14.

Essentially classified as "commercial lands," these SLUPs identified in Table 11 tend to be located in projected high commercial growth areas along major transportation corridors, within incorporated jurisdictions, or where future annexations by the City of Tucson or other jurisdictions could occur. Some other small SLUPs tend to be in areas where suburban development is already occurring. The principal difference between SLUPs and regular grazing leases is that these 5 year permits allow the ASLD to convert land easily for development.

The Urban Boundary Defined by Grazing Allotments and Ranch Lands in Pima County, 1999.



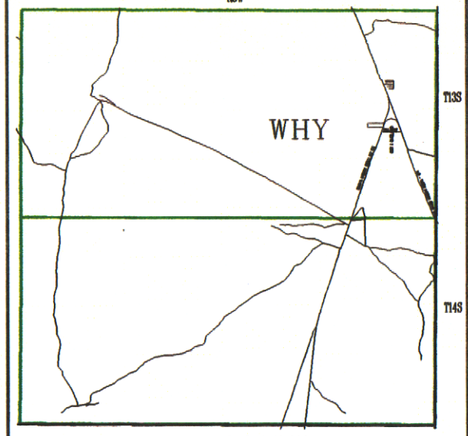
Planning Units

1. Middle San Pedro (174,314 ac.)
2. Cienega-Rincon (318,535 ac.)
3. Upper Santa Cruz (449,684 ac.)
4. Middle Santa Cruz (361,851 ac.)
5. Tortolita Fan (203,546 ac.)
6. Avra-Altar
   A. Altar valley (713,807 ac.)
   B. Avra Valley (221,404 ac.)
7. Tohono O'odham (2,354,910 ac.)
8. Western Pima County (1,082,281 ac.)

Figure 13

- Urban Boundary
- Major Roads And Streets
- Major Washes
- Grazing Allotments
- Sonoran Desert Conservation Planning Unit Boundaries
- Ranch Lands
- Agricultural Lands
- Bureau Of Land Management (BLM)
- State Trust Lands / Santa Rita Exp. Range
- Wildlife Refuge / Conservation Area
- Coronado National Forest
- Tucson Mountain Park / State Park
- Goldwater Gunnery Range
- Tribal Lands
- National Monument
- Cienega Creek / Colossal Cave
- Urban Boundary

Why Inset



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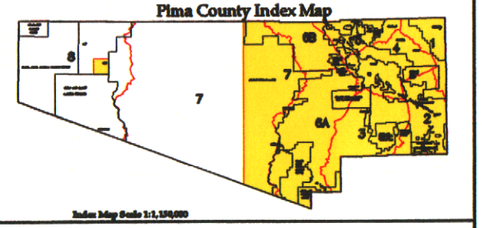
Pima County Index Map



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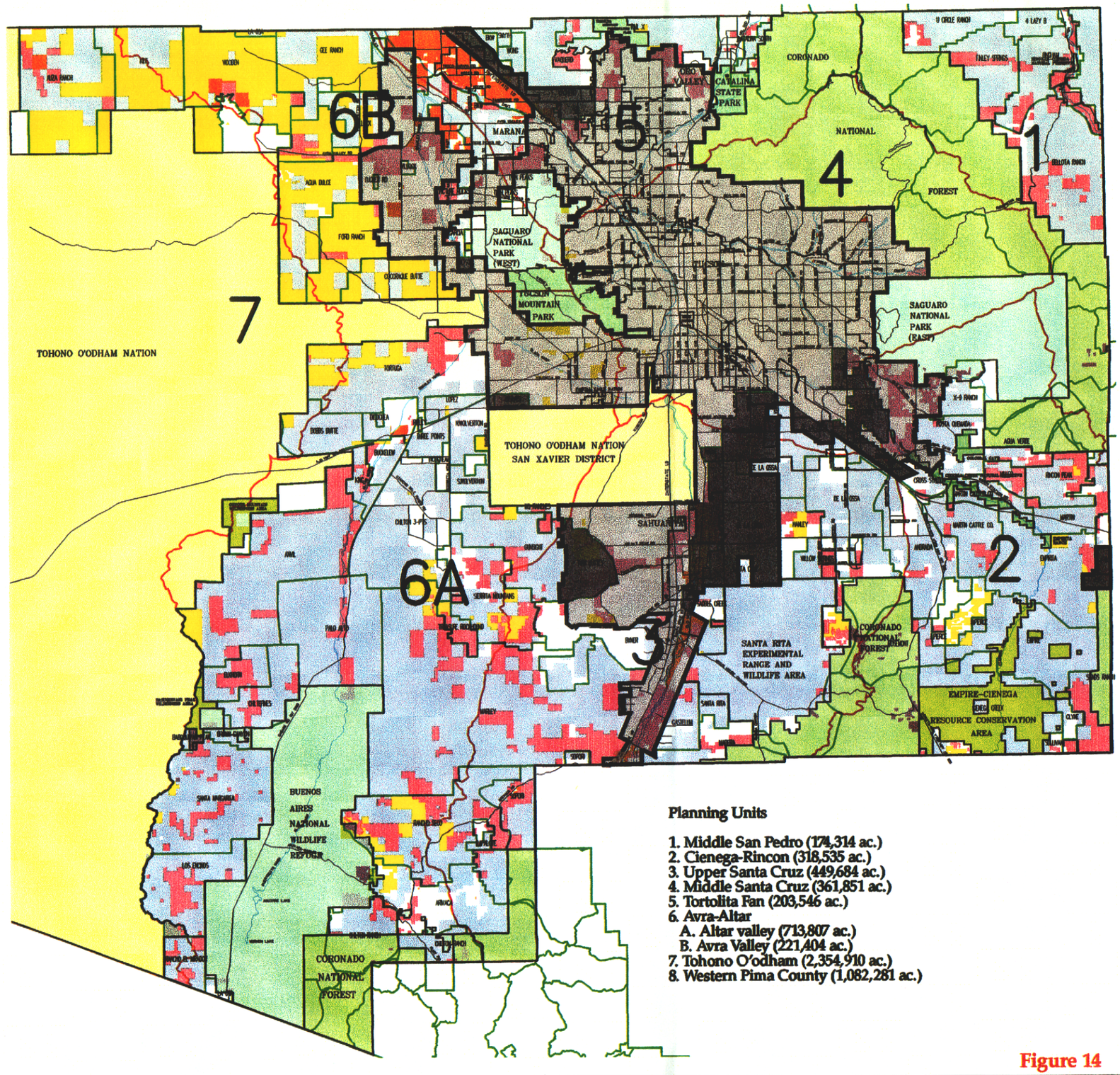
/pygmyowl2/sonora/ranch/allot/amls/urban_bnd99.aml Plotted: 11/19/99

The Projected Urban Boundary Defined by Grazing Allotments and Ranch Lands in Pima County, 2005.



Planning Units

1. Middle San Pedro (174,314 ac.)
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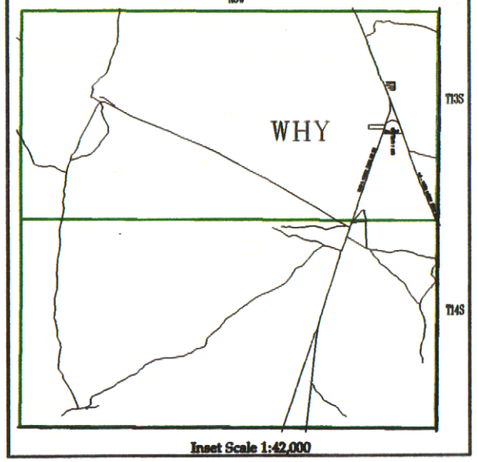
   A. Altar valley (713,807 ac.)
   B. Avra Valley (221,404 ac.)
7. Tohono O'odham (2,354,910 ac.)
8. Western Pima County (1,082,281 ac.)

Figure 14

Urban Boundary
Major Roads And Streets
Major Washes
Grazing Allotments
Sonoran Desert Conservation Planning Unit Boundaries
Ranch Lands
Agricultural Lands
Bureau Of Land Management (BLM)
State Trust Lands / Santa Rita Exp. Range
Wildlife Refuge / Conservation Area
Coronado National Forest
Tucson Mountain Park / State Park
Goldwater Gunnery Range
Tribal Lands
National Monument
Cienega Creek / Colossal Cave
Urban Boundary
Expanded Urban Boundary

Why Inset



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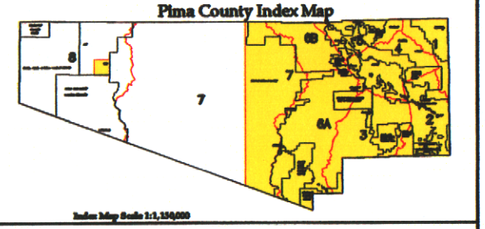

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/pygmyowl2/sonora/ranch/allot/aml s/urban_pnd05.aml Plotted: 11/19/99

Under the terms of the SLUP, the rancher can be evicted in 30 days even if the 5 year permit is still current, and there will not be any reimbursements for any improvements to the land, as is customary for regular grazing leases. In fact, permitees are not allowed to make any improvements on these lands and have no right to appeal. In contrast, regular 10 year grazing leases have greater protections and incentives for ranchers, including the right to file an objection and an appeal process if application for a commercial use is made, as well as compensation for their improvements made to the land over the years. While 93 grazing leases have some protections, the 16 grazing permits do not. Moreover, should these permits be sold, it is nearly certain that the viability of the ranches dependent on these grazing lands will be very negatively affected, with the likely consequence that much of the private deeded ranch lands will also be sold, resulting in nearly 60,000 acres of developable land.

Table 11. ASLD 5 Year Special Land Use Permits for Grazing

PERMIT #	Acres ASLD	Est. Acres BLM	Est. Acres Private	Cattle - ASLD	Total Cattle
1	1280			2	2
2	498			1	1
3	2495	1920	4000	23	79
4	593			5	5
5	2156			27	27
6	7558			59	59
7	1280			0	0
8	21215		960	191	199
9	423			6	6
10	1913		1600	36	66
11	1554			12	12
12	5535			9	9
13	256			2	2
14	267			3	3
15	1349			15	15
16	4183			20	20
TOTAL	**52,555 acres**	**1920 acres**	**6560 acres**	**410 cattle**	**504 cattle**

Finally, in addition to the potential loss of these lands as natural open space, another implication of this kind of limited permit is more subtle. With long-term tenure of the land unlikely, there is no incentive for continued good stewardship when it is certain that the land will be graded for development. This change in view from land being valued for its productivity to land valued as a commodity marks the transition of ranching to real estate and allows the urban form to expand one ranch at a time, defining a new urban boundary.

II-2. Preserving Western Heritage and Culture:

While perhaps less measurable than loss of lands, the funds of knowledge embodied in the ranching community continue to be eroded as ranchlands are sold for development and children of ranching families seek other means of livelihood. While the popular myth of the western

cowboy and "cowboy culture" is replete with simplistic images of cowboys and horses galloping after stampeding cattle, white hats, flying chaps, big spurs, campfires, and the Marlboro Man, western heritage and culture is not that at all and is, in fact, much more. Culture may be defined as a set of norms, ethics, beliefs, knowledge, goals, and values shared by a society or community with practices that reinforce those values and inform members of that society about themselves, how to conduct themselves, and how to interact with their environment.

While certainly part of the greater American society, the ranching community, farmers, miners, and yes, even office workers all have a unique culture and fund of knowledge that allows them to operate effectively in their social and working environment. For ranching and farming families, there is a knowledge and intimacy with the land that grows out of first-hand experiences. Moreover, they have the benefit of a wealth of wisdom passed on from previous generations who lived on the same land and knew how to conduct the business of cattle growing and caring for the land. This fund of knowledge simply cannot be learned and understood as well as someone raised in that culture and on the land. Agriculturalists, in particular, have very specialized knowledge on which all members of our larger society are dependent. Even if new places of food production are being created and affecting our global market, it is a significant risk to become entirely dependent on these sources and lose this knowledge. Both the knowledge of how to produce food and the capacity for agricultural production are critical to the very existence of any society. Sustaining that knowledge of the land and allowing ranchers to continue to practice their livelihood and manage the land to improve its natural productivity and health will result in better long-term stewardship.

II-3. Ranching and Cultural Resources:

Ranch conservation can also be considered a cultural resource conservation objective because it preserves traditional lifestyles and cultural landscapes that contribute to the visual, social, and cultural and historical character of our greater community. Ranch conservation will also help to preserve specific historic properties associated with ranching, such as historic ranch buildings, as well as entire ranching landscapes, shaped by the natural land form, that encompass buildings, fences, corrals, camps, pastures, watering sites, roads, and other features placed on the natural landscape. Moreover, because ranching preserves the natural landscape and environment, archaeological sites, prehistoric settlement systems, and traditional cultural places valued by Native American groups and others are also preserved.

To date, more than 6000 archaeological and historical sites have been identified in Pima County, and it may be estimated that between 40 to 60 percent of all recorded sites have been destroyed by development, both regulated and unregulated. Because most cultural resources surveys are completed in advance of development projects, many sites are sequentially identified, recorded, investigated, documented, and then destroyed by the development, whether a county flood control project, ADOT highway construction, subdivision development, or shopping center. Areas where the greatest protections have been achieved for cultural resources include existing reserves like Saguaro National Park where development is precluded, or in ranching areas where development is limited and where preservation of the natural landscape is essential to the ranching operation. In these areas, not only are individual sites preserved, but the entire cultural landscape is preserved to provide meaning and context.

II-4. Maintaining a Traditional Industry & Diversifying the Local Economy:

Despite price uncertainties on both the input and output sides, yield variability, and operating expenses that approach more than 70 percent of gross sales, ranchers and farmers in Pima County contributed $46,861,000 to the state and local economy in 1997, up some 21 percent from 1992.

Much of this agricultural productivity in Pima County can be attributed to individuals, families, family corporations and trusts that own relatively small deeded parcels, usually the original homestead site, and lease public lands for grazing. Most ranches and farms are small to moderate sized operations, and many produce only supplementary income for their owners, with an average net cash return of $29,746. The net return to the 419 Pima County farms and ranches was nearly $12,500,000.

A detailed discussion of the cumulative economic contributions of ranching to the greater community is beyond the current scope of this report; however, there is more than the direct effect of total sales and net incomes to consider. There are the interdisciplinary linkages between different sectors of the economy sometimes called indirect effects. These may be "backward-linked" linkages dealing with production like feed stores, veterinary services, etc., or "forward-linked" linkages dealing with marketing, sales, and distribution like auction facilities, feedlots, and processing plants. These direct and indirect effects allow for estimations of the total impact of the industry on the economy, which considers not only those directly employed in ranching but those ancillary and supportive industries and services that assist in production and distribution. To derive these estimates of the total and cumulative impact of the ranching industry, "inter-industry multipliers" can be used to estimate employment in the total economy due to an increase or decrease in the output of the sector, or other multipliers can be used to estimate how much income in the economy will increase or decrease due to changes in output of that sector.

While no recent economic studies for Pima County specifically were available for this report, some similar analyses and information exists for Arizona as a whole, from which some very rough estimates for Pima County can be derived. In 1990, the percentage of the Arizona workforce involved in meeting national food and fiber needs was close to the national average of about 15 percent, and total employment impacts were more than 94,300 jobs statewide, based on 50,400 jobs specific to agriculture. The multiplier for employment may be estimated at 1.9, close to the multiplier of 2 suggested by an economist with the University of Arizona.

In Pima County, the USDA reports that 1185 direct farm workers were hired in 1997 by some of the owners of the 419 farms and ranches in Pima County. When these workers and the owners of the farms are considered, there were at least 1600 people directly employed, at least part-time, in farm production. If the same multiplier of 1.9 is applied, the employment estimate for Pima County may be roughly about 3050 jobs. Hired positions alone accounted for a payroll of nearly $9.4 million. As for income in Pima County's economy, it was earlier noted that the net return to farmers and ranchers after expenses was about $12.5 million. If the same multiplier is used, there is an estimated $25.0 million added to the local economy from the agricultural sector. How accurate these very rough estimates are may be arguable; however, the point of this discussion is to demonstrate that agricultural pursuits remain a viable traditional industry that provides employment and income to residents in Pima County.

Before leaving this discussion of the economic role of ranch conservation, mention should be made of the economic benefits of tourism in rural areas that includes both "eco-tourism" and "agricultural tourism." In 1991, total tourist and visitor expenditures state-wide were almost $6.8 billion dollars with $680,000,000 spent in southern Arizona counties. While this accounted for the full range of visitors, about $2.6 billion was spent on eco-tourism and outdoor recreation activities throughout Arizona, with $774 million spent on hunting, fishing, and wildlife associated recreation. Agricultural tourism is another growing tourist industry where "pick your own" orchards, pumpkin fields, and vegetable fields can attract as many as 10,000 to 30,000 visitors per farm during the produce season. Moreover, some ranches are beginning to offer ranch-living and round-up tour packages, attracting many tourists seeking an authentic experience of working and living on a real western ranch. While no numbers are available yet to define the impacts of these activities, eco-tourism and agricultural tourism are growing as opportunities to supplement income from other rural industries such as ranching.

II-5. Conserving Water Resources:

Ranch conservation is critical to conserving water resources, especially ground water. Simply put, ranches use far less ground water than subdivisions, which can rapidly exceed the area's safe yield or the amount of water an aquifer will yield without depletion. Two brief studies are presented to illustrate how sustainable open range ranching can conserve water sources and accommodate both grazing and wildlife use.

Sonoita Valley:

One recent study of the Sonoita Valley completed in 1998 by Robert Naeser and Anne St.John describes water use and consumption in the Elgin-Sonoita area in Santa Cruz County near the headwaters of Cienega Creek. Portions of the following section discussing their findings and the implications for development and water consumption are summarized from a presentation by Thomas E. Sheridan to the Sonoran Desert Conservation Plan Steering Committee in August 1999. Other data presented in this section were compiled and analyzed by Pima County staff.

The Sonoita Valley relies entirely on rainfall stored as groundwater according to studies conducted by the Yale School of Forestry and Environmental Studies. Using hydrological data for the western portion of the Sonoita area, researchers developed an annual water budget for the Sonoita area based on estimates of recharge of 3980 acre feet of water per year. According to the study, a cow/calf animal unit consumes about 15 gallons of water on a hot, dry day. Moreover, when cattle and wildlife like pronghorn, deer, and javelina that drink from the same water sources are considered, only 14 acre feet of water are used per year. (An acre foot of water is equal to 325,850 gallons.)

In contrast, a single person in Sonoita consumes about 10 times as much water as cattle or wildlife, and average use for one person is about 150 gallons of water per day, or about 0.17 acre-feet of use per year. A conservative estimate of total residential water use for about 2000 residents in Sonoita is 337 acre feet per year. Present water use by residents, commercial uses, and ranching remains below the safe yield estimate amount, and sufficient recharge helps to maintain adequate water flows in Cienega Creek, home to a number of

threatened and endangered species of fish. However, future population and residential growth will likely consume and exceed surplus recharge over time. Although the researchers estimate that the safe yield development density in Sonoita is one residence per approximately 12 acres, current zoning allows a minimum lot size of about 4 acres or approximately 8200 homes, which would consume 3900 acre feet of water each year, more than three times the available surplus recharge. More than one house per 12 acres means that Sonoita would have to mine its groundwater. To insure safe-yield, the minimum size of a parcel would have to be tripled from 4 to 12 acres, or risk depletion of groundwater and loss in surface flows in Cienega Creek.

In the Elgin area, a similar water budget was attempted, but lacked adequate hydrological information. The researchers nevertheless were still able to conclude that in non-irrigated natural grasslands used for pasture that a cow-calf unit consumed approximately the same amount of water - 15 gallons per day - as in the Sonoita study. Furthermore, if this use is then analyzed by the average number of cattle (10.5) that graze on a square mile of land covering 640 acres, the amount of water consumed is only about one quart per acre per day.

Arivaca Ranch:

In the Arivaca area, a water consumption study was recently completed by John Regan, Pima County Sr. GIS Analyst, to address the question: Does a working cattle ranch use more water than a subdivision? This was the question put to our computer-based geographic information system (GIS). Water use can be measured to some degree using a GIS technique in a similar way that the question was asked in the Sonoita area study. By using some general and similar assumptions on human and animal water consumption, we were able to develop estimates of water use for the pre-subdivided Arivaca Ranch before 1970 and current use by the "wildcat" subdivision known locally as *"The Forties"* that resulted from the sale of the Arivaca Ranch.

Before 1970, Arivaca Ranch was made up of about 10,500 deeded acres plus various grazing leases on state and federal land. There were only ten wells in the entire watershed. In 1970, Fred Boice sold 10,000 acres to Nationwide Resources, who made plans to subdivide their holdings. Nationwide tried unsuccessfully to get a higher density zoning approved, and ended up marketing the old ranch as 40-acre, lot-split parcels. Using this strategy, they were exempt from subdivision requirements. *"The Forties"* were sold in phases over the next five years.

As the new owners discovered they were able to sell off 30 of their new 40 acres and pay-off their remaining 10 acres, "wildcat" subdividing began in earnest. Many new owners of10-acre lots chose to subdivide, or lot-split yet again, resulting in parcels as small as 2.5 acres. The result was that by 1999, there were 477 parcels of various sizes spawned from the original 156 subdivided forty acre parcels. Many of these owners drilled wells, resulting in 242 new wells in the old Arivaca Ranch area. Using the capabilities of our GIS, *"The Forties"* were isolated in the watershed. These comprised 6240 acres of the 10,000 sold by Boice to Nationwide. The remainder of the 10,000 acres lies in another watershed and was not included in the analysis. We combined Pima County Assessor's parcel base and the Arizona Department of Water Resources's well registry. This essentially linked registered wells with the parcel base and land use information contained in those files. We discovered there are many subdivided parcels without wells or water supply, and it is assumed their water

consumption is zero. A data query to identify land use was then performed on the resulting file. Using this as a starting point, some quick calculations revealed the amount of water residents in *"The Forties"* were probably using annually. This figure will of course vary from year to year, depending on a variety of external factors such as rainfall, temperature, amount of outdoor watering, etc. We used an average residential household size of 2.5 persons per residential unit and assumed each person used 150 gallons of water per day. The results are shown in Table 12:

Table 12. Water Use in the "Forties" in Arivaca

Wells:	Water Use:	Calculations:
-Residential (44)	**18.48 acre feet/year**	(44 x 2.5 x 150 x 365 = 6,022,500 gallons/year)
-Mobile homes (125)	**52.50 acre feet/year**	(125 x 2.5 x 150 x 365 = 17,109,375 gallons/year)
-Irrigation (16)	**26.64 acre feet**	(16 x reported amounts in 1998)
-Ranch (6)	?	(6 wells: use unknown)
-Vacant (57)	?	(57 wells: use unknown)
TOTAL	**97.62 acre feet of pumped groundwater used in *"The Forties"* in 1998**	

Pre-1970 Arivaca Ranch varied in acreage and herd size, but working backwards, we were able to deduce some estimates of herd size and estimate ranch water use. The primary water consumer on a non-irrigated ranch in southern Arizona is cattle. We were unable to distinguish between groundwater and surface water used by the animals, so we'll display the results of the calculations and allow the reader to draw their own conclusions. During the 1980's, Dale Smith, the owner of what was left of Arivaca Ranch, stated he was running about 500 animal units annually on his deeded land and grazing allotments. Assuming the number of grazing leases did not increase and the 6240 acres of deeded land in the watershed sold in 1970 was used for grazing, we can come up with an approximate herd size for the pre-1970 Arivaca Ranch. Using an average of 40.5 acres needed to raise one animal per year in the Arivaca area, we can assume the pre-1970 herd size was around 654. Each animal uses about 15 gallons of water / day. We also assume human use for a ranch this size would be about 10 persons, each using 150 gallons per day.

Calculated out:

-654 x 15 x 365 = 3,580,650 gallons/year or 10.98 acre feet / year
-10 x 150 x 365 = 547,500 gallons per year or 1.68 acre feet / year

TOTAL **12.66 acre feet of water used by pre-1970 Arivaca Ranch**

"The Forties" wildcat subdivision presently uses 6.3 times the amount of water used by one working cattle ranch in 1970, and if built-out to its potential 1560 parcels, it could use more than 51 times the amount of water used by the old Arivaca Ranch!

The various studies are clear in their conclusions. People on average consume about 10 times more water per capita than cattle. In comparison to developed areas on the same amount of acreage, cattle ranches using open range have a much lower rate of water consumption and provide water for both cattle and wildlife. However, when private ranch lands are sold, wildcat subdivisions are often created, which have the potential to significantly increase water use and pose risk to the water table and to the viability of live streams like Cienega Creek.

II-6. Preserving Unfragmented Natural Open Space and Wildlife Habitat:

Ranch conservation preserves the natural landscape to provide unfragmented open space and habitat critical for maintaining sustainable and diverse ecosystems and wildlife corridors. It was noted in earlier sections of this report that in eastern Pima County about 13 acres of natural open space are being converted every day to residential or commercial uses, contributing to urban sprawl and leap-frog development, whether regulated or unregulated.

It has also been shown in earlier sections how ranching defines the current urban boundary of the Tucson metropolitan area and how that urban boundary could expand by as many as 60,000 acres in the next five years, one ranch at a time. When a new urban boundary is formed, it is the next ranch and its allotments that become vulnerable to sale, creating yet another cycle of converting ranchlands to real estate. As the entire agricultural industry becomes less viable due to this conversion of land use, more marginal ranch holdings may be converted to wildcat subdivisions further fragmenting the landscape. Unfortunately, many of these relatively small, deeded parcels are also some of the most biologically sensitive and productive lands.

If the goals of the Sonoran Desert Conservation Plan are to conserve our natural environment and to allow our diverse ecosystems to persist and thrive, it is imperative to protect natural open space from further fragmentation. At the present time, eastern Pima County still has the opportunity to achieve these goals because ranchlands outside the urban boundary form adjacent, continuous, and extensive tracts of natural open space that retain some of the most critical and productive wildlife habitat. These open spaces provide connectivity across valleys, provide a variety of habitats from riparian bottomlands, to bajadas and foothill and mountain environments, and they remain largely intact. Historically, ranching has proved uniquely capable of protecting these vast open spaces. Because of southern Arizona's aridity, large land areas are required to support sustainable ranching operations. Out of a combination of economic and ecological interests in the land, which creates the incentive to restore and maintain the land's natural productivity, most ranchers have become good stewards, managing the land for its long-term health rather than short-term gain.

II-7. Benefits to the Ranching Community:

As a consequence of growth, however, native species are becoming endangered, and there are growing risks of landowner liability under the Endangered Species Act. To address this risk, Pima County is seeking a Section 10 Permit under the Act. This will allow the region to go forward in compliance with federal species protection laws with reduced liability, provided that an adequate habitat conservation plan (HCP) is in place for the region and being implemented. Under this large-scale, regional HCP, the permitee may identify a broad range of activities that may be brought under the "umbrella" of the permit's legal protection.

This permit will then allow the community to continue to pursue economic development and agricultural activities, as long as the permitee and private landowners are implementing the terms and conditions of the permit. It is the goal of the Sonoran Desert Conservation Plan that the ranching community will be afforded much greater protections, greater certainty of land tenure, possible incentives for even larger stewardship roles, and protection of property rights.

II-8. Ranch Conservation Efforts to Date:

While much has been done to preserve open space in Pima County, population growth, proposed development, urban sprawl, and economic and political pressures will continue to threaten rural areas and the ranching tradition of southern Arizona. Future efforts to conserve the traditional use of ranch lands and the public lands that support this industry will require significant citizen and intergovernmental cooperation. Moreover, working with groups like the Altar Valley Conservation Alliance, Arivaca Watershed Educational Task Force, the Arizona Common Ground Roundtable, and the Southern Arizona Cattle Growers Protective Association, and others will provide needed input for how best to achieve ranch land conservation from those directly involved in ranching. To date, Pima County has been involved in a number of successful ranch conservation efforts that have kept ranchers ranching while preserving the land's scenic, wildlife, and cultural resource values.

Empire Ranch:

The historic Empire Ranch located along upper Cienega Creek in the Empire-Cienega Valley was once one of the most significant ranching operations in southern Arizona. By the late 1870s, a number of small ranches were established in the Cienega Creek valley, then called "Stock Valley." The Empire Ranch, established in 1876 by Walter Vail and Herbert Hislop on 160 acres, soon became the most prosperous of these ranching efforts with its holdings expanded by their purchase and consolidation of other smaller ranches, including the Cienega Ranch, to nearly 1000 square miles by 1906.

In 1987, Pima County proposed to purchase the Empire-Cienega Ranch in order to prevent development of the Empire community plan proposed by the Gulf American Corporation, which would have allowed some 30,000 homes, with 100,000 residents, to be constructed on 45,000 acres within the Cienega watershed. Concern over urban sprawl and groundwater depletion lead the Board of Supervisors at that time to propose acquisition and to increase the Flood Control District tax levy in anticipation of ranch acquisition. The county's interest in ranch acquisition heightened awareness of the need for conservation efforts, and in cooperation with the Bureau of Land Management, the ranch was purchased and is now part of a federal conservation area. In total, the land is larger than the present corporate boundary of the City of Tucson. Under a cooperative management agreement, a private ranching family working in tandem with the Bureau of Land Management continues to ranch within the context of conservation ranching to ensure the sustainability, health, and productivity of the land under their excellent stewardship and management. Empire Ranch and the acquisition of a portion of the old Romero Ranch at Rancho Romero resulting in the creation of Catalina State Park were the first efforts of the county to halt urban sprawl through ranch conservation.

Empirita Ranch:

First established as the Kane and Siemond ranches, the Empirita Ranch along the lower Cienega Creek was purchased by the Pima County Flood Control District in 1990. While this land was originally purchased for its storm water and recharge values, it was quickly realized that this rich upland environment has significant environmental, open space, and cultural resource values that would require additional close management. Again, with the support and

expertise of a local southern Arizona ranching family who had adjoining grazing leases, the Flood Control District entered into a management agreement with them to manage the 360 deeded acres for its resource value to the public, while permitting grazing on those portions of the ranch that could sustain such use. As stewards of the Empirita Ranch, the rancher is responsible for overseeing the health of the land, maintaining the buildings, wells, fence lines, gates, and signage, and providing an on-site manager at no cost to the county. Although sensitive resource areas were closed to grazing, this managed approach allows the historic ranch to continue as a working cattle ranch, retaining the traditional land use and the economic viability of this industry, and preserving open space and other important values.

Posta Quemada Ranch:

This historic ranch near Colossal Cave was also acquired initially for its watershed and quality riparian woodland values. Named after the nearby 1858 Butterfield stage station that was burned in the early 1860s during the Civil War and later rebuilt and burned again by Apaches, this ranch today comprises 469 deeded acres and almost 8000 acres of State Trust grazing leases that were turned over to the Pima County Parklands Foundation to manage with the assistance of a local conservation rancher. This unique practice has again provided on-site management, land stewardship by the rancher, the protection of sensitive riparian areas, and the conservation of open space while continuing to support local ranching efforts on the state grazing leases. The public is also afforded the opportunity to view, experience, and understand the traditional practices of a working cattle ranch due to the educational facilities and ongoing efforts of the Parklands Foundation.

II-9. Traditional Ranching Areas Remaining in Pima County:

Altar Valley and Arivaca Area:

Both the Arivaca area and Altar Valley remain one of the most significant historic and traditional ranching areas in eastern Pima County. Here, unbroken ranch lands extend from the Coronado National Forest south of Arivaca and the Mexican border at Sasabe north to the Tohono O'odham Nation "Garcia Strip." The valley is also bordered by the Tohono O'odham Nation to the west and extends east to the Sierrita Mountains and the Upper Santa Cruz Valley watershed. The largest of the watershed study areas in eastern Pima County, the Altar Valley comprises nearly 714,000 acres.

Ranching in the Altar Valley has been a traditional and continuous way of life since the valley was first settled beginning with the General Homestead Act of 1862 in the 1800s. Like the Arivaca area, the Altar Valley represents some of the most important unfragmented ranch lands in eastern Pima County. The historic Robles Ranch, once one of the largest ranches in the Altar Valley, will soon become the site of the Robles Junction Community Center. In the Arivaca area, a number of traditional ranches continue in operation that date from as early as the Spanish Colonial and Mexican periods and the Aribac Land Grant. Buenos Aires Ranch, founded in 1864 by Pedro Aguirre as a ranch and stage stop, now comprises the Buenos Aires Wildlife Refuge established in 1985.

To the east of Arivaca, adjoining the Upper Santa Cruz Valley, extensive ranch lands continue eastward to the Interstate 19 area. While these private and State Trust lease lands continue as working ranches, they may become more susceptible to fragmentation and development should urbanization from the Green Valley area begin to encroach westward.

Upper Santa Cruz Valley:

The historic upper Santa Cruz Valley was the route of travel and exploration by early Spanish missionaries and its military seeking to expand the northern frontier of Colonial New Spain. Attracted to the relatively permanent water along stretches of the Santa Cruz River, early ranches were established along the river as Spanish land grants, including the Tumacacori Land Grant south of Tubac and the San Ignacio de la Canoa Land Grant. Canoa Ranch comprises a very significant historic site in Pima County as one of the oldest ranches in the Santa Cruz River Valley, in continuous use as a working cattle ranch from 1820 to the 1970s. No longer a working ranch, its remaining 6400 acres are threatened by the further urbanization of the Green Valley area.

To the west of Canoa Ranch, the historic Sopori Ranch also dates to the Spanish Colonial period and is referenced in Spanish documents from the 1700s. This ranch falls in both Pima and Santa Cruz counties. Extensive ranchlands adjoin the Sopori Ranch, forming a continuous landscape and is even greater in size. Together these ranches and others comprise a significant and extensive area of unfragmented open space and traditional land use.

To the north of Canoa Ranch, the Santa Rita Experimental Range comprised of 53,000 acres of State Trust Lands and the nearby Santa Rita Ranch continue to operate as working ranch lands. Now associated with range studies conducted by the University of Arizona and others, the Experimental Range continues its mission established in 1903 to research the improvement and management of semi-arid grasslands in the Southwest. While not immediately threatened by sale for development, the Experimental Range is located adjacent to the developing areas of Green Valley, Sahuarita, and Corona de Tucson. With the exception of these areas, much of the upper Santa Cruz River Valley, comprised of nearly 450,000 acres, represents nearly continuous ranchlands.

The Cienega Creek Valley:

As noted above, the historic Empire Ranch located in the Empire-Cienega Valley was once one of the most significant ranching operations in southern Arizona, eventually encompassing some 1000 square miles and a number of smaller ranches that were established in what was then called "Stock Valley." Other nearby ranches and homesteads established at the time that were consolidated into the Empire Ranch include the Cienega and Sanford ranches, as well as the Gardiner and Wakefield ranches, among others. Today these continue as working ranches within the 45,000 acre Empire/Cienega Resource Conservation Area managed by the Bureau of Land Management.

This watershed, comprised of some 318,000 acres and much of it grassland, extends from the Rincon Mountains south and east to the Santa Cruz and Cochise county lines. To ensure the

long-term conservation of this region's important natural and cultural values, the "Las Cienegas National Conservation Area Establishment Act" was introduced to Congress by Representative Jim Kolbe in September 1999. This Act establishes a national conservation area in the Cienega Creek and Babocomari watersheds located in Pima, Santa Cruz, and Cochise counties. The proposed bill, developed in collaboration with a citizen's group the Sonoita Valley Planning Partnership, is intended to conserve, protect, and enhance various natural and cultural resources and values while allowing environmentally responsible and sustainable livestock grazing and recreation to continue.

San Pedro River Valley:

Long subject to raiding by Apaches and isolated by the Catalina Mountains from the relative safety of the military presence in the Tucson area, the initial settlement of the San Pedro River Valley with homesteaders and ranchers began somewhat later in this valley than elsewhere. Settled by Henry and Lem Redfield in 1875, the Redington area just across the mountains and along the San Pedro River became the social and economic hub of this portion of Pima County. A number of traditional ranches continue in operation in the area, comprised of nearly 175,000 acres in Pima County.

The Bellota Ranch, which sits astride Redington Pass, has been a working ranch since the 1870s, but has been subject to increasing development pressures since the late 1970s. Recently the City of Tucson purchased the Bellota Ranch to prevent urban sprawl and preserve grasslands and riparian areas extending from the Coronado National Forest to the San Pedro River. Plans are in progress to continue the Bellota Ranch as a traditional working ranch.

The Avra Valley:

The Avra Valley, comprised of some 220,000 acres, extends north from the Tohono O'odham reservation "Garcia Strip" area to the Pinal County line and east from the reservation to the Tucson Mountains. Drained by Brawley Wash, this valley has seen a decrease in ranching as development has expanded west of the Tucson Mountains. With the downcutting of the Brawley Wash, portions of the valley floor's desert scrub and grasslands environment now receives less water, and it is less productive as grazing lands. Ranchlands are increasingly being converted to subdivisions, many of them unregulated. However, to the west of the Brawley Wash, productive grazing lands, much of it BLM with some State Trust and private lands, form a continuous and unfragmented landscape rich in natural and cultural values.

The Tortolita Fan:

The Tortolita fan area, comprised of some 203,000 acres, takes in the Canada del Oro drainage area and the lower Santa Cruz River floodplain and extends north to the Pinal County line. With the rapid growth of Marana and Oro Valley, much of this area has already been converted to real estate development, with the exception of State Trust grazing lands immediately to the southwest and east of the Tortolita Mountains. The Marana area along the Santa Cruz River floodplain holds much of Pima County's remaining agricultural croplands.

III. The History of Cattle Ranching in Southern Arizona

The following section on the history of cattle ranching is summarized and excerpts derived from a number of studies. Principal works consulted include: William S. Collins, *Cattle Ranching in Arizona*; Nathan F. Sayre, *Species of Capital: An Anthropological Investigation of the Buenos Aires Ranch, Pima County Arizona, and its Transformation in a National Wildlife Refuge*; Thomas E. Sheridan, *Arizona, a History*; and C.L. Sonnichsen, *Tucson, The Life and Times of An American City*.

III-1. Spanish Colonial and Mexican Periods:

The Arrival of Cattle in the New World:

Domesticated cattle and the practices of livestock raising have their origin in the Old World from nearly the dawn of history. Early peoples from Europe, Asia, and Africa doubtless hunted wild bovine animals for countless eons for their meat and hides. At some point, captured ruminants such as cattle, buffalo, sheep, and goats were kept for their milk and to serve as draft animals. Across the ocean in the New World the native Indian peoples had not yet domesticated many animals. In the Andean region of South America, the tamed llama served many of the same purposes as cattle in Eurasia. The peoples of North America had no such servant animals and continued to hunt animals like the wild bison.

Remarkably, little is known of early Old World cattle. While they became basic to the economy of Eurasian civilizations, few writers found much to record about these mundane beasts. One thing that can be said with certainty is that by the early modern era, European cattle, while of one species, had attained a great variety of regional variation. Both natural and artificial selection created great differences in size, appearance, milking capacity, and adaptability. True "breeds" of cattle as we think of them today are the product of highly selective breeding practices tailored to produce an animal with maximum marketability.

European conquerors, missionaries, and settlers brought the first cattle to the New World. Since the Spanish and English were most successful in transplanting their culture to the Americas it was their cattle types and practices that most influenced New World cattle raising. While not unique-Arizona shares in a Spanish borderlands heritage with several states-the combinations of an extraordinary environment and its own historical timing has left modern Arizona with its own story of cattle development and a distinct cultural heritage.

It is to the Spanish, adapting to conditions of the New World, that we owe much of the character of ranching in the American West. Events over the centuries have left a tangle of continuities and discontinuities so that ranching today that serves a modern American market is also shaped physically and culturally by traditions brought by those first settlers.

Ranching, as opposed to simple cattle raising, can be traced to the cowpens of medieval Castille. Castille was one of the strongest of the Christian kingdoms on the Iberian peninsula. At the height of the Moorish conquests in Spain the Castillians were pushed to the highlands of the north-central part of the peninsula. Sheep were the most important of their domestic animals, cattle usually being held in close confinement to serve as draft animals. Mutton rather than beef was the common meat for both Christians and Muslims. By the mid-13th

century, as the Castillians slowly pushed the Moors south, they found themselves in control of much of Andalusia, a low-lying portion of southern Spain where lower rainfall makes the land more useful for grazing than for farming. Increasingly, cattle were let loose to graze on the hillsides and left to reproduce and fend for themselves. It was in Andalusia that such practices as tending cattle on horseback and organizing roundups to cull the herds originated. These cattlemen formed local associations, called mestas, to regulate their roundups, settle disputes, control theft, and otherwise serve their common interests.

With our limited knowledge of cattle before the British began to keep herd books in the later 18th century, it is difficult to be precise about the characteristics of Andalusian cattle, but there are four broad types. The Retinto is a red- to tan-colored animal sometimes shading toward brown. The Black Andalusian is a solid black. The Berrenda is white with black markings while the Cacereño is solid white. All of the these types have large, widespread upturned horns and their hair is short, fine, and typically solid in color. These are called criollo, the "cattle of the country."

Criollo cattle, where they can still be found, exhibit a very narrow range of basic characteristics. They are generally tan with short, fine hair and carry long, upturned horns. Most are solid colored though some black-and-white occur. They vary in other characteristics such as size and milking capacity due to both artificial and natural selection.

However, near uniformity of several basic characteristics suggests that only a few types of cattle were brought over from Spain. The historical record also notes cattle in the manifests of the earliest voyages to the New World, but practically none later. This makes sense if we consider the cargo capacity of the small ships of the time, the size of cattle, and the length of the voyage (average of sixty days). Once herds became established in the Americas there was no reason to carry them across the Atlantic.

It was Christopher Columbus, on his second voyage, who carried the first cattle to the New World. This large colonizing expedition on seventeen ships carried 1,200 crew and colonists with a cargo of cattle, horses, hogs, sheep, plants, and seeds, to the Caribbean island of Hispaniola in November 1493. The records indicate that Columbus picked up a number of cattle from both Cádiz and the Canary Islands.

These early colonizing efforts were difficult; most of the first colonists eventually returned to Spain. While gold in the streams of Hispaniola provided the lure to keep up the effort, cattle provided the necessary sustenance. In search of gold, a high-ranking Spaniard and his retainers would build a villa near an Indian village whose inhabitants could be forced to work the placer mines. They obtained pasture rights to the surrounding land and let their herd graze on the open range. When the gold was gone, the villa became a cattle ranch.

With sizable breeding herds in the New World, the practice of carrying cattle from Spain practically ceased. In all, the total number of cattle carried from Spain and the Canary Islands probably was no more than a few hundred. The first herd established on the mainland was in 1510 on the isthmus of Panama. Cortez carried no cattle on his conquest; the first herd in New Spain (Mexico) arrived in 1521 with Gregorio de Villalobos. His first small herd may have numbered only seven heifers and a bull-a small start to tremendous cattle industry in North America. The first permanent herd in what is now the United States was in Florida starting

in 1565. Colonists in New Mexico trailed cattle there in 1598. The first domesticated herd arrived in Texas in 1717, preceded by wild cattle some years earlier. Cattle arrived in California in 1769.

Although no permanent herd was established at the time, it was through Arizona that the Spanish first introduced cattle into what is now the United States. In 1540, the would-be conqueror Francisco Vasquez de Coronado led an expedition of about 300 Spaniards, upwards of 1,000 Indian allies, 1,500 horses and mules, 5,000 sheep, and 150 cattle, toward the farthest reaches of the then-known New World to conquer the Seven Cities of Cíbola. Along the way, Coronado was forced to abandon some cattle and these began to reproduce and form a wild herd. Within a few decades, great herds numbering in the tens of thousands in northern Mexico could trace descent from these wandering strays from Coronado. By the time Coronado crossed southeastern Arizona, he had few cattle remaining.

The institutions of cattle ranching developed quickly in Mexico. A brand book was established in 1529. This was necessary in an open range system where cattle were allowed to roam with minimal tending. Following the tradition of the mestas of Andalusia, a livestock association encompassing all of New Spain was founded in 1537. The Spanish government knew that by encouraging cattle raising its New World colonies would have a strong economic support. In 1533 it granted free pastures to both Spaniards and Indians to encourage the rapid propagation of livestock. The haciendas of Mexico, typically, were established on royal land grants for mining. Cattle were brought in and raised to supply the miners with food, clothing, and work animals. But what began as supplement for subsistence quickly became the mainstay of the hacienda economy. By 1600, cattle in the New World numbered in the hundreds of thousands.

Spanish Cattle in Arizona:

The era of the conquistadors ended soon after the failed Coronado expedition and expansion of the Spanish empire was left largely to missionaries. In 1591, missionaries of the Society of Jesus, the Jesuits, began their slow efforts at Christianizing the Indians in New Spain's northwestern frontier, also known as Pimeria Alta (Figure 15). The Jesuits founded missions and extended the frontier 1,000 miles from southern Sinaloa to northern Sonora. The most famous missionary in Arizona history was Father Francisco Eusebio Kino. Father Kino brought cattle in large numbers to his Arizona missions. They would be the mainstays of the mission economies and a major attraction for Indian converts. To the mission at San Xavier del Bac, for instance, he bought about 700 heads. These cattle were largely left to fend for themselves, foraging on the open range, and they soon began breeding in large numbers. The herds that Kino began expanded successfully well into the nineteenth century. Kino's significance in Arizona history is well known, but his leading role in establishing cattle raising in Arizona in the Spanish period is so important that it deserves special notice here.

Kino was a well-educated man, born in 1645 in the mountainous region between Austria and Italy. In 1681, he emigrated to Mexico, and in 1687 to Pimería Alta (present day Sonora and Arizona), he began to establish a chain of successful missions. From his headquarters at the mission Nuestra Señora de los Dolores in Sonora, Mexico he made a series of visits down the Santa Cruz and San Pedro river valleys. He set up numerous visitas in northern Sonora and Arizona, including Tumacácori, Guevavi, and San Xavier del Bac. His main strategy for

The Northern Pimería Alta, 1691–1767

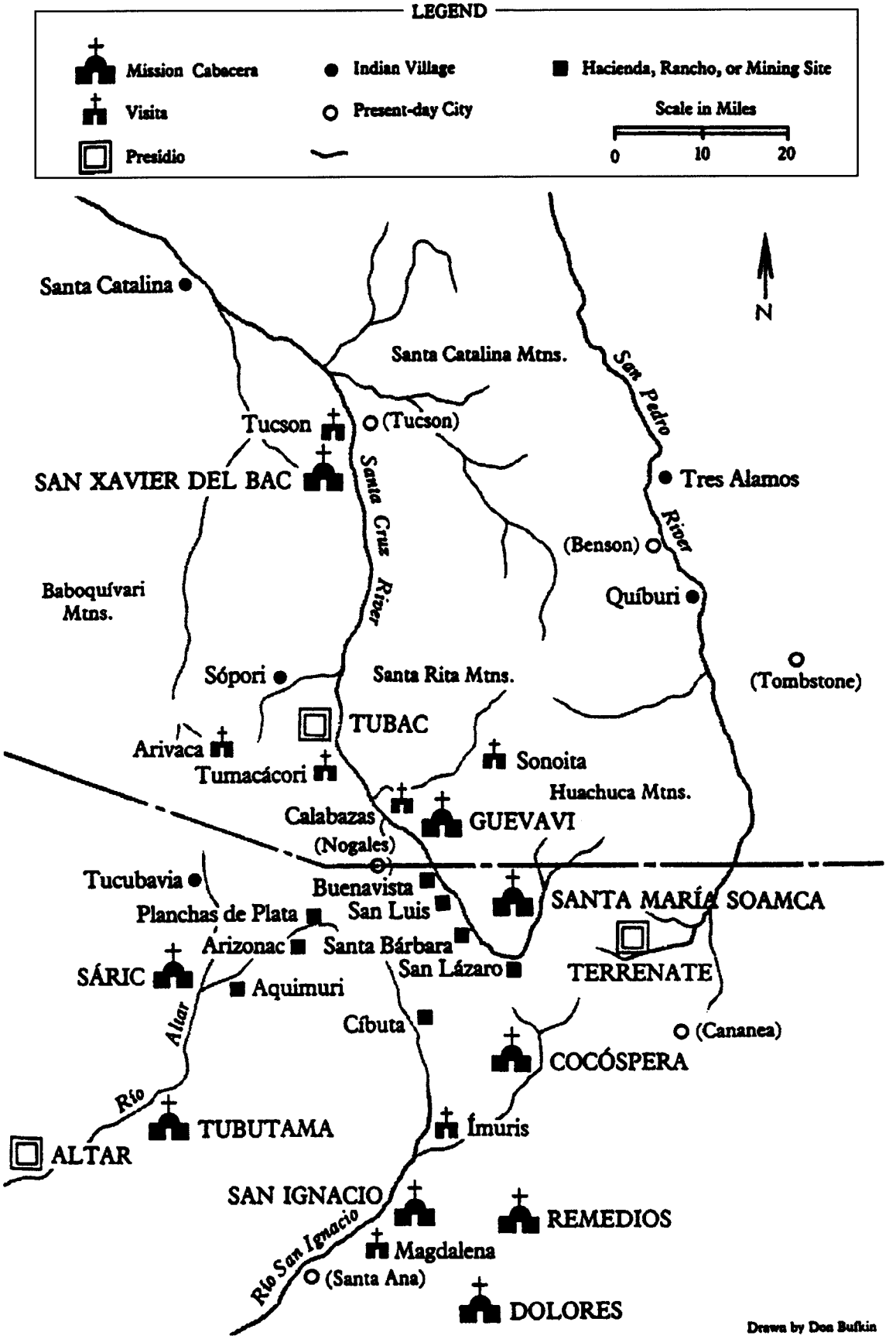


Figure 15

Christianizing the native Pimas and Tohono O'odham was to provide them with the means for a settled existence centering around the missions. There they would learn to live in a European manner. From his stock ranch at Dolores, Kino brought horses, mules, cattle and sheep and taught his converts how to care for their herds so they would expand and provide a permanent source of a livelihood. By this time, cattle raising was well established in Sonora with perhaps thousands of head of stock.

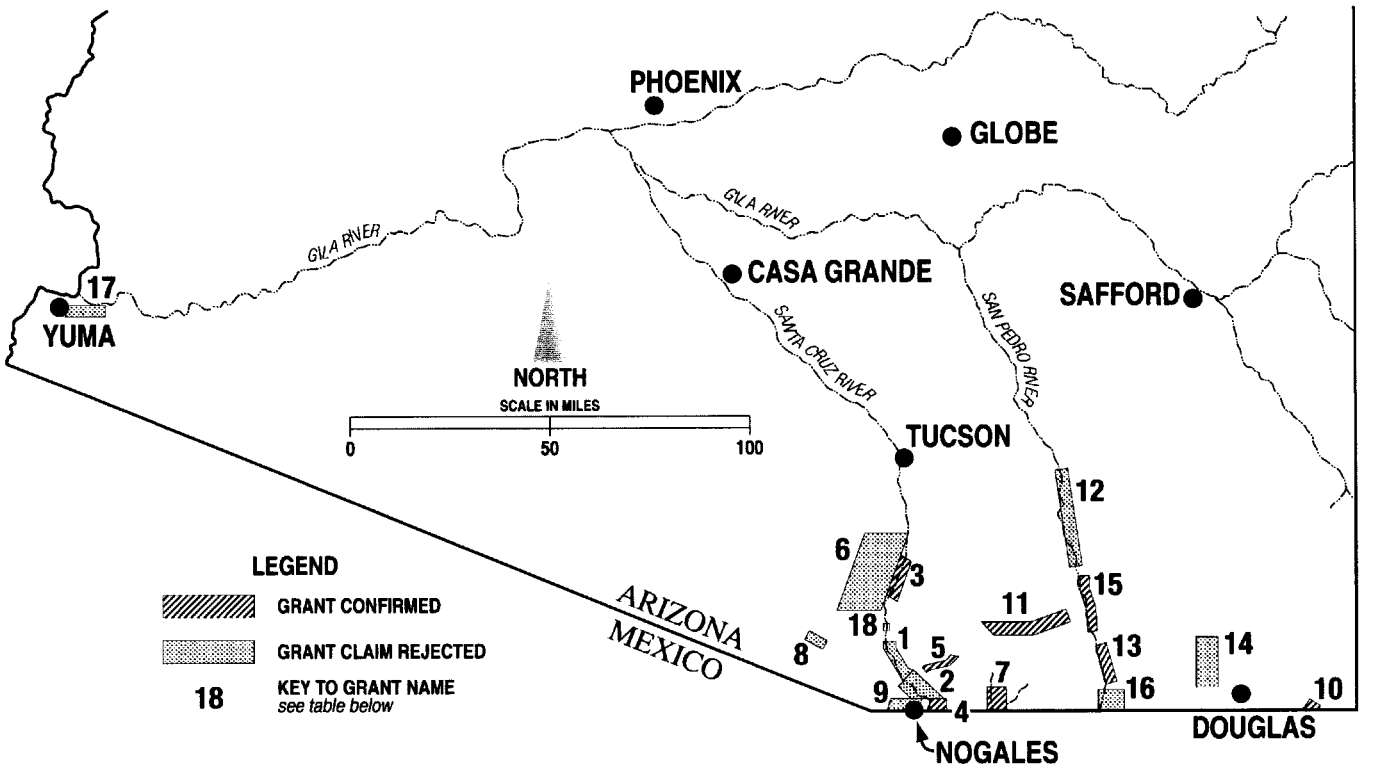
Gifts of cattle made Kino welcomed throughout northern Sonora. Traveling into Arizona in 1696-97, he gave "a few cattle and a small drove of mares" to the eastern Sobaipuri Indians at San Pablo de Quiburi and about one hundred head to those at nearby Santa Cruz de Gaybanipitea on the San Pedro River. He also left cattle at San Xavier del Bac. Kino intended these gifts to not only make missionaries like himself welcome, but also to establish an alliance between the Spanish and the tribes. For the Sobaipuris, their new cattle were a mixed blessing. Sobaipuri cattle provided a tempting target for Apache raids. By the 1760s they had either moved farther west or fallen to the Apaches. Since Kino's travels were usually restricted to the Santa Cruz valley, he gave cattle frequently to the Tohono O'odham.

Following Kino's death in 1711, the Arizona missions suffered decades of relative neglect. Many of the rancherias established by Kino had fallen apart, and revolt by the Pimas in 1751 resulted in the death of several missionaries and many of their native supporters. This short-lived rebellion had two important effects. First, the Jesuit order would never again have any real influence over the Indians. Second, in its efforts to reestablish control, the Spaniards established the presidio at Tubac.

Located in the valley of the Santa Cruz River at an altitude of 3,000 feet, Tubac sat at the bottom of a basin formed by the Tumacácori Mountains to the west and the larger Santa Rita range to the east. The terrain set the limits of the extent of Spanish colonial cattle raising. While cattle occasionally wandered and went wild, especially in the nineteenth century, they could never stray far from a reliable water source.

Tubac's most important commander was Captain Juan Bautista de Anza. With his limited resources-the presidio had only about fifty soldiers-Anza fought for years against hostile Apaches. By the late-eighteenth century, cattle were well established in Arizona and basic to the subsistence of both Spanish colonialists and their Indian allies. At the same time, hostile tribes like the Apache took advantage of the cattle for their own needs. Probably most Apache raids on the Spanish were aimed at their livestock, and the recovery of livestock was considered a notable achievement by the Spaniards.

In 1769, Spain's relatively lax control over its northwestern territories was threatened by Russian trading and trapping posts coming down the Pacific coast and threatening California. Franciscan missionary Francisco Tomás Garcés and Captain Anza conceived the plan to create an overland supply route to funnel colonists, livestock, and other supplies to California. In 1773 and 1775, Anza and Garcés led two expeditions from Tubac providing that Arizona could be a crucial link in maintaining control over California. Sixty-five cattle provided food on the hoof for the first expedition along the Camino del Diablo or Devil's Highway, the almost waterless track across southern Arizona. The second expedition included some 240 people, 695 horses and mules, and 355 cattle, who made the long journey to found San Francisco.



Name of Grant Claim	Acreage Claimed	Acreage Approved or Rejected
1. Tumacácori	81,350	rejected
2. Calabazas		
3. San Ignacio de la Canoa	46,696	17,204
4. Buenavista (María Santísima del Carmen)	17,354	5,733
5. San José de Sonoita	7,593	5,123
6. El Sopori	141,722	rejected
7. San Rafael de la Zanja	152,890	17,352
8. Aribaca	8,677	rejected
9. Los Nogales de Elías	32,763	rejected
10. San Bernardino	13,746	2,383
11. San Ignacio del Babocomari	123,069	33,792
12. Tres Alamos	43,385	rejected
13. San Rafael del Valle	20,034	17,475
14. Agua Prieta	68,530	rejected
15. Ranchos de las Boquillas	30,728	17,354
16. San Pedro	38,622	rejected
17. Algodones	21,692	rejected
18. Otero (Tubac Claim)	1,199	Claim not filed
	850,050	116,416

Graphic Design Section BR 11/99

Figure 16 Spanish Land Grant Claims in Southern Arizona

Hard-pressed to maintain control over its northern provinces with an economy of resources, the viceroy of New Spain issued a plan intended to extend both a carrot and a stick to the Apaches. While it called for vigorous war against hostile tribes, its most important feature was a plan to corrupt the Indians and make them dependent on Spanish supplies. Those Indians who made peace or were captured were to be settled at establecimientos de paz (establishments of peace) where they would be given a steady supply of alcohol, food, and inferior firearms. Tucson was one such supply point. Many Apaches did take advantage of this new policy and a new era of relative peace began. Between 1790-1820, the number of settlers grew as did the number of farms, mines, ranches, and the number of cattle. Some 5,600 head of cattle were said to be around Tucson by 1819. A census taken at Tumacácori mission in 1796 found 103 people. Of Tumacácori, the missionary, Father Bordoy, said "The resources which the mission at present has...are quite small. Since it scarcely has lands in which to sow, not because these are lacking, for there are lands, but because the water is lacking with which to irrigate them...Cattle are not worth much, since they have increased in these lands."

This brief mention of cattle is both informative and frustrating. The written records from this era are not extensive and there are unanswered questions in almost every area. From this excerpt we see the natural limits of farming and how naturally cattle took to the land. Individually, cattle were "not worth much," yet they supported the colonial economy. Selling cattle was about the only way missionaries could raise funds to build churches at Tumacácori and San Xavier. The record reveals the importance of cattle raising, but chroniclers paid little attention to the details of this mundane activity.

Spanish and Mexican Land Grants:

Cattle ranching dominated other activities such as farming or mining in the Spanish colonial economy of this era. To take advantage of the new peace, ranchers expanded their herds and petitioned the crown for grants of land shown on Figure 16. Large land grants helped establish the Elias, Ortiz, Herreras, and other Hispanic families permanently in Arizona. Most land grants in Arizona date from the last years of Spanish rule and the first ten years of Mexican dominion (1821-1831). After 1831, with the Mexican government unable to continue the policy of subsidized peace, the golden era ended. The bribery policy had worked to some extent, but the Apaches had not been corrupted into forgetting their old ways. When the stream of supplies ran short, the Apache quickly took up raiding again. No new petitions for grants in Arizona were filed after 1831.

Tomas and Ignacio Ortiz received a large land grant at San Ignacio de la Canoa along the Santa Cruz River in 1821. The governor of the Provinces of Sinaloa and Sonora granted this land for the purpose of raising "large cattle" and horses. The Ortiz brothers acquired another grant at Arivaca in 1833. This land was gained on the basis of an 1812 grant to their father, Augustin Ortiz, of two sitios for stock raising. (A sitio was approximately one square league with 4,338.464 acres.)

The largest land grant, however, was situated away from the Santa Cruz and San Pedro valleys, where most Spanish colonial activity centered, in the San Bernardino valley, which in 1822, reportedly ran as many as 100,000 head of cattle on a range of nearly 75,000 acres.

This tremendous ranch spanned both sides of the present international border. Other ranchers found good grassland in the Sonoita and Sulphur Springs valleys.

Under the Law of the West (which encompassed Sinaloa, Sonora, and southern Arizona), a grant of four sitios (17,350 acres or twenty-seven square miles) could be given for cattle ranching purposes. The grantee was required to immediately place livestock on the land. These extensive lands could only be marked by simple stone markers which caused later disputes over wandering cattle, water rights, and legal boundaries.

As large as these grants were, more land was needed to raise large numbers of cattle. Mexican cattlemen could add to their grant lands by paying the cost of a survey and the prevailing land price at the time of the grant. Later American ranchers would quickly learn the necessity of having a large range in an arid environment. In this way, Spanish and Mexican law better recognized the requirements for large-scale cattle raising in Arizona than did American law.

The early years of the Mexican Republic saw turmoil throughout the country. Tucson had the only significant colonial population in Arizona, with about sixty civilians plus soldiers. Politically, it was a part of the state of Sonora (after 1831). The mission system, the backbone of Spanish colonial efforts was ended. For several years there were no resident missionaries at San Xavier del Bac. The mission lands were nationalized in 1834 by largely abandoned to the Indians until the American period. Apaches attacked the Pima vaqueros at the mission rancho of Calabazas in 1830 after which the Pima abandoned the land they had gained in 1807. Warfare continued to the point that by the 1840s most Mexican ranches in Arizona were abandoned and the few remaining settlers were huddled about the presidio at Tucson. The giant San Bernardino ranch was abandoned sometime around 1831-33. Petitions were filed in 1831 for the Tres Alamos on the San Pedro River, but with increasing hostilities, nothing became of this last effort to expand ranching. Cattle raising as an industry ended and the animals left to the wild. Previous experience showed that the hardy cattle could do very well for themselves in the wild. Early American travelers through Arizona in the 1840s reported vast herds of wild cattle and range conditions were noted as excellent. However, by the 1850s wild cattle were exterminated from the Arizona range.

The cause was simply the continuous slaughter of wild cattle by Apaches, American soldiers and gold-seekers crossing Arizona, and Mexicans hunters supplying meat to Fronteras and Santa Cruz in the 1850s that overwhelmed the animals' natural ability to reproduce. Enough survived, through, to form a large herd of wild cattle. It was this wild herd encountered by the Mormon Battalion in their famous "Battle of the Bulls" on December 11, 1846. At a point where bluffs restrict the San Pedro River on both sides, several Mormon soldiers and many cattle and mules were reported by injured by enraged wild bulls.

The wild herds never got the opportunity to expand far beyond the area of initial Spanish and Mexican settlement; most were restricted to the length of the Santa Cruz and San Pedro river valleys. Commissioner Bartlett found them halfway between Agua Prieta and Fronteras, south of the junction of the San Pedro River and Babocomari Creek. Other overland travelers, however, did not report cattle. It is impossible to estimate the exact number of wild cattle, but reports from the Mormon Battalion and later gold-seekers indicated that they numbered in the thousands, at least for a short time.

Interestingly, only two out of more than eighty journals of Americans crossing Arizona in the 1840s and 1850s reported any female cattle, and this suggests one reason for the failure of the wild herds to survive. The apaches apparently had a preference for cow meat over bull meat. This selecting out the cows may have crucially limited the herd's ability to reproduce. The wild herds were probably all but gone by 1854. In that year chroniclers with two trail drives from Texas to California reported no signs of any wild cattle.

The Spanish and Mexican land grants left a tangled legal mess to be resolved under American rule. Under the Treaty of Guadalupe Hidalgo ending the Mexican-American War in 1848, owners of Spanish and Mexican land grants could secure continued title if they could find evidence in Mexican archives of the legality of the grants. The Territorial Surveyor General would then investigate the claim and report to the Secretary of the Interior. The U.S. Congress then had to take final action to approve the grant. By 1888, the Secretary of the Interior referred fifteen claims to Congress with thirteen recommended for approval and two for rejection, but Congress refused to take up the issue, and established the Court of Private Land Claims to review the claims. Working between 1891 and 1904, Table 13 lists the eighteen grant claims in Arizona reviewed by the Court.

Table 13. Spanish Land Grant Claims in Arizona considered by the Court of Private Land Claims.
(From Walker and Bufkin)

Name of Grant Claim	Acreage Claimed	Acreage Approved or Rejected
1. Tumacácori	81,350	rejected
2. Calabazas		
3. San Ignacio de la Canoa	46,696	17,204
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16. San Pedro	38,622	rejected
17. Algodones	21,692	rejected
18. Otero (Tubac Claim)	1,199	Claim not filed
	850,050	116,416

Complicating matters in Arizona, the Baca family of New Mexico won a settlement over a large land grant claimed for Las Vegas, New Mexico in which it was allowed to select five tracts of almost 100,000 acres each elsewhere. The family chose two tracts in Arizona Territory. Baca Float Number 3 lay along the Santa Cruz River and overlapped much of the Tumacácori,

Calabazas, and San José de Sonoita grants. The second tract in Arizona, Baca Float Number 5, was located in Yavapai County.

In southern Arizona, only a few properties survive from the Spanish and Mexican eras. Only the great mission San Xavier del Bac still stands with a high degree of physical integrity. Mission sites at Tumacácori and Calabazas stand more or less as ruins. The presidios at Tubac and Tucson have totally vanished as architecture and are now archaeological sites. The Tubac site is protected as part of the Tubac Presidio State Historic Park.

San Xavier de Bac, San Agustín del Tucson, and Tumacácori are primarily significant as mission sites. The presidios are more important as military bases and the centers of settlement. As we have seen, the missions greatly aided the expansion of cattle raising in southern Arizona. They not only had herds to support their own activities, but also gave cattle to the Indians. Livestock represented the center of the Spanish and Mexican era economy.

The missions included more than just the religious building. The churches were centerpieces of communities and other structures existed to facilitate all the activities of daily life. Besides the church, there would also be the quarters of the missionaries, an open square, workshops, storerooms, barns for horses and cattle, and structures for the Native American community. Nowhere in Arizona do these associated buildings still stand.

The Tucson urban area has already consumed most of its Spanish Colonial and Mexican Period settlements, and expanding development along the Santa Cruz River at Green Valley, Sahuarita, Canoa, and even Tubac are eroding the archaeological record all along the historic corridor of Spanish and Mexican activities.

Nonetheless, it is clear that the introduction of cattle and other livestock during the Spanish and Mexican periods forever changed the Native population who adapted to these European innovations by altering their own patterns of settlement and subsistence. Morever, cattle ranching was about to become a critical industry and effect even greater change in Territorial Arizona with the advent of the American Period.

III-2. The Territorial American Period & Homesteading:

The Spanish and Mexican period, when Spanish missionaries first introduced cattle and horses into Arizona and great land grant ranches operated, ended with the 1854 Gadsden Purchase. Not least in the significance of this Spanish Colonial period is the profound effect that the introduction of cattle made on the native Indian economy. Of course, cattle were only part of the larger mission and presidio system imposed on these people by the Spanish, but as Father Kino knew, cattle were a necessary resource on which missions and colonies rested.

Historical trends during the American period may be followed by the number of cattle in Arizona. Up to 1880 the number of cattle was fairly low. Only about 136,000 head roamed the entire extent of Arizona, up from practically zero in the 1850s when the area came under American control, but far less than the number that would be permanently established. The 1880s saw a tremendous growth in the industry, leaping to 927,880 in 1890. From 1848 to 1880 this may be called the pioneer period. In this era only a few ranchers set up permanent

cattle raising operations. The Civil War and Indian warfare greatly hindered American occupation in the Southwest. By 1880, Indian warfare was all but ended except for the famous campaign of Geronimo in southern Arizona. With the Southern Pacific transcontinental route crossing southern Arizona in 1880 and the Atlantic and Pacific (later Santa Fe) routes opening northern Arizona in 1883, a great boom period began. This continued until 1893 when a great drought and overstocking devastated the industry. The census recorded a drop to 742,635 head in 1900. This boom and bust are the next major periods.

A period of transition followed the drought of the 1890s. The number of cattle remained fairly stable (average of 796,494 head from 1900 to 1920) while the industry developed a more secure foundation. Toward the end of this period, the industry was so firmly established that it again boomed in the 1920s, reaching a historic peak of more than one million head. The Great Depression of the 1930s forced another contraction in the industry. This fourth and last era from 1930 to 1950 was also fairly stable, though at a lower level of activity, with an average of 701,812 head across the state. The modern period after 1950 saw another but different boom — the urbanization of Arizona, which today is having a profound effect on Arizona's cattle industry.

The Pioneer American Era in Southern Arizona:

Apache warfare against the Mexicans beginning in the 1830s was successful enough in Arizona to effectively separate the Spanish and Mexican cattle industry from the later American period. The Mexican cattle were either killed or scattered to run wild, eventually vanishing by the 1850s. Victory for the United States in the Mexican-American War led to the acquisition in 1848 of most of what is now its Southwest, including Texas, New Mexico, most of Arizona, and California. Under the terms of the 1853 Gadsden Purchase (ratified in 1854), the U.S. acquired those parts of Arizona and New Mexico south of the Gila River. These arid lands that comprise Pima County today (politically part of New Mexico Territory until 1863) were one of the harshest frontiers facing American settlement. Not only was there the challenge of the terrain which made traditional farming difficult, there was also the business of subduing the Indians if the newly acquired lands were to be Americanized. Violent conflicts between the U.S. military, American settlers, and the various Indian groups, particularly the Apache tribes continued sporadically until the final surrender of Geronimo in 1886.

Through the 1850s, Arizona was a little more than a passageway for gold seekers and emigrants traveling to California. The southern route, which generally followed the Gila River, was one of the major transportation routes in the West. In the late 1850s the Butterfield Overland Stage Company opened regular services across the desert Southwest, followed in 1881 by the completion of the Southern Pacific transcontinental railroad line through Tucson and Pima County. People trailed their cattle and oxen (steers) along with them.

The cattle trails did not follow a uniform path. From Texas and New Mexico to Tucson there were several possible routes. One trail left the Pecos River near Roswell, New Mexico and headed west through Tularosa, Santa Rita and Silver City. It then followed the San Francisco River to the Gila which it followed across Arizona. A second trail went from Pecos into El Paso, followed the Rio Grande north to about Las Cruces and then headed west to Deming and Lordsburg. In Arizona it passed the Chiricahua Mountains through Apache Pass, around the

north side of the Dragoon Mountains to the San Pedro River, then between the Whetstone and Rincon Mountains to the Santa Cruz River and Tucson. This was the route later used by the San Diego and San Antonio stage line and the Butterfield. Yet another variation followed the path of the Mormon Battalion through Guadalupe Canyon, the San Bernardino Valley, and then up the San Pedro before crossing over to Tucson. A fourth trail came up north from Sonora straight up the San Pedro. Beyond Tucson the trail pretty much followed the Gila River.

Through the 1850s and up to the start of the Civil War, herds of Texas longhorns passed annually across southern Arizona on their way to feed the hungry miners in California. With little population of its own except for the Indians, these Texas trail drivers found little incentive to establish ranches in Arizona. Many noted the abundant forage available and its potential was clear, but it was only a potential as long as hostile Indians made the area dangerous and there was practically no local market. A popular writer, J. Ross Browne, traveled across Arizona in 1864 and commented that the Gándara or Calabasas ranch was

> *one of the finest in the country. It consists of rich bottom lands and rolling hills, extending six leagues up and down the Santa Cruz River by one league in width, embracing excellent pasturage and rich arable lands on both sides...At present, however, and until there is military protection in the country, it is utterly worthless, owning to the incursions of the Apaches.*

Not only did Arizona contain practically virgin grasslands for livestock, cattle raising practices in this pioneer period made its capital investment needs low. The cattle themselves could forage on the open range, reproduce and increase the herd, and could be driven to market. Stockmen required little capital and not a lot of labor to maintain sizable herds. The industry required extensive lands through, and in the arid environment, a reliable supply of water was a necessity. Fortunately for the stockmen, ownership of the land they needed was never a requirement. The typical pattern was to acquire just enough patented land to secure good watering places. Then by controlling the available water, the surrounding open range was theirs for the taking. In this era there was no problem with government grazing permits or fees. Of course, the stockman's range was vulnerable to possession by latecomers be they other stockmen, farmers, or other settlers. This led to conflict as the first on the range believed they should have perpetual rights to it.

Federal land laws encouraged the rapid privatization of public lands. Railroads acquired tens of millions of acres as subsidies for expanding the nation's rail net; mineral laws all but gave away tremendously valuable ore bodies. Perhaps most well known was the 1862 Homestead Act passed to provide the means for free labor and yeoman farmers to acquire a competence in land. Though its exact terms were amended over the years, the Act promised 160 acres of free and to anyone who would settle on and work it.

Arizona stockmen quickly used the Homestead Act to their advantage. The 160 acres they claimed encompassed water sources which automatically gave them control, though not ownership, of the surrounding range. With a small homestead, a stockman could control a ranch of several thousand acres. Some stockmen were not above bending the law to take control of more land. Through fraudulent and dummy entries, for example, by having their employees file homestead entries and then purchasing them cheaply after they were patented, some major land holdings were pieced together.

Trailing Texas cattle across to California accounted for most of the industry's activities during the 1850s. One of the first to establish a permanent ranch in Arizona was Pete Kitchen. Born in Kentucky about 1822, Kitchen served in the Army during the Mexican-American War and then proceeded to California. He arrived in Tucson in 1853 or 1854. Realizing the potential of the grasslands along the Santa Cruz River, Kitchen decided to make a go of ranching, taking a number of well-armed Opata and Mexican workers to Potrero Creek, which empties into the Santa Cruz just north of Nogales. The adobe headquarters he built were practically a small fortress, and defense against hostile Apaches proved a great challenge. When federal troops were withdrawn from the territory at the beginning of the Civil War, Kitchen almost uniquely, managed to hold onto his ranch.

In this era, an isolated rancher could not survive just by specializing in cattle raising. These pioneers had to attain a high degree of self-sufficiency, producing all their food and many of the materials necessary for themselves and their workers. Pete Kitchen's ranch supplied all manners of agricultural goods to Tucson, the army, miners, and other passing through or attempting to settle in southern Arizona. In addition to cattle, Kitchen raised sheep, chickens, hogs, and horses. His fields produced fruits, vegetables, and grain. As the most reliable source of supply in the region, Kitchen's ranch played a crucial part in the early settlement of southern Arizona. But as Indian conflicts decreased through the 1870s and especially after the opening of the Southern Pacific Railroad, Kitchen's ranch no longer mattered so much, relatively speaking. After nearly twenty years of frontier cattle raising, he sold out in 1883, reportedly for $36,000 and moved to Tucson.

Henry Clay Hooker was one of the most successful ranchers in the pioneer period. Beginning with a 160-acre homestead, Hooker expanded his Sierra Bonita Ranch into a personal barony measuring twenty miles west to east, and almost thirty miles north to south. He arrived in Arizona in 1866 and got his start in the cattle industry, as did many stockmen, by getting a contract to furnish beef to the army. He moved to the Babocomari Creek where he could supply beef to Ft. Crittenden, and moved again in 1870 to the Baboquivari Valley southwest of Tucson, he found his Indian problems somewhat relieved. Within a few years he was an important stockman in that part of the Territory.

In southeastern Arizona, in 1871, Hooker discovered abundant water and lush grass and established the Sierra Bonita Ranch in the Sulphur Spring Valley. Within a couple of years of its founding, the Sierra Bonita Ranch held several thousand head of cattle along with a large herd of horses. Hooker supplied beef to the Apache reservations and to Army posts. By 1884, Hooker estimated that he had supplied more than 100,000 head of beef and stock cattle since coming to Arizona.

In the Cienega Creek Valley, between the Santa Rita and Whetstone Mountains is a broad expanse of rolling hills, and good grass and permanent water that attracted cattlemen and sheepmen early. Men of the name Sanford, Kane, and Gardiner started some of the first small ranches there. The Cienega Ranch in 1880 ran 1,000 cattle and 23,000 sheep. Big money and big ambitions moved into this area in 1876 when Walter Vail, in partnership with two Englishmen, bought the 160-acre Empire Ranch and 612 cattle. Vail bought up surrounding ranches until his won spread lived up to its name. Up to 50,000 cattle grazed on the Empire at it height and Vail controlled nearly a thousand square miles of range stretching from the Mexican border to the Rincon Mountains. Vail understood that to get a good return in Western

ranching, one had to make sizable investment in land, cattle, and improvements. A shrewd businessman, Vail expanded his vast land base and operated the Total Wreck Mine which yielded substantial wealth in Silver allowing Vail to diversify his holdings.

Like his land holdings, Vail also created an expansive ranch headquarters. The original ranch house was a simple, four-room zaguan plan with a central hall dividing two rooms from the other two. Its adobe walls were eighteen inches thick. Stylistically, it followed Mexican traditions of building material and layout. Vail expanded the house with five new rooms, and then in 1884, after bringing a new bride to the Empire Ranch, attached another large adobe house to the original. The new addition boasted a large stone fireplace and a half-hexagon bay window, a Gothic Revival detail which spoke for the imported tastes of newcomers to Arizona. This house still stands and is being preserved by the Bureau of Land Management, which now owns the ranch where cattle still graze.

Another of the great cattlemen of southern Arizona was Colin Cameron. The Camerons were an important family from Pennsylvania. They made a fortune in banking and railroading, and, in 1882, he had a brother started ranching in Arizona in a big way, purchasing the San Rafael land grant. He built a veritable palace on the range and from it Cameron ruled over a ranch that dominated 600,000 acres. Like Hooker and Vail, Colin Cameron had the foresight and money to improve his herd in the boom years of the 1880s. Today, the San Rafael continues as a working ranch under the current management of the Nature Conservancy and Arizona State Parks.

It is important to note that the arrival of Anglo-American ranchers into Arizona did not end the importance of Hispanics in the ranching business. With the decline of Indian warfare, the Otero, Pacheco, Elías, Ruelas, León, Ortiz, Ramírez, Amado, and other old families returned to ranching. Newcomers coming up from Mexico included the Carrillo, Aguirre, Robles, and Sanmaniego families. Many others earned their living working on ranches all across Arizona. None, however, retained their claim to the original Spanish and Mexican land grants.

III-3. The Boom Years of the 1880s:

The pioneer period cattle industry depended on government contracts to supply beef to soldiers and the reservations. For this purpose, it sufficed to import sturdy Texas longhorns and Mexican criollos. These animals survived well in the harsh environment and could be trailed across hundreds of arid miles. Their meat, though, had limited market appeal. The opening of transcontinental rail service in Arizona with the completion of the Southern Pacific in 1881 rearranged the parameters of the livestock industry. Foremost was the opportunity to begin supplying meat to a national market. To meet this challenge ranchers had to shift from longhorns to the more marketable Shorthorn and Hereford breeds. In the Sulphur Springs Valley, for example, the rail town of Willcox shifted the direction of local cattle marketing. Henry Hooker, for one, moved quickly to adapt his Sierra Bonita operation to the dictates of this expanded market. In 1884, he brought in Shorthorn and Herefords breeding stock.

Changing the breed of cattle required altering the method of cattle raising. These improved breeds were both more valuable and less able to fend for themselves on the open range. One method used to protect them was to exterminate natural predators like the wolf and mountain

lion. Capital improvements on the ranch were also necessary. The boom period was the high point for the open range system, but it also stretched the capacity of the range beyond its natural limits.

Early arrivals in southern Arizona uniformly noted its abundant grasses along the major streams. The Mexican cattle period apparently placed no great strain on the region's grassland, or at least there was sufficient time in the decades from the 1830s to the 1870s for it to recover. However, by the 1870s, cattle herds had already reached optimal numbers. Further increases only tended to decrease the land's ability to regrow an abundant forage, year after year. In addition to cattle, there was also a thriving industry in harvesting wild hay to sell to the army posts and settlements. Ranchers themselves cut wild grasses for hay to sustain their herds in off seasons. Surveyors for the Public land Survey often noted hay roads and hay corrals, especially in Cochise County. Typically, it was Mexicans and Indians using sickles, knives, and hoes who did this labor, seeking out grama, galleta, sacaton, and other good hay grasses.

Wild hay harvesting occurred over several decades, declining after about 1910. In years of good rain yields per acre could be from 0.86 to 0.92 tons. In some riparian areas yields of up to two tons per acre were reported. This business was highly regional with Cochise County accounting for nearly half of the total hay harvest in the territory. Although not entirely a cattle-related activity, ranchers took advantage of the availability of wild grass for hay, and it provided an important support for the industry. Unfortunately, while it provided an important means of supplying food for cattle over the whole year, wild hay harvesting could also exacerbate the overgrazing problem that was growing ever more serious through the 1880s, especially when cut by poor methods. The Tucson Star noted the seriousness of the situation when it found

> *...the vast plain of grama grass west of Tucson is being dug out by the roots, thus totally destroying the hope of the grass starting where it has been cut out...The grama grass of Arizona is the finest pasturage known, and is a source of great wealth in the growth of stock... This grass can be cut without killing the roots, and to this there cannot be urged any objection...Unless something is done, the grama grass will soon be a thing of the past in Arizona.*

The wild hay business declined as changing land conditions made the supply increasingly uncertain. Mesquite, acacias, and other woody shrubs invaded the grasslands, permanently reducing their forage potential. Grasses still grew, but it was only during wet years that enough grew to warrant commercial cutting. Ranchers after the boom period moved increasingly toward their own supply of irrigated crops to supply hay.

In the boom economy, speculative cattlemen moved to fill every corner of the territory, taking advantage of any open range available. The boom of the 1880s also created a mentality that refused to recognize any negativity. In his annual report of 1883, Territorial Governor F.A. Trittle claimed that Arizona Territory had 34 million acres of grasslands-enough to carry 7,680,000 cattle. In fact, Arizona could never graze anywhere near that number. When the number went significantly more than one million (and there was a significant number of sheep in addition) the conditions for a rangeland disaster where at hand. The boom period began to falter in 1885 when the first drought struck. When low rainfall combined with the record

number of cattle on the range, the land simply could not support the size of the herds. In addition, the effect of the bust was nationwide, with cattle prices falling from $30 to $35 per head to $10 or less in 1885. What fattened cattle there were in Arizona were shipped off to get whatever price they could. Still, losses were exceedingly high.

There was hope in the irrigated fields of the Salt River Valley, but with freight rates high, some alfalfa was left rotting in the field. The Southern Pacific had recently completed a branch from Maricopa to Phoenix, and many ranchers thought they could ship their cattle from there.

III-4. The Bust Years of the 1890s:

While there had been many relatively dry years from the 1860s through the 1880s, the great drought of the 1890s was particularly tragic and had a significant effect on the landscape. The number of cattle as well as other forms of livestock increased to record highs by 1890. Significantly, those numbers were also more concentrated in particular areas of the territory than in the later twentieth century. Many ranchers well understood that they were grazing beyond the land's capacity to recover. When overgrazing was exacerbated with drought, the result was not only massive loss of livestock and financial ruin for many, but also change in the natural flora of the desert grazing lands.

Early descriptions of southeastern Arizona make it quite clear that the region was far more of a grassland than it is today. The decline of tall grasses and the increasing dominance of woody plants like mesquite, acacia, burroweed, and snakeweed are a direct result of human activities like fire suppression, wild hay harvesting, and livestock grazing. Natural fires act as a suppressant for these types of flora and favor quick-growing plants like grasses whose primary energy storage is in their roots. Also, many streambeds that are dry today had much greater and regular flows of water and were surrounded by forests of willow and cottonwoods. Large stands of mesquite and sacaton spread over large areas of bottom land.

While fire suppression, haying, and grazing placed increasing pressure on native grasses, new species of grass, more adaptable to new conditions, were introduced. Short species that spread by runners were increasingly favored over grasses that reproduce primarily by seed. Streambeds were often indefinitely defined, changing course easily across wide valleys. The trampling of cattle and the change in flora greatly increased the rate of erosion and caused severe gullying. This increased the damage due to intermittent flooding and contributed to the fall of many stream flows to below the surface. The arroyos that so characterize the deserts of southeastern Arizona today are, to a large degree, the result of human land use. Cienega Creek, near Pantano and home range of the Empire Ranch, is now dominated by mesquite. Edward L. Vail in 1880 described the area as a succession of meadows thickly covered with sacaton and salt grass. Mesquite then was limited to the gulches and checked erosion. The change was becoming apparent in the 1890s. Ten years after the optimistic estimate that Arizona could support more than seven million cattle, the governor's report of 1893 mentioned, "In nearly all districts, owing to overstocking, many weeds have taken the place of the best grasses.

In 1901, D.A. Griffiths, chief botanist for the Arizona Experiment Station in Tucson began a study of forage conditions in southern Arizona. Even after cattle numbers had been greatly

reduced over the 1890s the land still shows the effect of overgrazing. He characterized the southern Arizona rangeland as more degraded than any others he had seen in the Western United States. And that was not just his opinion. Henry Hooker recalled that range conditions were "fully double" their current capacity, and described the changed San Pedro Valley:

> *The San Pedro Valley in 1870 had an abundance of willow, cottonwood, sycamore, and mesquite timber; also large beds of sacaton and grama grasses, sagebrush, and underbrush of many kinds. The river bed was shallow and grassy and its banks were beautiful with a luxuriant growth of vegetation. Now the river is deep and its banks are washed out, the trees and underbrush are gone, the sacaton has been cut out by the plow and grub how, the mesa has been grazed by thousands of horses and cattle, and the valley has been farmed. Cattle and horses going to and from feed and water have made many trails and paths to the mountains. Browse on the hillsides has been eaten off. Fire has destroyed much of the shrubbery as well as the grass, giving the winds and rain full sweep to carry away the earth loosened by the feet of the animals. In this way many waterways have been cut from the hills to the river bed. There is now little or nothing to stop the great currents of water reaching the river bed with such force as to cut large channels and destroy much of the land under cultivation, leaving the river from 10 to 40 feet below its former banks.*

As to the cause of these environmental changes, Hooker believed the cause was due "principally to overstocking." At the height of the boom, there were 50,000 cattle at the head of Sulphur Springs Valley and the valley of the Aravaipa. By 1900, there was not more than half that number, and those doing poorly.

C.H. Bayless, a rancher in Oracle, agreed:

> *The present unproductive conditions are due entirely to overstocking...Droughts are not more frequent more than in the past, but mother earth has been stripped of all grass covering. This is all the direct result of overstocking and cannot be prevented on our open range where the land is not subject to private control.*

Bayless's last point is significant. An important part of the problem was the nature of land ownership. For land in the public domain, a rancher had no long-term interest in maintaining its productivity. Where land could be entered at any time by homesteaders, miners, or other ranchers, it was actually in the rancher's short-term interest to take as much from the land as he could before someone else came along. The result was a landscape mined of its forage rather than conserved as a permanent resource.

After 1893, the number of cattle declined, but overgrazing remained a permanent problem. The census recorded a high of 927,880 head of cattle in 1890. The actual number was surely well more than one million. For the period 1900 to 1920, the average number of cattle was 796,494 head. Sheep, however, more than made up for this decline, rising from 515,136 in 1890 to 1,226,733 in 1920. Sheep were more prominent in northern Arizona. Overall, the livestock industry which was somewhat geographically concentrated in the pioneer and boom periods, spread more evenly across Arizona, mitigating the impact of the increasing numbers. The legacy of a permanently changed landscape remains an important problem today and is central to political debates over the role of livestock in the economic future of Arizona.

III-5. The Start of the Modern Cattle Industry:

The disastrous drought of 1891-93 forced ranchers wishing to stay in the business to reorganize and take a different approach to cattle raising. In the 1880s ranchers tried to raise and feed the largest herds for sale to the beef markets of California and other parts of the nation. In the new cattle business, Arizona ranchers increasingly specialized in breeding superior beef animals and then shipping them to other states for fattening. On the range, a system of paying grazing fees for use of the public domain institutionalized the stockman's right to use the land. With his long-term use of the land assured, ranchers could make capital improvements by building water tanks and fences. By limiting the number of cattle investing in the land and practicing good management, ranchers ultimately created the conditions for a gradual recovery of the land and their herds in the decades ahead. The open range gave way to stock raising as a modern business enterprise.

The cattle, too, underwent more systematic improvement. In the early pioneer days, Arizona cattle were derived from Mexican and Texan criollos. The Texas Longhorn was an Andalusion-derived criollo with a small influence of preregister American (i.e., British-derived) cattle. As mentioned before these cattle were well suited to the harsh conditions of the frontier range. They were also adequate to the restricted market of military posts and Indian agencies. However, the larger market opened by the transcontinental railroads was now demanding a higher grade of beef. This was the result of the increasing dominance of recognized cattle breeds. Selective breeding of cattle began in England in the late eighteenth century. Different breeders bred toward different goals, some for heavier bodies and more meat, and others greater milk production. This breeding spread to Europe and became formalized in the creation of breed societies and recorded herd books. By the early nineteenth century, there were a number of competing "breeds" of cattle such as Shorthorns, Herefords, and Angus in the beef category, and Jersey and Ayrshire in the dairy.

The Shorthorn gained early favor. The first Shorthorns to establish a recorded herd in the U.S. arrived from England in 1817, but it was only after the Civil War that systematic replacement of non-breed types began. The Hereford soon followed and eventually dominated. Ranchers throughout Arizona Territory slowly replaced their herds with Shorthorns and Herefords. The governor's report of 1889 claimed that the territory's herds were greatly improved. Only along the Mexican border and the Indian Reservations did the old cattlemen find a continuing market. Cattle improvements, however, increased the need to invest in land improvements since these breeds could not survive as well on their own. The Hereford became the dominant breed in Arizona. Of all the breed cattle, the Hereford proved the most adaptable to range conditions. While it probably could not survive in a wild state as its criollo cousins could, Herefords have long remained the favorite of western ranchers-a seemingly perfect balance of hardiness and marketability.

The business concentrated on marginal improvements to secure its niche position in the national cattle market. They found that by retaining yearlings, they reduced the future calf crop and increased the size of the breeding herd that could be kept.

As for the capacity of the land, this concept changed from what is the maximum number of cattle that we can possibly stock to "what could be carried through the poorest season" — a significant change in emphasis.

III-6. Grazing the Public Domain:

The romantic image of the cowboy, cattle, and the open range has little connection with the reality of the cattle business in any era. In the Spanish and Mexican eras, land grants defined land ownership and were used to promote cattle raising and settlement. Many of these grants were later confirmed in the American period. Even in the frontier American period, ownership of waterholes and creeks was a crucial element in establishing a permanent ranch. Who could graze on the open range, that is, on the unfenced public domain, was largely determined by who controlled the nearby water. Ranchers could acquire land through a variety of methods, and this section will summarize federal land law and establish the primary legal framework in which ranches in Arizona were created and operate.

The great expanse of land that we call the public domain is what remains of the 1.8 billion acres of land acquired by the United States in the eighteenth and nineteenth centuries. The first major acquisition came as several of the newly independent states ceded their claims to trans-Appalachian lands to the confederation and later the federal government. The lands were seen to provide a long-term source of revenue for the government to help it pay its Revolutionary War debts. Land was also to be given to war veterans in compensation for their service. From the very beginning, then, the public domain was seen only as something to be disposed of. Through the first half of the nineteenth century-up to the acquisition of the future state of Arizona-debate revolved around the most advantageous method of disposing of land. The two primary competing views were between those who wanted to maximize revenue and those who wanted to promote settlement and development. Roughly speaking easterners supported the former viewpoint while westerners supported the latter.

The Louisiana Purchase of 1803, the purchase of Florida from Spain in 1819, the British cessation of Oregon below the 19th Parallel, and then the acquisition of the Southwest in the Treaty of Guadalupe Hildalgo (1848) and the Gadsden Purchase (1853) rounded out most of the territory of the lower forty-eight states. In the early years when the need for revenue was critical to the survival of the young federal government, the land laws tended to support the idea of orderly identification of lands and sale both in large and small plots. The landmark Land Ordinance of 1785 established the system of survey of public lands into six-mile square townships and the further division of a township into thirty-six, one square mile sections. Of the first townships surveyed in the Old Northwest-today's Midwest-one-seventh were to be reserved to satisfy military land warrants while the rest were to be auctioned off at no less the one dollar per acre. One section was to be reserved to provide revenue for public schools. The initial application of this law was hesitant as surveys in the wilderness and continuing Indian warfare slowed interest in the area.

The next major change in public land law came in 1796. The major influence at this time was Secretary of the Treasury Alexander Hamilton who supported the idea of selling land in bulk to capitalists and land companies in order to obtain immediate revenue. Thomas Jefferson believed that the public domain should be divided to provide farms for the largest number of people in order to preserve and promote the civic virtues he believed derived from an independent, rural lifestyle.

With the federal government handling thousands of land claims, Congress in 1812 centralized responsibility "to superintend, execute, and perform all such acts and things touching or

respecting the public lands of the United States" to a new General Land Office (GLO). Land sales rose and fell over the next few decades in response to the general economic conditions of the country.

One important issue that arose and which affected Arizona in particular was how to treat preexisting land claims. The Treaty of Guadalupe Hidalgo and the Gadsden Purchase guaranteed the property rights vested in legitimate land grants from the former sovereignties. In Arizona the issue revolved around Spanish and Mexican land grants. Poor documentation and fraudulent claims complicated the situation so that many years passed before these claims were settled.

Complicating the situation even more were the pioneers moving ahead of the slower moving surveyors and establishing farms and ranches. Legally, these people were squatters with no legal rights to the land. Occasionally, the federal government took action to removed squatters, but these people were not without their sympathizers and supporters. After all, they claimed, they were only fulfilling the government's expressed desire to fill up the frontier as rapidly as possible and several times in the first half of the nineteenth century Congress gave squatters prior claim. These laws expressed the declining concern over revenues from land sales and the increasing desire to promote development.

The first major land law enacted after Arizona became part of the Untied States was the Graduation Law of 1854, which lowered the price for lands that had gone for years without a buyer. Under this law, land could be bought for as little as twelve-and-a-half cents an acre. Land sales boomed again after graduated prices began, though as was often the case, speculators and fraudulent entries plagued the process.

The most serious debate in the 1850s revolved around the proposal to give away land free its supporters espoused the idea of the yeoman farmer and claimed that a homestead law would provide a safety valve for poorly paid urban workers. The homestead proposal became central to those arguing in favor of "free soil." The newly formed Republican Party backed a homestead act, and after Lincoln's election in 1860, Congress easily passed the Homestead Act of 1862. Under this Act, any head of household, widow or single person over twenty-one years of age could apply for 160 acres of the public domain. The land would become private-be patented-after the claimant worked the land for five years.

The Homestead Act of 1862 promised great things for American democracy. The ideas it embodied fulfilled the vision of Thomas Jefferson; however, the reality of implementation was otherwise fraudulent and speculation continued with no more than minimal oversight or even concern from Congress. In Arizona cash-poor ranchers used the Homestead Act to claim springs and riversides knowing that to control water in the desert was also to control the thousands of acres beyond. More affluent ranchers could get their employees to claim land and then purchase it cheaply after it was patented. This method contributed greatly to the amalgamation of large ranches.

With the end of the Civil War, the federal government turned again to efforts to dispose of the public domain. Land laws passed in the 1870s and afterward tried to fine tune the law with the particulars of the great variety of land in the West. Many people believed in their ability to alter the very climate in which they settled. The idea that "rain followed the plow" gained

widespread adherence. Years of good rain encouraged this belief and spread settlement well beyond the natural limits of wise agricultural use. Congress then passed the Desert Land Law of 1877 which offered full section (640 acres). While the Desert Land Law did not require actual residence on the land, it did require irrigation be applied to the land, something may found difficult or impossible. Fraud flourished under both of these acts. One infamous trick was for a claimant to pour a barrel of water on his land and then pay a witness to testify that they had seen it irrigated. Response to the Desert Land Act was quick in Arizona with nearly a hundred claims filed within the first few months. In southern Arizona, some of the early claimants included prominent men like A.P.K. Safford, Thomas and Samuel Hughes, E.N. Fish, Franklin and Don A. Sanford, and Sabino Otero.

Open range had limited appeal even to stockmen. Many put up fences on the public domain to control their own and other's cattle. This raised the rancor of many homesteaders who did not like public lands being treated as private ranges. February 1885, Congress responded to homesteaders' complaints by declaring it unlawful to enclose any public lands. President Cleveland responded with an executive order to remove all fences on the public domain. This federal policy did not change until the 1930s.

For years Congress ignored the many recommendations made by head of the General Land Office and by special commissions on the need to reform the land laws to reduce fraud. Congress finally acted in 1891 by passing the General Public Lands Reform Act (also called the General Revision Act). Under this law individuals could not acquire more than 320 acres of public land and Desert Land entries reduced to 320 acres.

This act also recognized a new force in the public land debate. With so many ways to acquire public land it was no surprise to find the public domain greatly diminishing at the end of the century. Seeing how many of the forests of the Eastern states were stripped away, many people began to worry about the rapid depletion of Western forests. A new ethic of conservation developed that challenged the age-old idea that the public domain must be given over to private hands for the country to develop. Conservationists believed that the permanent prosperity of the nation depended on the wise and controlled use of its resources. Forests, for example, or range land could grow timber and grass forever if managed in a way that did not encourage immediate short-term profits. The Act of 1891 contained a provision to set aside public forests in timber reserves. For the first time, the idea that some land should permanently reside in the public domain found a voice in the law.

While presidents Harrison and McKinley set aside some reserves, conservationists found their true hero in Theodore Roosevelt for whom conservation was a crusade. He wrote, "If we of this generation destroy the resources from which our children would otherwise derive their livelihood, we reduce the capacity of land to support a population, and so either degrade the standard of living or deprive the coming generations of their right to life on this continent."

In addition to the General Land Office, authority over the public domain now resided in several agencies. The Bureau of Reclamation controlled lands dedicated to irrigation projects. After 1907, the Forest Service managed the increasing number of forest reserves. In 1916, the National Park Service was created to oversee the increasing number of National Parks and Monuments which the President and Congress were setting aside for special use.

While federal government became increasing active in public land development and accepted the idea of a permanent public domain, the older homestead ideal did not die. The Reclamation Act of 1902 maintained a statutory preference for small farmers and the Forest Homestead Act of 1906 again opened agricultural lands within the forest reserves to settlement. Responding again to the needs of the arid West, the Enlarged Homestead Act of 1909 increased to 320 acres the amount of non-irrigable land that could be claimed. In 1912, Congress reduced the time a claimant had to spend on their homestead to receive a patent to three years. These liberalized terms created the last public lands boom. In all, more homestead claims were made after 1900 than before. This boom ended in 1917 with American entry into World War I. After the war an agricultural depression destroyed many people's hopes of finding a living on a farm.

In the 1920s there was also simply less good agricultural land left to claim. What remained of the public domain served ranchers more than any other interest. Western ranchers depended on easy access to public lands for their economic survival. But competition became increasingly fierce with new comers claiming their share of the public bounty. There were two major problems associated with the open range. First, there was no law that prevented any new comer from grazing on the same land. Sheep herders arriving on lands previously used only by cattlemen caused several famous conflicts in the history of the Old West. Many ranchers illegally fenced sections of the public domain to keep out intruders. Second, because they could not protect a long-term interest in the public domain, open range rangers had every incentive to mine the land for as much forage as they could get. This contributed to overgrazing resulting in erosion and other land damage.

Ranchers divided on the need for new rules on range management. The most progressive understood the lesson of the drought of the 1890s and realized that limits had to be placed on the number of livestock if the industry was to survive. With the support of many ranchers, the Forest Service became the first federal land management agency to institute a system of grazing permits and fees. Others, however, continued to support further privatizing of the public domain. In 1916, Congress responded to these voices by passing the Stockraising Homestead Act of 1916. This law allowed claims to 640 acres and required only that ranchers settle on the land and make improvements worth $1.25 an acre. But even a homestead of a full section was insufficient for Western ranching. The debate of the 1920s turned increasingly toward the option of grazing leases and fees.

President Hoover proposed giving all of the remaining, unappropriated public domain to the states, claiming they could administer it more efficiently. The opposition was overwhelming and quickly buried Hoover's suggestion. Under President Franklin D. Roosevelt the debate of public land culminated in 1934 in passage of the Taylor Grazing Act. This landmark legislation marked a new era in public land regulation. After Roosevelt withdrew all non-mineral entry of the pubic domain, the era of homesteading effectively ended.

The purpose of the Taylor Grazing Act was "to stop injury to the public grazing lands by preventing overgrazing and soil deterioration; to provide for their orderly use, improvement, and development; [and] to stabilize the livestock industry dependent upon the public range" through lease of public lands to stockraisers. The Act called for the creation of grazing districts to manage leases at the local level. Secretary of the Interior Harold Ickes created the Division of Grazing to administer the new grazing districts. Priority in giving out grazing leases went to

ranchers who had adequate private land to support their herds at least part of the time, in other words, ranchers were not to depend totally on public land grazing. Other factors favored traditional use. All these benefitted established ranchers by giving priority to those who claimed initial use of the land. Fees of five cents per animal unit per month (one AUM equals the cost feed one 1000 pound animal, eg. one cow, one horse, or five sheep, for a month) paid for the new system. Ranchers cooperated because their advice often directed administration policy set by the Grazing Advisory Boards. The Division of Grazing became the U.S. Grazing Service in 1941 and was headquartered in Salt Lake City.

Meanwhile, the General Land Office received a new mission and new responsibilities. Instead of simply administering the privatization of public land, the GLO now oversees range leases, land exchanges, mineral leases, as well as land sales.

World War II had a profound impact on the General Land Office and the Grazing Service. Despite budget and staff cuts, they tried to do what they could to contribute to the war effort. The Civilian Conservation Corps, the New Deal's program to get the unemployed out of the cities and into the countryside to do useful work fell victim to wartime budget cuts. The GLO made plans to renew its conservation work after the war. However, it became a target of criticism after proposing grazing fees be increased to fifteen centers per animal unit in 1941. The Grazing Service tried to get out from under the controversy in 1946 by not pursuing the fee increase, but Congress responded by severely cutting the Service's budget. The Grazing Service saw its personnel reduced from 250 to 86 and its district offices reduced from sixty to eleven.

To end the attacks on the Grazing Service and to eliminate duplicate responsibilities, the Truman Administration studied the idea of consolidating the Grazing service with the General Land Office. When Congress did not object to this plan, the merger was accomplished and a new agency, the Bureau of Land Management created in 1946.

The Bureau of Land Management 1946-1953:

In its first years, the new Bureau of Land Management (BLM) struggled to survive and to establish a viable mission and plan. Internally, there was the business of creating a new organization out of the former GLO and Grazing Service personnel. Decentralization became the key to BLM's organization, and much of the real work of the agency would be carried out from regional and district field offices. The major areas of operation revolved around range and timber management, engineering and construction, adjudication, and classification and planning. Arizona became part of Region No. 5 which also included New Mexico, Texas, Oklahoma, Arkansas, and Louisiana.

The new BLM did not escape controversy with Congress. Many conservatives disliked the idea of a permanent land management agency. The agency also suffered from an extremely tight budget. Its initial eighty-six personnel had to manage some 150 million acres of grazing land, an impossible task to accomplish effectively. As a stopgap, money from Taylor Grazing Act fees for range improvements were used to pay the salaries of BLM range employees. This, however, made the BLM range managers practically the employees of the ranchers who they were supposed to be regulating.

Secretary of the Interior J.A. Krug, who replaced Harold Ickes, appointed a California rancher Rex L. Nicholson to prepare a plan to place BLM on a solid foundation. Nicholson recommended an increase in BLM personnel up to 242 employees and a grazing fee increase from five cents per AUM to eight cents, an amount calculated not to stir up the ranchers to major opposition. Of the eight-cent fee, two cents were to be dedicated to range improvements and the rest divided between the states and the federal treasury. The federal share paid only 70 percent of the cost of BLM's range administration with the rest coming out of general fund appropriations. Congress approved the outline of the plan, including the grazing fee increase, but failed to appropriate enough funds to cover costs over what the fees could pay for.

The Bureau of Land Management continued as a troubled agency until Secretary Krug appointed a new Director with a mandate to transform the agency. Along with a new organization there was a new mission to guide the agency. The mission revolved around the new concept of "multiple use," as a "system under which the same area of land was issued simultaneously for two or more purposes, often by two or more different persons of groups." This new view replaced the previously held concept that land should be managed to maximize its highest value use. Multiple use recognized the many values attainable from the public domain but introduced complications since different land uses might be either compatible or competitive. In 1952, the idea of "area administration" was begun, wich provided each district office all the resources and technical specialists they needed to administer the land under their jurisdiction.

The BLM was transformed into a real conservation agency. But the problem of inadequate funding remained. Even after the grazing fee increase, BLM personnel remained well below the levels recommended. With surprisingly little opposition, the BLM managed to get a grazing fee increase and then turned to Congress to fund a more effective range management program to eradicate a poisonous weed called halogeton. This weed, poisonous to cattle, spread rapidly across the West.

The Forest Service:

Two strains of thought, one in the East and one in the West, converged in the 1890s and early 1900s to fundamentally alter how federal lands were to be used. In the East, the rapid depletion of the nation's timber resources fostered a new policy in which the federal government retained perpetual ownership of forests and conserved them as permanent national resource. In the West, ranchers found themselves constantly fighting intruders on what they considered "their" land. Most jealously guarded their claimed right to graze on the public domain free of charge, but slowly the effects of overstocking began to change their attitude. A regulation of federal land use could be to their benefit if it legitimized their claims to priority use of the land.

The General Public Lands Reform Act (or the General Revision Act) of 1891 marked the beginning of a new era in the public domain. The Act gave the president authority to set aside forested areas as "reserves." President Harrison created the first two reserves in 1893 including the Grand Canyon Forest Reserve in Arizona.

It was President Theodore Roosevelt, though who created forest reserves by the score across the West. By proclamation Roosevelt set aside the Santa Rita, Santa Catalina, Mount Graham, Chiricahua, Pinal Mountains, Tonto, Baboquivari, Huachuca, and Tumacácori reserves. An act in 1907, renamed the forest reserves National Forests. Of these, only Baboquivari reserve is no longer in the National Forest system.

Beginning in 1902, stockmens' associations began officially approving federal regulation of grazing on the public domain. In Arizona, support for the idea solidified by 1907 so that the Arizona Cattle Growers Association could pass this resolution:

> *We, the members of the Arizona Cattle Growers' Association, favor a supervision and regulation of the public grazing lands within this Territory by the Federal Government, through some system which would operate in an equitable, just and proper manner to all occupants of the range, and which would not interfere with homestead entry at set periods.*
>
> *We suggest that a fair and just regulation of these public lands can be accomplished by leasing upon a per capita basis, and in the event this method is determined upon, we favor the issuance of leases for periods of not more than ten years.*
>
> *We believed that under any system of Government control of range the rights of the present occupants of the grazing area as determined by priority of occupancy and use, should be carefully safeguarded; and we urge that in the enactment of such a law for control of grazing lands, it be provided that no provision of such law shall in any way interfere with the sanitary livestock laws of this Territory.*
>
> *Such a supervision and regulation can only be accomplished by the enactment of the property Federal laws, and we earnestly request Congress to enact such laws.*
>
> *We deplore the devastation caused throughout the northern part of the Territory by migratory sheep herds, and we look to Federal control of the public grazing-lands to prevent this unfair use of Arizona's grazing-lands.*

The defensiveness of this resolution is obvious in their reference to the damage done by unregulated sheep herds and their insistence that range rights be determined by "priority of occupancy and use."

The Transfer Act of 1905 marked a major change point in the forest reserve system. President Roosevelt supported the transfer of the reserves from the Department of the Interior to Department of Agriculture. The Forest Service already recognized the political necessity of largely following the livestock associations' recommendations on grazing regulations, and included these recommendations nearly fully.

The 1905 Transfer Act included the following principles:

1) that priority in the use of the range would be recognized and the grazing privileges in the beginning allowed those who were already using the range;

2) that any changes found necessary in either the number of stock grazed or the methods of handling them would be made gradually after due notice had been given;

3) that small owners would be given preference in the allotment of permits and be exempted from reduction in numbers of stock;

4) that checking of damage to and improvement of the forest would be brought about so far as possible without total exclusion of the stock;

5) that forage resources of the national forests would be used to the fullest extent consistent with good forest management; and,

6) that the stockmen would be given a voice in the making of rules for the management of their stock upon the range.

Up to 1906 the reservation of timber lands had little affect on the free use of grazing land by ranchers. In that year, grazing fees were introduced for the first time. The benefits of a regulated leasing system and the professional and cooperative demeanor of the rangers began to win over many ranchers over the next few years.

The basic land unit for grazing in national forests is the allotment. An allotment is defined according to the physical features of the land and surveyed to determine its grazing capacity. In the early days, rangers drew allotments with minimal information.

Today, allotments are continuously studied and adjusted to take into account changing vegetation conditions and erosion. Many allotments include private deeded lands and lands owned by multiple land managing agencies such as the Forest Service, State Land Department and the Bureau of Land Management. Modern rangers also make allowance for wildlife forage and proper watershed drainage. Leases of allotments ranged from one year, to five, and eventually ten years. Today, five and ten year leases are most common.

In the debate over grazing fees, ranchers have usually supported the position that fees should only cover the cost of administering the Forest Service's grazing program. Competing interests supported the idea that grazing fees should reflect the value of the land in order to maximize revenue and restrict overgrazing. This debate has yet to be resolved and continues to be a serious current political question.

State Lands:

In addition to leases on federal land, ranchers also make use of state lands. The state of Arizona owns approximately 9,637,000 acres of land, accounting for about 13.2 percent of the state. Most of this, about 8,333,000 acres, is held in trust for the benefit of the public schools and other benficiaries. Congress granted Arizona section 2, 16, 32 and 36 of each township from the public domain. Where those sections were already appropriated, the state received other lands of equal value elsewhere. The state uses the lands to produce maximum revenue for the schools and other beneficiaries, which can be accomplished either by leasing or sale.

State land is distributed unevenly across the state often in a checkerboard pattern with other lands, which is why a rancher may find himself leasing land from several government jurisdictions. Where urban development has greatly increased land values, the state might reduce the lease permit from 10 years to 5 years to sell the land more easily, or it has, in the past, exchanged a small piece of valuable land for development for a larger area of less valuable land. This means that the land ownership map of Arizona is always in flux, and eastern Pima County has a high proportion of State Trust Lands subject to these changes.

III-7. The Early 20th Century:

For Arizona cattlemen, the 1920s was anything but roaring. The livestock industry, like much of the agriculture throughout the country suffered from a severe economic recession and underwent a shakedown of overextended farms. World War I had promised high returns to cattlemen. Public policy and private interest combined to maximize production to supply beef to the Allied side of the European conflict. Ranchers expanded their herds and took on a heavy debt load to develop their facilities. However, the war came to an unexpectedly quick end at the close of 1918. Livestock and other agricultural prices began to drop so that by 1921 from the previous ten-year average of 244,680 head per year.

Arizona cattlemen by this time were fully integrated into a national cattle market. There was little they could do individually to alter the state of the economy. Still, local conditions did matter. Weather, for instance, was always a factor in deciding the prosperity of a particular area. Market prices, though, were set nationwide and were little affected by regional variations.

Conditions both within the state and outside worked to continue Arizona stockmen's difficulties into the middle 1920s. Drought in California in early 1924 cut into sales of Arizona feeders as California stockmen moved their excess off of the range. Both 1924 and 1925 were dry years generally throughout Arizona. The Arizona Cattle Growers' Association reported the range as in extremely distressed condition. This translated into feeder cattle in poor condition and slumping sales. The Association convinced both the Santa Fe and Southern Pacific railroads to lower their rates by 35 percent to help move cattle off the weakened range.

California has always loomed large in relation to Arizona's economy. While a good portion of Arizona feeder cattle moved to states like Colorado, Nebraska, South Dakota, and Kansas for fattening, California became the largest and most important market. Particularly in the 1920s, California was undergoing a tremendous population boom which expanded demand for beef year after year. At the same time this put increasing pressure on that state's own ranchers to adapt to new conditions, shifting from breeding to feeding and dressing. From 70 to 80 percent of Arizona cattle shipments went to California.

It was California's cattle industry that moved first to organize the western livestock industry. Backed by the state's major banks, the California Cattle Growers' Association created a cooperative marketing system that would guide sales of beef cattle, hopefully smoothing out irregularities in supply that might destabilize prices. By 1925, some 90 percent of Arizona cattle feeders had joined the California marketing plan. When conditions were bad for Arizona stockmen in 1925 and 1926, many credited the new cooperative marketing plan for keeping

prices stable. Renamed the Western Cattle Marketing Association in 1927, the cooperative expanded its membership farther east into New Mexico.

By the late 1920s, Arizona beef cattle ranchers were fully integrated into a multi-state marketing system whose explicit purpose was to manipulate the market to stabilize prices at a high level. The cooperative system was a response to the depressed conditions that marked the early 1920s. While stockmen might relish the image of rugged individualism, in reality they operated as business men with an integrated market and their strategies reflected profit-maximizing behavior.

III-8. The Great Depression & the New Deal Era:

The Great Depression placed severe strains on the beef market nationwide. Prices dropped precipitously from 1930 to 1932. State, and county tax authorities offered some relief by lowering taxes. The county assessors and state tax commissioners met in Globe in December 1932 and proposed a new valuation scheme. Range cattle would be assessed at $10 per head, feeders at $15, and grazing lands in the southern counties were not to be assessed at more than $1 per acre. This scheme was not applied quite as proposed. In 1933, per acre grazing lands in some of the southern counties were assessed at: Cochise, $1.11; Maricopa, $2.52; Pima, $1; Pinal, $0.86; Santa Cruz, $1.13; Graham, $1.11; and Yuma, $1.06. Government programs helped raise beef prices somewhat.

Reference has already been made to the Taylor Grazing Act which was probably the most significant legislative act coming out of President Roosevelt's New Deal programs affecting cattle raising. In this section we will look at other areas of activity, first, the conservation and range improvement project built by the Civilian Conservation Corps (CCC). The CCC was the brainchild of Franklin D. Roosevelt. Like his predecessor, Theodore Roosevelt, Franklin Roosevelt was a dedicated conservationist. As President, Congress gave him the initiative in formulating the nation's strategy to combat the Great Depression. Roosevelt formulated a plan to create a work corps from the unemployed who would be set to useful public works on federal lands. The Corps (officially called the Emergency Conservation Work until 1937) was one of the first of the major programs enacted by Congress in Roosevelt's first one hundred days. Plans for Arizona in 1933 included 20 camps with approximately 200 men each. Eighteen of these camps were to be in the National Forests and two in the National Parks. The distribution was two camps each in Sitgreaves, Tonto National Forests; three each in Crook and Prescott; four each in Coronado and Apache; and five in Coconino. The CCC in the Tucson area were also responsible for the development of Tucson Mountain Park, Colossal Cave, Sabino Canyon, and many erosion control projects in the surrounding mountain foothills.

The variety and quantity of valuable projects built by the CCC is amazing and never since been matched in terms of public effort. Many projects were intended to improve the range for cattle raising. Innumerable check dams were built to control erosion. Enrollees surveyed grazing allotments and built the first fences to control grazing. Small crews traveled hundreds of miles making post holes (sometimes with dynamite), hauling and setting juniper posts, and stringing wire. Their efforts dotted the landscape with new water tanks. The Corps estimated it exerted 5,517 man-months of effort on water development projects in Arizona and New Mexico between 1935 and 1939.

Another New Deal program, the Agricultural Adjustment Administration, also aided range development. Its Soil Conservation Range Benefit Program, begun in September 1936 attempted to encourage range improvements. It helped construct fences, earth dam tanks and wells in order to spread livestock more evenly across the land and thus reduce erosion. This program operated on both private and state lands and, though voluntary, attracted about 450 Arizona ranchers by the summer of 1937.

III-9. World War II & the Post-War Era:

Both World War II and the postwar years saw a great boom in the cattle industry, and the value of cattle in Arizona rose from $23,010,195 in 1940 to $75,145,243 in 1950.

The typical ranch in Arizona in 1950 was a cow and calf outfit, producing calves and yearlings for fattening elsewhere in the country. Except for the irrigated agricultural areas, primarily in the Salt River Valley, Arizona was not particularly well suited for fattening cattle, nor was the population base here large enough to support a significant meat processing market. On the land, both private and government efforts and ranchers themselves had developed springs, wells, concrete dams, and thousands of earthen tanks to assure a ready supply of water. Where range cattle in the pioneer era relied on natural sources of water, by 1950 it was said that cattle rarely had to travel more than two miles to find water.

A small change in marketing practices came after World War II. Most cattle from Arizona were shipped to a terminal market such as Los Angeles, Denver, Kansas City, or Omaha which drew from large cattle raising hinterlands. The alternative to this sort of marketing was to sell fattened cattle directly from large commercial feed lots locally. Still, direct marketing increased in importance in Arizona afer 1945.

Another factor affecting Arizona cattle ranching after the war was the response of wealthy people trying to minimize their tax burden. At a time when the top marginal tax rate approached 90 percent, investors discovered the value of placing money in cattle ranches. Ranches as tax shelters introduced a new character in Arizona ranching. New owners arrived who were not particularly concerned with the operation of the ranch. Many may have wanted to own an Arizona ranch as much for a romantic Western getaway as for business purposes. It was the land holding pattern that contributed to this favorable tax benefit. Since relatively little of the land of a ranch was privately owned, a very high percentage of a ranch investment was in depreciable assets. It was possible to depreciate up to 10 percent of the whole investment each year and nearly 80 percent within ten years. For an investor in the 60 to 90 percent tax bracket, an investment in a ranch could return up to 72 percent of the whole investment with tax offsets in ten years. And the investor would still own the ranch at the end. The transition to real estate had begun.

III-10. The Post-War Era and Urbanization:

With the close of World War II, Tucson and Pima County entered a new time of transition — from a small Southwestern city with an agricultural base to a growing metropolitan area, whose growing population was estimated to increase at a rate of 1000 people per month.

New businesses continued to fuel the economy and growth. In 1944, a $1.0 million cement plant was opened in Rillito north of Tucson, and in 1945 Davis Monthan Air Force Base underwent a $1.5 million expansion, bringing new families and construction workers into the area. By 1948, nearly 5000 new housing units were being constructed each year.

The surge in in-migration was not just local. In fact, the whole Southwest was booming, due to what George E. Mowry, in *The Urban Nation,* called "a vast urbanization of the nation's people." This occurred as men and women from small towns and farms moved to urban centers to work in factories and defense plants to support the war effort. Many of these new migrant workers moved on to find work in California and the Southwest where they were welcomed. The desirability of growth was never debated, because bigger was better.

The population growth figures amply demonstrate the success of this boosterism. Spurred on by groups like the Sunshine Climate Club, people flocked to Tucson, and the Tucson City limits continued to expand in all directions toward the mountains. With a population of 32,500 in 1930, the Tucson metropolitan area has grown to about 213,000 in 1960s, or 555 percent in 30 years! In addition to housing for permanent residents, much of the new construction was for tourists and winter-visitors, and hotels, motels, apartments, and new shopping centers rose on the outskirts of town. Unfortunately, this growth had to be paid for. With declining investment in the older areas of Tucson, there was a marked decline in downtown by 1950, marking the beginning of disinvestment in the inner city as Tucson continued to sprawl outward.

As growth exploded, there was another important but silent transition that occurred and continues to grow in magnitude today — that is, the transition of southern Arizona and Tucson from a rural Southwestern region to an urbanized sunbelt metropolitan area. Not only have land use patterns changed the landscape tremendously, but the region's population, politics and culture have shifted from the country-side to the city. In 1900, the majority, or 84 percent, of Arizona's population lived in rural areas, but by 1990, this was reversed with nearly 88 percent living in expanding urban and suburban areas.

Consequently, the rural landscape began to be viewed from a largely urban perspective and from a greater distance. From Tucson's downtown core, the urban boundary first expanded north and south along the river and then eastward, and small farms and ranches along the Santa Cruz and Rillito rivers were some of the first agricultural lands to be converted to real estate. This trend of urban expansion into ranchlands continues today; however, it is those remaining ranches, their public grazing lands, and public land preserves that form the urban boundary and mark the transition from rural open space to urban land form.

While the growth — no-growth debate continues in Pima County, growth is occurring anyway with some 10,000 to 15,000 new residents each year. Growth in itself is not the problem; it can be a solution if where and how growth occurs can change. The solution is putting quality development in the right places while conserving our remaining open space and ranch lands. This will protect our natural and cultural landscape and define the urban boundary.

IV. The Current Practice of Ranching in Pima County

by Micaela K. McGibbon

The rangelands of Pima County have been harvested by cattle since the mid 1600's when Spanish explorers introduced them into the area. Originally run by missionaries and local Indians, by the late 1700's livestock numbers had increased and many were claimed as private property. To determine the owner of an animal, people began branding cattle, a practice dating to ancient Greece and Egypt. This method of management as well as many of the livestock husbandry methods developed over the years to work cattle have been passed on from one generation to the next. Some of the original methodology descending from the Spaniards is preserved in the working ranches of the west. Science and technology have also been applied to make modern ranching more efficient, less stressful on cowboys, cattle and healthier for the land.

There are 419 ranches in Pima County. Most ranches have been bought and sold many times and most are within a family run business or corporation. Some ranches have been passed down through many generations in a single family. Ranching is not just a business but a culture. The challenge today is to keep ranches and the unique western culture they animate from being consumed by development, while improving the environment and preserving the large open landscapes.

IV-1. Family Businesses:

Following the Gadsden Purchase of 1854, and with the passage of the Homestead Act of 1862, American homesteaders were encouraged to come to the west. By the 1870's, the west was beginning to increase in population. The new settlers were able to bring agriculture to the west as a productive contribution while creating a way of life to raise their families in a sparsely populated portion of the growing United States. Many did not know of the dry and difficult conditions that they would have to face in the desert. A small percentage of determined settlers were able to make a living off the land. The few who did, bought out smaller operators to increase the size of their ranches, making them more productive as an economical unit.

Deeded lands that were once 160-acre homesteads are scattered throughout modern working ranches. They are typically the locations of wells, springs and riparian areas on the ranch. The original homesteading families that settled in the area are not forgotten. Some family names are found on maps of the southwest. In the areas they settled, the canyons, tributaries, wells and pastures preserve their names. These names are important to the heritage of the west because each of them contributes a life story to the evolving mural of local history. Many of these stories have been lost through the years, but some remain to enlighten many generations through oral tradition, western novels and academic histories.

Many of the ranches in Pima County have been in existence for over 100 years. Few have been passed down in single families; most have changed hands since the early homesteading days. The lands have been sold as ranches or broken down into pastures, allotments (Federal leased lands), state leases, and old homesteads. Sold separately or pieced together, they can be incorporated into another ranch. If a ranch is broken up for siblings, it is often difficult for

one sibling to buy out the others and in most cases, one area of the ranch is not large enough to be an viable economic unit. In today's economy, raising livestock cannot financially compete with land development. With these factors combined, there is a threat to open space when ranches or parts of ranches are sold. Many are bought to develop homes and communities, breaking apart open space.

Lands in beef production today have been used historically for raising livestock. One of the unique characteristics of Pima County is that many generations of family partnerships and individual owners dominate the ranching industry; few large agribusiness corporations are involved in ranching. Of the county's 419 farms and ranches, 332 are family owned or run by a family corporation. Non-family corporations run only 9 ranches and farms, and 24 are owned by a cooperative, trust, estate or institution. The ownership patterns of local ranching are different from those of eastern corporate farming and ranching and contribute to the preservation of western ranching as a culture. While revenue serves as the only bottom line in many large corporations, family held businesses consists of other values.

Ranching as a Culture:

In today's society many people feel fortunate to know where their ancestors came from. For some ranching families, children are growing up in the same house a great grandparent was raised. As a child grows up on a ranch the family speaks of things that they did in the past, good and bad and how it affected the ranch. The land, plants, livestock and wildlife become the equivalent of pets children learn to care for from an early age. The ranch and ranching activities become a working part of the family as treasured and as integral to the upbringing of each generation as the customs and traditions of any tight-knit culture.

Because of all the lessons the land has taught generations of people and families, there is an intimate knowledge of the land, its seasons, and its changes incorporated into the living culture of the family that it passes on and experienced from generation to generation. The greatest pride is received by passing on an ever more productive ranch land to succeeding generations with improved water systems, increasing forage production and the skills and knowledge gained from generations of workers, who spent much of their lives working with the land.

Television and video do not dominate the lives of ranch children. The malls do not beckon. Instead, identifying grasses, watching wildlife and learning land management and livestock husbandry skills keep ranch children knowing they have value and a calling in life. As young adults, the stories from the family elders and their past experiences assist in the present day decision-making process. The culture is more valuable than the revenue it generates. This is one reason some ranchers stay on the land in spite of increased value of the land in development, the costs of vandalism, environmental extremism and the false accusations many ranchers have to face each day. Many families and traditions still live strong in the cattle industry. Much of what they practice reflects the old way of doing things, resembling their knowledge rooted in family and culture. This includes the different kinds of ranching and the methods used to raise cattle.

IV-2. Kinds of Ranching Operations

In the Sonoran Desert, as a rule, ranchers either raise cows and calves or buy and feed cattle to resell. Ranchers choose the best operation for their area by evaluating environmental and economic factors as well as personal preferences and skills. The availability of water and the varieties and growing seasons of the grasses on the ranch are other factors considered. Financially, agriculture requires large capital investments for typically modest percentage returns. In ranching, there are large investments in land, cattle and equipment to be made. Weather and the beef market have long been the variables most offsetting ranch income but this generation is now faced with the added pressures of environmental lawsuits and growing urban populations wanting lands.

Cow and Calf Operations:

Raising female livestock and their offspring is the most traditional form of ranching. To begin an operation, cows or heifers (young females) are purchased. The next step is to purchase bulls. On average and depending on the size and terrain of the ranch, one bull is needed to cover between 8 and 15 cows. This is a large initial expense, but a bull will be able to breed cows for about 9 years. Another method used to breed cows is artificial insemination. This is much more labor intensive for the rancher but this method gives him the ability to choose from more bulls without having to purchase them. Alternatively, cows can be bought already bred. The breeding livestock should be chosen to be able to tolerate Arizona's summer heat while producing a high quality marketable calf.

Once the cow or heifer is bred she has a gestation period of nine months. To increase the chances of a large and healthy calf, usually 70 pounds or more, the rancher must keep her in good health. This includes providing adequate forage in a pasture, as well as water and minerals. When cows are close to calving, many ranchers check the cattle frequently to reduce the loss of calves and cows to birthing problems.

Once the calf is born it is able to run with its mother. While it is with its mother, it has to be branded and vaccinated. About 6 to 8 months later, the calf weighs between 400 and 600 pounds and must be weaned. It is important to wean by the time it is nine months old because the cow needs the following three months to prepare for the birth of her next calf. The weaned calves are taken to a set of corrals and fed until they are gentled. The calves are then broken up into two groups, steers (castrated males) and heifers (unbred females). The heifers will be split again into replacements or sale heifers. The replacement heifers are used to replace old cows on the ranch while the sale heifers can be sold to another rancher for breeding stock or sold with the steers. The steers primarily are sold to farms where they consume crop residue or extra feed before heading to feedlots for final fattening. These fed steers and heifers make up the high quality beef cuts in the market.

The cow/calf operations do well in the southwestern states. The west is able to produce pounds of valuable meat on land that cannot be used to grow crops. Another benefit of raising cattle in the southwest is that the mild winters allow cows to calve on the land and not in a barn, as they must in the colder climates during some of the winter months. In most cases, cows have their calves without human assistance. Most herds increase in value over time as knowledgeable ranchers pick top quality replacement heifers and buy quality bulls.

Certain times of the year are more labor intensive for the working of the cattle. The labor requirement, other than at high intensity round-up periods, is related to the size and ruggedness of pastures and their proximity to human impacts like vandalism, gates left open allowing cattle into pastures set aside to rest and gates that are closed but need to be open for cattle and wildlife to get to water. Steepness of terrain and the number of washes affect fence washouts while distribution and type of waters (wells or stock ponds) affect the amount of labor essential to the daily assurance of adequate water supplies. People are needed to move cattle through their rest rotation grazing cycle or within pastures movements throughout the annual cycle. Ranch labor also includes the repairs of pipelines, tractors, trucks and trailers. Professional veterinarians can be called in for big emergencies, but ranchers generally do most routine animal health work.

From the time cows are bought and the first offspring are sold, at least 18 months will go by. Many people cannot afford to wait this long before receiving their first paycheck. With the environmental lawsuits and the uncertainty of grazing leases, a rancher may think twice about beginning a cattle operation. Another economic downfall is that the total gross income from the first sale of calves is a fraction of the initial cost put into starting the operation. No operator is able to predict the calf crop for the year. Dry breeding months and lowered forage nutritional value may cause cows not to breed, leading to a decrease in the calf crop. Cows may lose a calf from birthing difficulty, disease or becoming prey to coyotes, wolves, lions or packs of free-running domesticated dogs. With all of these factors and occurrences, an 85% calf crop from the entire cowherd marks a successful year.

The chances of making a profit raising cows and calves increase if a rancher is able to stay on the land for many years. Over time, the operation will be able to pay for it self but the rancher and the financial institution must be patient. Of all the operations, this is the most inclusive. The rancher is able to be an active part of an animal's life from before it is born until it leaves the ranch as a steer, heifer or a well-developed cow. Many ranchers find satisfaction watching their herd grow in numbers and in quality. A serious cow and calf operator is a long-term producer committed to the livestock and the land and will work hard to ensure the land is sensitively managed to maintain its health and productivity.

Over time, different variations of the cow calf operations were developed with the increasing numbers of people interested in the cattle industry. Changes also occurred to meet the demand for higher quality and specially fed beef. New and different ways of involving people were developed as well as new methods of raising beef. Packers did not want just any cattle; they wanted a large calf that had been fed specific rations for a certain period of time. This began the second and third level of the livestock industry: the feeder or stocker operators and feedlots.

While the public wanted a fed and "finished" product, ranchers still needed to sell their calves soon after they were weaned off the cow. People began to buy calves and pasture them for a couple months. They found that the weaned calves could gain weight by grazing the harvested crop residue like corn stalks, wheat stalks and other plant material left over after a farmer had harvested the primary crop. The calves could then be sold as heavier calves to a feedlot. The feedlots would then finish the calves by feeding them with special rations made to produce high quality beef the public was demanding.

Stocker Operations:

A stocker operation involves buying beef animals to be backgrounded (grown on the land) prior to going to a feedlot or entering the breeding herd. The animals are often young cattle that have already been weaned from their mother. Most of the calves weigh between 400 and 600 pounds. After they are bought, they are cared for while they grow until the beef market is high or they reach a weight of 800 pounds. These calves are then sold to a feedlot. The stocker makes a profit by buying calves when the market is low and selling them when the market is high. A profit is made if the money generated from the sale of the animals is enough to pay the expenses of buying and caring for the calves and maintaining the ranch facilities such as water troughs and fences.

There are many different reasons ranchers could choose this kind of operation. Some cattle ranches are unable to provide forage for cattle all year long. Some land only produces feed in certain seasons. For instance, some areas of land get winter rains and produce spring forage instead of summer forbs and grasses while other land cannot be grazed during certain times of the year due to snow covering the plants. Feeding stockers prevents having to move whole cowherds off a ranch when it is unable to be grazed. Financially, returns come more quickly on the cattle because they are usually sold within six months. A landowner may also be able to contract their land to feed cattle. This prevents the landowner from having to buy cattle, making the investment much lower. Feeding weaned calves requires less labor, and the calf survival rate is higher than watching over baby calves. Farmers are able to participate and profit from the livestock business by feeding stocker cattle the leftover stalks from corn and other grain crops, valuable nutrient-rich plant material that would otherwise not be converted to human food and byproducts.

There are also drawbacks to the stocker business. One of them is the difficulty of trying to teach the calves which plants are edible. One way to do this is by feeding calves well before turning them out to pasture. If the calves are not hungry, they will not eat the first thing they see. They will sample different plants, develop a taste for the good plants and learn which plants, if any, are toxic.

The stocker rancher also has to be able to play the cattle market. Because these cattle are kept for only a short period of time, the best quality of cattle at the lowest price must be found so they can be sold for a profit. Quality is difficult to identify in some cattle because most times the background of the cattle is unknown. Buying cattle can be a challenging task, and it takes a very skilled and experienced rancher to read the market and evaluate the quality of the cattle.

Combining Operations:

Some operations combine raising cows, calves and stockers to get the optimum utilization of their land. This is a good option for ranches with mountains and rugged areas. Younger cattle are much more agile than older cows and are able to climb mountains. Cows do not utilize mountainous areas as much not only because they are difficult to climb, but also because predators such as lions and bear are more often found in this area; cows would rather not expose their calves to these kinds of dangers. By grazing stockers, the rancher is able to make

better use of the land. Stocker calves can also be quickly bought if the rancher needs to utilize some pastures without investing in breeding stock. Cattle purchased as stockers do however bring with them the chance of being sick and have the potential to cause other animals on the ranch to get sick by passing illness through shared feed and water, or just being together.

Feeding calves does not always entail buying calves to feed. The rancher can decide to keep the calves that have been weaned from their mothers and let them graze in one of the harder to use pastures. The rancher has an advantage in doing this because they know the background of the calves, and the calves already know what forage is nutritious and what is toxic. By keeping and feeding the home-grown weaned calves, the chances of hitting a good market is greater because the calves can be sold at any time if the price rises, ultimately optimizing income from the sale of calves raised on the ranch.

Feedlot Operations:

Feedlots began over 200 years ago in New England. Not knowing what should be done with the surplus of crops like beets, grain, apples and brewers mash, it was fed to cattle and hogs. With these by products, livestock grew large for a small amount of money. By feeding cattle, producers were able to provide large animals with plenty of meat. One fed animal could produce two times the amount of beef from unfed animals and the fed animals yielded a better tasting product. The feedlot operators would come to an area once the ranchers settled the land and established large cattle numbers. They would buy the young cattle and the left over crops in the attempt to make a profit.

There are no feedlots in Pima County, but several are located in Maricopa and Pinal counties and elsewhere in Arizona. There are, however, many feedlots in the Midwest that buy cattle from Arizona and Pima County. They create most of the calf market in this area, as well as produce the finest beef in the world. The cattle feeders are also highly dependant upon science and technology to create well-run feedlots, management techniques, and feed rations needed to keep cattle healthy and desirable for the varying market.

IV-3. Methods & Management for Productivity

The health of the land and cattle have been a concern for cattle producers beginning in the mid 1890's when severe drought and overstocking nearly denuded the range. Since then, many range management techniques have been developed by ranchers, universities, and soil and range conservation experts to increase the sustainable productivity of the land.

Material improvements are easy to spot such as fences, roads and water catchments, known as stock tanks. Others are more long-range and require years for visible results such as implementing appropriate grazing rotation systems and changing the breed of the cattle. Finally, there are improvements made off the ranch by rancher organizations working to create legal and physical infrastructure for a modern beef production industry.

Historic Material Improvements:

After the great drought of the 1890's, the cattlemen realized that the management practices had to be changed on the land. First, ranchers had to determine where their ranch began and where their neighbor's ended. Each operator had to fence the neighboring cattle out. Fences marked the beginning of range management and the end of the free-for-all range period. Modern ranching with sustainable production was born. Fencing enabled a rancher to manage and improve the forage resources and to expect to reap the long-term rewards of his stewardship. This was a great investment for the cattleman. Some ranchers made interior fencing used mostly to haze cattle to a corral or water hole. Holding pastures, large areas of land fenced off to hold cattle, were also built to pasture cattle for a night or a couple days until they could be worked.

From the earliest history of western livestock husbandry, water was the most central element. Ranchers worked to increase water through stockpond construction. Stockponds were strategically placed to capture runoff on ephemeral washes. Water was stored in a stockpond for its longer-term availability for livestock and wildlife. Hand-dug wells, and later deeper drilled wells were added to the ranch improvements. Wells are able to pump water from underground into storage tanks providing a secure water source for the animals. The storage tanks have pipes running to water troughs. The water troughs stay full by the use of floats. When an animal drinks enough to make the water level decrease, the float will go down, opening a valve to let water into the tank. Once the trough is full, the float goes up following the level of the water and closes the valve. The security in the water source allowed one element of nature to be harnessed. With time, ranchers were able to run pipelines through valleys to provide more permanent water sources for the livestock and wildlife.

Many improvements were made because they were obvious needs to the ranches. Water had to be added to the dry region and fences had to be strung to keep cattle on their respective ranches. These were the improvements that ranchers knew would pay for themselves. Today, many ranchers, universities and agencies are committed to the constantly changing better approach to range management. With the results of many studies, academic and rangeland experiments, as well as the experiences of the past, the ranch community is more willing to invest in improvements to enhance the land their cattle graze.

Modern Needs of a Working Ranch:

Today, ranches consist of a basic framework of fences, stock tanks, water lines and water troughs. Because of the increased knowledge of range management, many ranchers have invested time and money building additional pasture cross-fences and waters to implement rest rotation strategies or other grazing management plans appropriated to ensure improved forage yield and good rangeland condition. Not only does the rancher play a primary stewardship role, the land agencies such as the State Land Department and Bureau of Land Management, as well as others, share in the responsibility for keeping the land in healthy condition. All of these factors contribute to the increasing health of the land in the west.

Improvements made to a ranch can be very expensive to a rancher, which causes much thought behind each action. First, there must be a reason to make an improvement. For

instance, cattle may not be able to use an area of the ranch because it is too far from water, or cattle should be fenced out of an area for a certain amount of time during the year. Once the purpose of an improvement is established, the rancher must determine if there are adequate finances. If the improvement is put on the ranch, can more cattle compensate for the cost, will the land improve, or does not having the improvement decrease the ability of the land to support cattle. Once the decision is made to make a fence, pipeline or water trough, another ring of actions begin.

Because most of the land grazed in the west is leased, the probability of the improvement passing through leased land is great. On leased land, costly permits must be applied for, and the project must be approved by the land agency. Next, there has to be consultations about archeological finds, and endangered, threatened and valuable plants and animals. Each land agency has a different set of rules that has to be followed. If the improvement gets approved and all clearances are made then the improvement can be built. This may involve hiring a well digger or buying materials and providing labor. Once it is built, the improvement is considered the rancher's private taxable property. It is also the responsibility of the rancher to maintain the improvement for the years to follow. While stocktanks and fencing are easy for the general public to see, there are many more improvements made on the ranch that are not as obvious. Such as grazing practices.

IV-4. Carrying Capacity

There are rules and guidelines for the range managers to help maintain and improve grazing lands, using cattle as a tool. Carrying capacity, determined by calculating forage production, is the number of animals that can be grazed while ensuring a sustainable forage supply and protection for soil while maintaining wildlife habitat.

It is a term that can pertain to a section of land, grazing allotment, valley, or other specified land area, and it is used as a land management tool for the both the leasing agency and the rancher. Carrying capacity determines both the management of the land and the land value. The more animals a parcel of land is able to support consistently and sustainably, the more valuable the land is to a land owner or buyer.

The carrying capacity of the land is measured in animal unit months, AUMs. An animal unit is defined as the amount of forage needed to feed one mature cow weighing 1000 pounds while not lactating. Table 13 shows different animals and their animal unit equivalent.

Table 13. Animals and Animal Unit Months (AUMs)

Kind and Class of Herbivore	Animal Unit Equivalents
Cow and calf pair	1.35
Calf weighing 500 pounds	0.6
Mature Bull	1.15
Saddle Horse	1.25
Mature Goat	0.17
Doe and kid pair	0.24
Mature mule deer	0.23

This table does not distinguish the different among forage preferences (grasses, browse, cactus fruit etc.) each animal uses. While cattle and horses depend mostly on grasses, deer, sheep and goats eat mostly shrubs. This means that the dietary overlap between many species is small and each animal depends upon different plants to survive.

To determine how many animal units can be placed on an area, the land is rated by the number of AUMs it can support. An AUM is an animal unit month, or the amount of forage needed to support an animal unit for one month. In the more arid southwest, AUMs are assigned to sections, 640 acres of land. In this area the carrying capacity of the land ranges from 12 up to 240 AUMs per section. This means a section of land can support from 1 animal unit per year up to 20 animal units per year. The amount of livestock on a ranch can not exceed the AUM rating; however, it is important to note that many ranchers do not use the land to its maximum capacity. The unused remainder is a significant forage reserve needed for drought situations or it may be part of a range improvement plan such as prescribed burning.

The capacity of the land is determined by an estimate or actual inventory of how much forage is available. For many grazing regimes, the inventory and monitoring of plants occurs every year. In other long-term stable production areas capacity rarely changes. The land owner, be it the rancher, State Land Department, Bureau of Land Mamagement, or Forrest Service, is responsible for doing range inventories. Many times other range experts such as range conservationists from the Natural Resource Conservation Service, universities and private consultants are involved in monitoring and in carrying capacity assessments. Long term ranchers are strongly motivated to apply strategies leading to stable or better still, upward trends in vegetation and range health. Specific methods used to measure the inventory of forage on rangelands will be discussed in later sections.

The agricultural value of the land is dependent upon how many cattle the forage will support. Many grazing lease payments are based upon how many cattle are on an allotment of land. The only way to justify an increase in cattle numbers is to document a substantial increase in forage production over a long-term period. Since the higher performance of livestock is related to conservative to moderate (not heavy) grazing and more valuable calf crops are grown on well-managed ranches with surplus forage, it is never in the rancher's economic interest to run down the land and the livestock by staying too long in a pasture. Overgrazing depletes the capital value of the ranch. Promoting and practicing good range management improves the bottom line for ranchers. On a ranch, healthy land is essential for healthy cattle. The carrying capacity of the land is an excellent tool to prevent the decrease of range health. It is not only used as a regulatory tool, it is also used to determine land value and fair markets for grazing leases. Fortunately there is the ability to alter the carrying capacity of the land by landlords. This is one good method to keep the land healthy by using incentives for the land owner and the livestock owner.

IV-5. Grazing Management:

Grazing management is the manipulation of grazing animals to accomplish desired results in terms of animal, plant, land, or economic responses, (Valentine 1990). It is a relatively new science primarily developed in the United States in the last 40 years. For the past 20 years, the new science has been widely accepted and its various strategies applied to many ranching

operations have employed these new technologies. Throughout the years ranchers, scientists, and range conservationists have developed techniques to use cattle as tools to improve the land while providing an economically viable ranching unit. Grazing systems, the manner in which grazing and nongrazing periods are arranged within the maximum feasible grazing season, either within or between years are the results of their studies. This section will not define all grazing systems, but describes some of the systems as shown on Figure 17.

Year Round Grazing:

The most primitive of all grazing systems is year round grazing. It was used when there were no fences on the land and cattle could not be confined to a pasture or a ranch. Cattle would follow the rains, moving up into the mountains in the winter and the valleys during the summer monsoons. The natural movement of cattle allowed the land to rest at different times of the year. When ranches were first fenced, many had valleys and mountains within their boundaries cattle were able to follow a similar grazing pattern. Today, continuous grazing systems can be set up on an entire ranch or within a pasture on a ranch.

The success of a well run continuous grazing system is dependant upon two factors. The land must be moderately stocked, under the suggested stocking rate, and the animals should be well distributed throughout the pasture. Though these two factors seem simple and logical for the health of the land, but there are many reasons why they are difficult to fulfill. Keeping less cattle on the land decreases the income of the ranch. With less cattle on the land, there are less to sell. Secondly, to be able to distribute cattle on the land, there has to be many well developed waters in the dry climate. Water is the largest variable in livestock distribution excluding topography or fences. Waters are however a large investment and some ranch incomes are not able to afford to include a water development in their budget.

Though year round grazing is not optimal for land, cattle within this grazing system do well for many reasons. The cattle are very familiar with the pasture and the different forage areas throughout the year. Their forage quality does not change if the land is properly managed. The cattle do not have to be moved to another pasture and are only moved twice a year for roundup purposes. The days that other cattle are being moved, the cattle in this system are grazing. Since there is limited time around human activities, these cattle do have a tendency to be less docile.

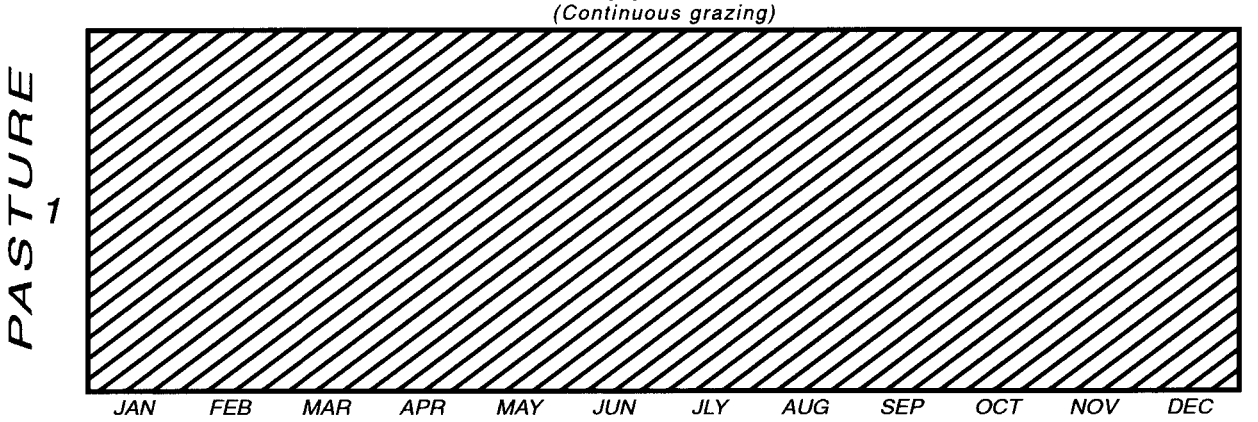
Rest Rotation Grazing System:

Rest rotations come in many forms. They can have a set pattern of resting and grazing lands or they can be developed to utilize an area by rotating cattle when the land dictates. Each of the rest rotation requires a higher degree of management and ranch infrastructure. To have a rotation within a ranch there must be fences within the ranch breaking apart areas into pastures. These pastures are used to keep cattle in one area of the ranch while other pastures rest (do not have cattle in them). Each pasture also must have at least one water for the animals. Labor for these operations is more intense. Instead of working cattle only during roundup, cattle now have to be rotated or moved into new pastures throughout a year. Because the cattle are being worked with more frequently, they are easier to handle and some,

EXAMPLES OF GRAZING SYSTEMS

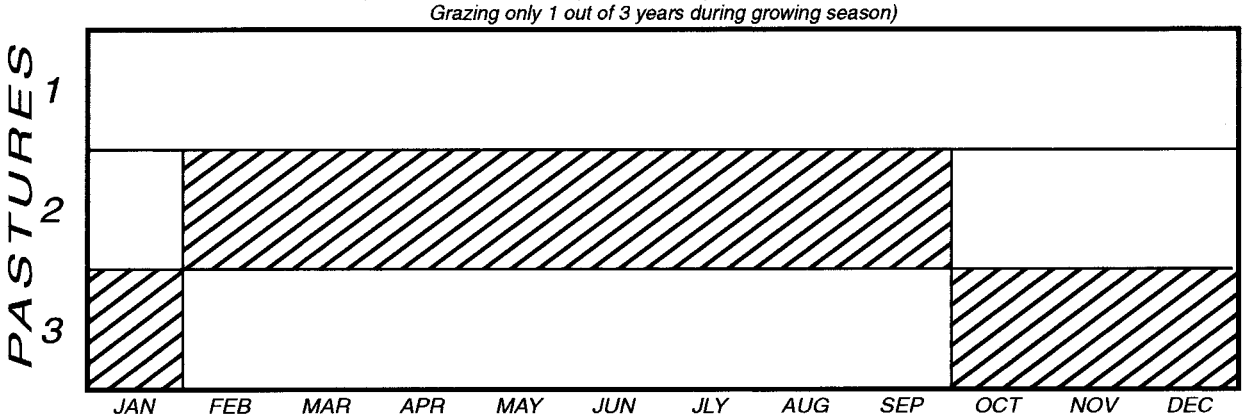
YEAR ROUND GRAZING

(Continuous grazing)



SANTA RITA GRAZING SYSTEM

(Pastures rested for two years out of 3 years during growing season.
Grazing only 1 out of 3 years during growing season)



SHORT-DURATION GRAZING

"Multiple Pasture Rotation" (20 days grazing / 140 days rest)

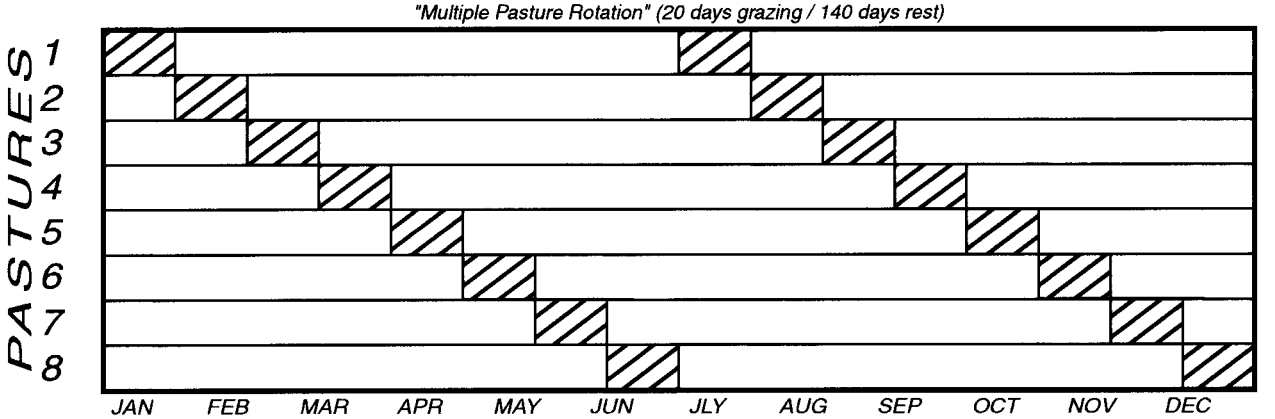


Figure 17

depending on the grazing system can be taught to move on their own. These new ideas in grazing have been advertised for almost 40 years but the methods have only been desirable to ranchers for the last 20 years. It is a new practice for ranchers, but there have been many large improvements made to the land because of them.

The Santa Rita Grazing System was founded on the Santa Rita Experimental Range, east of Green Valley, Arizona in the 1970's. It was designed specially for the year-long, semidesert bunchgrass ranges of the Southwest (Valentine 1990). It requires one herd and three pastures rotation; as one pasture is grazed, two pastures rest. Within the rotation, the herd of cattle is moved twice a year, October and February. One pasture rests for one year, one rests for nine months and one rests for three months. The three pastures alternate so after being grazed, the land rests for twelve months. This unique method has been proved to improve the condition of the range by grazing a pasture once out of three growing seasons.

Another rest rotation grazing system commonly used in the Southwest is called the best-pasture grazing system. It was created to provide a grazing system for areas of land that have scattered rainfall, falling at different times of the year and in different amounts within a ranch, mimicking the natural movement of cattle after rains in a more controlled system. It requires that each pasture within a ranch is carefully monitored to determine which is best suited for grazing. To utilize this system effectively, each pasture on the ranch should be used at least once a year to utilize the forage crop.

When ranchers begin to utilize grazing systems, the rest rotation is basic and can conform to almost any operation. It is commonly used because it is not strict about how many pastures or herds of cattle are needed. The pastures can also be in different elevations with different plant communities.

Short-duration grazing:

Short-duration grazing uses many pastures (5 or more) and one herd of cattle. It was first used in the rangelands of Africa in the 1960's to improve livestock production. The original system involved grazing one pasture for no more than 14 days and then allowing it to rest up to 60 days, short use with longer non-use. By doing this during the growing season, the grass would have ample time to grow to its potential and then be grazed by the cattle. Each time cattle were turned into a new pasture, there would be new plant growth to be grazed, increasing the nutritional value of the forage. Created for lands with longer growing seasons, this system has been adapted to the Southwest and has proven to be very beneficial to the land.

This grazing system works best if there are many pastures placed close together with a common water. By having a common water for the pastures the rotation simply requires the cattle to go to the water and out to pasture through a different gate. It is difficult to adapt to ranches in the Southwest because of the complexity of the fencing and the waters involved in the system. Once the fencing and water are put in place, it may take some time for cattle to become accustom to moving often but if taught, cattle will rotate with whistles or calls made by the rancher. Because these cattle are worked almost twice a month, the rancher is able to keep a close eye on the cattle and most cattle become very docile after being around people so often.

Each grazing system carries with it benefits to the land, cattle and rancher. There is no ideal grazing system for the west because each area has a unique soil type, elevation and rainfall. For a grazing system to work, the management must be able to adapt to the cattle and the land. There are many agencies that will work with the rancher, providing assistance to help maintain and increase the health of the land. They look at the ranch, the different grazing systems, the ranch infrastructure, the lands within the ranch to decide what is the best method of management.

Coordinated Resource Management:

The many variables to owning and operating a ranch in Pima County includes the volatile climate and economy and the least understood variable, the land ownership complexity within most ranches. A majority of the ranchers are not just managing tracts of private land, but land that is leased for grazing from other sources such as the Arizona State Land Department (AzSLD), the US Forest Service (USFS), the Bureau of Land Management (BLM) and private land owners. In addition to this complex of ownerships, there are often multiple uses of the same land by hunters, recreationists, miners and others. The jumble of ownership and uses can make it difficult to operate a ranch in Pima County. An approach has been developed in Arizona and other western states to assist the agencies, ranchers and other interested parties in properly managing our rangelands in this difficult environment. This tool is called Coordinated Resource Management Planning (CRMP).

CRMP is the method used to assist in inventory, monitoring and follow-up with western ranches. The entities invited to participate in Pima County are the AzSLD, USFS, BLM, USDA-Natural Resources Conservation Service (NRCS), US Fish & Wildlife Service (USF&WS), University of Arizona (UofA), and Pima County. Each agency or department assigns an individual who specializes in resource management to attend an annual Field Group Planning Meeting. A list of current and potential ranch participants is reviewed at these meetings. Recommendations are made as to the lead agency for each ranch and issues are discussed. The heart of the process, however, is the actual field visits to the ranches.

A ranch is initially selected for CRMP when it has varying ownerships, and chooses to voluntarily work with the process. If a ranch owner does not want CRMP, then agencies that oversee the leases on the ranch are only involved in the management practices carried out on the ranch. Currently, over 700,000 acres of rangeland in Pima County are participating in CRMP. By agreeing to work with CRMP, the rancher gains technical assistance and improved ease in coordinating management plans to meet various ownership rules and regulations. First, the ranch is inventoried for existing facilities, soils, ecological sites, trends, etc. This information is provided to the rancher and to all involved agencies. Not all entities are involved in every ranch. For instance, a ranch may have no USFS lease and therefore the USFS would not be involved. Next, the team develops a management plan with the rancher. Monitoring sites at key areas are set up and photos and frequency transects are read annually at theses sites. A management plan is dynamic and will need to be adjusted according to variables such as precipitation, water availability, and the effects of the grazing system. The monitoring sites help to determine what adjustments will be made and may assist in determining future structural improvements needed on the ranch.

By utilizing CRMP in Pima County, all parties are continually involved the management planning process. In addition, by having agencies such as the AzG&F, Pima NRCD, NRCS and UofA involved, the rangeland needs of wildlife can be included as well as other users. Agencies who do not own land give important technical recommendations as well as assist in inventory and monitoring throughout the process. CRMP has become an important planning tool for our rangelands and will continue to be used to improve the management techniques to ensure healthy rangelands for the future of Pima County.

Prescribed Burning:

Fire is a naturally recurring factor in the Sonoran Desert environment. For the past 200 years, fires have decreased in the region thought to be caused by severe drought, grazing and the suppression of fire by the Anglo settlers and public land managers. Today, the use of prescribed burning is coming to the fore front as one of the most natural, cost effective methods to reduce competition from woody vegetation.

When prescribed burning is used as a part of a complete range management program, the results are very encouraging. Grazing management will improve the condition of the rangeland up to the point where no further significant improvement can be made unless competition from the existing woody plants is reduced. The overall goal is to restore the natural balance of grasses, forbs, trees, and shrubs to the rangeland.

Fires, like any other range management tool take intricate planning and a true commitment by the rancher. Manpower and materials, ie. drip torches, water tankers, radios, pumps, and other tools must be arranged. When planning a prescribed burn in a pasture, it should be omitted from grazing for three years. Due to the decrease in the acres of pastures, the number of cattle on the ranch must be reduced. The first year of rest allows fuel (leaves, stems and grasses) to build up to carry the fire. The second year is used to do the burning. Depending on rain and weather conditions, the land will need one more year of rest to allow the new growth to become established and reseed itself.

The benefits of prescribed burning can include; control of undesirable plant species, restoration of natural plant communities, improved quality and quantity of forage for wildlife distribution, improved water yield from springs and seeps, improved access and visibility of an area, and greater diversity in types of habitats in an area. (Pase and Granfeld, 1977; Brown and Davis, 1973; SCS)

IV-6. A Year in the Life of a Rancher

It is important to know about range management tools, how cattle are raised and the different kinds of operations, but many people have an obscure vision about what actually happens on a ranch. Not only are cows calving, they have to be watched over. Not only are the grasses being grazed, they need to be managed. A year in the life of a rancher is more than getting up with the sun to ride a horse. It includes fixing water sources, fences, and anything else that can be broken, going to meetings, auctions and bankers, and reading and keeping informed about the industry, endangered species and new range management practices being

experimented with each day. Because there is so much to do, many will say ranch work is never done. The rancher's land is also open to the public in many cases. Because of this the rancher must deal with gates being left open, trashed campsites and other problems including vandalism resulting from careless visitors. Occasionally, the rancher provides emergency assistance to visitors ill-prepared for rugged country or for a family lost or stuck in a wash.

A rancher is both a user of the land and its caretaker. A year for the cow calf operator does not have a beginning because it never has an end. On many ranches, it is an ongoing scenario of calves being born, cattle being moved and things having to be fixed. Nevertheless, spring is a great time to begin looking at a cattle ranch and some of the different functions that have to be accomplished in order to have a viable operation. Spring is the time many calves are born. Cows need to be checked frequently to make sure they are calving safely and large predators or disease is not threatening the calves. Roundup time is approaching but before it can take place, the pasture the cattle are going into for the end of the spring and summer has to be checked. This includes fixing the fence that borders the pasture, making sure water sources have water, or making sure pipelines and water troughs are not leaking. Another important pasture feature is the amount of forage in the pasture. This dictates how long the cattle can stay in the pasture so it is not over used. Checking the pasture for these things can take weeks depending upon the conditions. Once the pasture is ready for cattle, the corrals used to work the cattle have to be fixed and ready. Many times this involves fixing a weld on a gate, oiling chutes and hinges and clearing a place under a tree to have lunch. Now all of the work on the land is done, what else is there? Well, horses need to be shod, trucks and trailers need to be checked, vaccines, eartags and other branding equipment need to be ordered. That was the easy part!

Roundup:

Roundup is one of the most common words associated with ranching. The word rodeo comes from the Spanish word rodear, to round-up or surround; yet, many people do not have a clear picture of what activities take place during a roundup. As seen in old movies, all ranches have a roundup. Roundup is the time when cattle are gathered from a pasture, moved to a corral and worked. What is not often understood is the importance of the activities that take place during a roundup. For instance, baby calves must be branded and vaccinated, some are dehorned, castrated and eartagged. Older calves must be weaned and separated from their cow. Cows must be checked to see that they have a calf or are going to have a calf, and every animal is inspected to check its general health. All of these activities serve a purpose and are done to protect cattle from theft and sickness and prevents them from hurting themselves or other cattle.

There are as many different ways to do roundup as there are ranchers. Roundup is a harvest time for the rancher. It is a time to count calves and monitor how well the cattle are doing. In addition to their purpose for gathering and working calves, roundups can also be scheduled to fit the times when pasture rotations take place.

Most roundups start early in the morning, even before the sun comes out. Afer the horses are fed and saddled, it is time to head out for the day. Usually, the horses are loaded up into a trailer and driven to the corrals where the cattle are going to be worked. As few as one person

can gather cattle depending upon the area of the pasture and how gentle the cattle are; however, many ranchers prefer to have at least 3 people to help gather cattle. To start the gather, the cowboys and cowgirls spread out on a fence line of a pasture. Their job is to zigzag through the pasture looking for cattle and push them to the opposite fence. Gathering is not an easy task in the often rugged, mesquite wooded pastures with mountains, washes and hidden areas where cattle shade up during the day. It is also difficult to push many cattle because some travel faster than others and some like to duck behind each and every bush or mesquite thicket. Once the cattle are gathered and pushed to the opposite fence, they are then slowly pushed to a corral where they are worked.

Working cattle is a skill that has to be learned on the job. A major goal of modern ranching is to do the job with efficiency and without causing stress to the cattle. Corrals are designed to incorporate an organized series of holding pens, lanes, gates, chutes and loading lanes. Besides being work friendly, corrals need to be strong. The strength of a fence is tested by a nervous cow or more often by two fighting bulls. Some ranches carefully maintain the still functional rataque corrals made of stacked mesquite and juniper branches , often dating to the turn of the 20th century, in addition to building new pipe corrals. The people working the cattle should be able to efficiently use their horses to get around cattle, open gates and be able to anticipate what an animal is going to do to prevent injuries to cattle, horses or riders. The ranchers work to have herds of calm, cooperative cattle by culling aggressive, animals and by carefully handling the herd to accustom the cattle to riders, pasture moves and seasonal round-up activities.

Once cattle are in the corral, they are counted. With adequate help and large corrals, a rancher can work over 100 cows in one day. They are looked over for general health to determine what needs to be done. Sometimes cows and bulls need doctoring. Some of the common sicknesses include pink eye, ringworm, rattlesnake bites, a horn curling back into the head and festering thorns or matter balls. A rancher has his work cut out when some of these ailments occur. There is no time to get weak-stomached when faced with an oozing wound needing quick attention for the animal's sake.

Next, baby calves and calves big enough to wean are separated from their mothers. Ranchers work the little calves quickly so they can be promptly returned to their mothers. Instead of roping calves, most ranchers now use calf tables. A calf table is a metal chute that secures a calf without having to rope and drag a calf to the fire as done in the old days. It is placed at the end of a narrow lane in which a calf cannot turn around. A person pushes a calf down the lane and into the calf table. Once in the chute, the calf's head and shoulders are secured and the table is turned horizontal so the calf is on its side.In less than one minute with skilled manpower, the calf is branded, dehorned, earmarked, eartagged, castrated, inoculated and sent off to its mother. Each of these tasks serves a purpose and none of them is done without trained personnel.

Branding:

Brands are a permanent identity of cattle in relation to the ranch. Today, each brand is registered with the state of Arizona Department of Agriculture. They are especially useful when a cow or calf accidently gets onto a roadway or another ranch. By reading the brand on

the animal, the owner can be identified and called to take the animal back to their ranch. Brands are also used when selling cattle. A person a cannot sell an animal without the having the proper paperwork for the brand that is on a calf. Once the animal is sold, new paper work has to be filled out for the new owner.

To prevent calves from being stolen, they are branded while they are little. Other marks seen on cattle include one-number year brands identifying the year in which the calf was born. Some cattle, especially high-valued registered animals, also have identity numbers to link them with their registration papers. The benefit of brands is that they are permanent marks on the animal, unlike ear tags. Ear tags can be pulled off in brush thickets and unlike tattoos, brands are readable from longer distances.

The second most common practice done is vaccination. One popular shot given to baby calves is a seven-way vaccine. This protects them from seven different infectious diseases they can potentially get throughout their life. With the dry southwestern climate, it is unnecessary to give cattle more shots. Cattle will be treated if they become sick but giving shots to cattle each year is unnecessary. However, if cattle are moved to a different ranch, another vaccination may be necessary to prevent shipping fever or new diseases from the new area.

Another calf-table chore that is castration. Before castration, male calves are called bull calves, afterwards they are called steers. There are many reasons ranchers castrate male animals. Bulls are able to breed cows and heifers. If all calves were kept as bulls the chances of inbreeding increases, and this can decrease the quality of the herd. Steers also grow differently from bulls because bulls produce more testosterone. Testosterone creates more muscle mass making for a tougher piece of meat. Most importantly, steers do not get as aggressive as bulls. They do not need to compete for females or rank in a herd. Steers are much more docile and less likely to hurt other animals.

A technique used to prevent harm to the cattle is dehorning. It is easier to dehorn an animal while it is small. If cattle are shipped to a feedlot with horns, the horns have to be tipped for safety reasons. This can be avoided if the cattle are dehorned when they are little. Dehorning also prevents many accidents on the ranch. While working cattle, in a corral it can sometimes be crowded and horns become an unnecessary hazzard. Cattle will not be dehorned if they are needed for registration purposes (pedigrees) and for defense of calves where predators are a large problem.

Once branding is finished, it is time to doctor any sick cows or bulls. They are doctored in a large squeeze chute. A squeeze chute has a head stall similar to the calf table. Once the cow sticks its head into the head gate, it is secured and the chute's sides come in and restrain the cow. On each side the chute has removable bars to allow access to the side of the cow. If a cow has to be milked or a bull's underside has to be doctored, most chutes have a lower door that opens up. These chutes become very helpful when a larger animal needs to be doctored. They are made to allow a rancher or veterinarian total access to the animal. This prevents the need of roping and tying down cattle. In fact because of the inventions of the calf table and squeeze chutes, roping is done more at rodeos than on working cattle ranches.

Somewhere between branding the calves and doctoring the cows, lunch is usually served. By the time cattle are done being worked, the afternoon sun is getting ready to set. Before leaving

for the day, the newly weaned cattle have to be loaded up into trailers to the headquarters corrals. The horses also have to be trailered home. Gates are left open into the next pasture in the rotation, and eventually the cows, calves and bulls make their way out of the corrals.

The roundup process usually takes place three or four times a week for many weeks before all of the cattle are worked. Roundup is not a one-day event on a working ranch. Recently, some Pima County ranchers have begun using helicopters to gather cattle. Cowboys and cowgirls are still needed to work the cattle in the corrals, but many days of riding different pastures looking for the missing few are saved for more productive work.

When the temperature starts rising in the Spring, ranchers check water sources three or four times a week or even daily in some areas. This entails driving to the watering sites, making sure the water troughs have water, checking storage tanks and float valves, repairing vandalism, maintaining windmills and submersible pumps and checking for leaks in water lines. Depending upon how many cattle a well is supporting, pumps or windmills may have to be turned on every other day.

Checking the water alone turns out to be a large project during the warm months of the year. Water is very important to maintain on the ranch because the cattle and wildlife depend on it, and with seasonal increasing heat their daily water intake increases. Many of the natural waters in the mountains begin to run dry in early or late spring depending on precipitation causing the wildlife to search for an alternative water source. During dry times of the year, wildlife and livestock depend almost exclusively upon the water provided by the ranch.

With the decrease in moisture, many of the earthen stock ponds dry up or are at a lower level. This provides the perfect opportunity for the rancher to clean out the holding tanks by removing sediment such as sand carried in by flood waters after intense summer rains. Sediment accumulates once the water stops in the holding tank allowing the sand to settle to the bottom. The sand decreases the holding capacity. Taking the sediment out allows for greater capacity, and more water can be stored for wildlife and livestock. It also prevents the stock pond from washing out. If the capacity is less than the runoff, the holding tank could wash out, causing both the loss of the water and the loss of a stock pond with a probable replacement value of $10 -15,000.

Spring and summer is also the time for some ranchers to begin irrigating and reseeding irrigated pastures. Not every ranch has an irrigated farm, but for those who do, this chore has to be done so the land can optimize the production of forage. Irrigated pasture is used not only for crops such as wheat and cotton, but also to grow grass for hay and pasture. On some ranches, farmland is used to pasture cattle during the growing season for the grasses on the ranch to thrive and provide optimal forage. Other ranches use the pasture to supplement weaned cattle or cows that are need special care.

When school gets out, many ranchers take the opportunity to put their kids to work. Many chores have to be done through the summer. Large ranch projects like fixing the barn, the roof on a house or floors in the trailers have to be scheduled between checking the waters, starting and stopping wells and checking cattle. Any day after San Juan's Day, June 24th, the ranchers begin searching the horizon for cloud build-up and the start of the critical summer rains. Their

schedules have to be made to fit the season. If a barn was being repaired, it must have a roof on it by the rainy season. The summer rains also demand that the ranch, including the cattle, be checked earlier in the day because there is always the possibility of getting stuck behind a running wash. After each rain, all water gaps (fences that run through a wash) have to be checked so cattle do not get into another pasture or another ranch. With the increase in rain, the need of pumping water usually decreases.

At the end of summer and the beginning of fall, the rancher has to begin to think about the upcoming roundup. If any corrals were broken the year before or if a post has rotted out, it has to be fixed. If the cattle are to be moved to a new pasture, the fences and waters have to be checked. The new pastures have to be ready and waiting for the cattle. The fall roundup follows the basic schedule of the spring roundup: gather in the morning, take a close look at the cattle, sort the cattle, brand new baby calves and wean the calves branded in the pervious spring. A good sized calf should weigh about 450 or 500 pounds. When cattle are weaned, they need to be moved from the cow herd. They are generally taken to a corral and fed. The corral should be strong because it will take three or four days for the young cattle to calm down. The best young heifers (females) have to be picked out for breeding stock to replace older cows. Some ranches do not sell their calves right away but instead keep them on ranch pastures until the market looks good or until the land is not

Once fall roundup is over, it is again time to think of more ranch projects that need to be done. With the cooler weather, it is easier to work outdoors. Because the snakes are in hibernation, it is a great time to do erosion prevention work in drainages, maintain trails and fix more fence. It is important to remember that while all of these other chores have to be done, the cattle must be watched and their waters and forage maintained throughout.

A year for a rancher is very unpredictable. Roundup always occurs, but may be rescheduled because of rain patterns or the availability of help. Calf crops cannot be predicted because, again, it may be a dry year preventing a cow to breed back, or calves could become prey to lions or dogs. These are all natural occurrences that are difficult to control. They must however be worked around if a rancher wants to stay in the business. Also, there is no time when the cows all decide that they do not need food or water. This prevents a ranch from being unattended at any time. Ranching it is a full year job, as well as being a very demanding job. If the rancher has an interest of staying on the land, the land must be cared for. Many look at the land as their own even though nearly 85% of ranching lands in Pima County are leased. And only about 15 % are privately owned. The rancher is indeed the steward of these lands.

IV-7. National Cattlemen Organizations:

While ranchers continue to work and live very independently in making decisions about how they operate their ranches using a variety of land management strategies, ranching as a way of life and as a business venture is also very much tied to our national and global economies. Like any profession or business, the ranching community has developed a network of national, state, and local organizations that help to facilitate and promote their agricultural and economic interests and to share information. The following section identifies some of these key organizations.

The Natural Resources Conservation Service:

The Natural Resources Conservation Service (NRCS), formerly the Soil Conservation Service, was born of adversity, a national response to the Dust Bowl catastrophe of the mid-1930's. The agency's first chief, Hugh Hammond Bennett, spoke eloquently for the land when he convinced the Congress that soil erosion was a national menace; that a permanent agency was needed within the Department of Agriculture to call landowners' attention to their land stewardship opportunities and responsibilities; that a nationwide partnership of Federal agencies with local communities was needed to help farmers and ranchers conserve their land.

Today, more than 6 decades later, the land-soil, water, air, plants, and animals-still requires someone to speak for its health and well-being, and that responsibility remains a challenge for NRCS, the U.S. Department of Agriculture's lead conservation agency. Indeed, no other Federal agency speaks for the health and fate of America's private land.

NRCS relies on many partners to help set conservation goals, work with people on the land, and provide assistance. Its partners include conservation districts , state and federal agencies, NRCS Earth Team volunteers, agricultural and environmental groups, and professional societies.

The nations; 3,000 conservation districts-virtually one in every county-are the heart of the conservation delivery system. These units of local government, organized by citizens under state law, operate on the premise that local people know the most about local needs. They link NRCS with their neighbors and with local priorities for soil and water conservation. They also augment the work of NRCS's conservationists with district programs and with their own technical and support staff.

The strength of NRCS is in its workforce. Most of its employees serve in USDA's network of local, county-based offices. The rest are at state, regional, and national offices, providing technology, policy, and administrative support. NRCS employees have the technical expertise and field experience to help land users solve their natural resource challenges and maintain and improve their economic viability. Employees are highly skilled in many scientific and technical specialities, including soil science, soil conservation, agronomy, biology, agroecology, range conservation, forestry, engineering, geology, hydrology, cultural resources, and economics.

Nearly three-fourths of the technical assistance provided by the agency goes to helping farmers and ranchers develop conservation systems uniquely suited to their land and individual ways of doing business. The agency also provides assistance to rural and urban communities to reduce erosion, conserve and protect water, and solve other resource problems. NRCS employees are committed to working with private landowners and managers to assess the state of their land and protect its values.

Society For Range Management:

The Society for Range Management is the professional scientific society and conservation organization whose members are concerned with studying, conserving, managing and sustaining the varied resources of the rangelands which comprise nearly half the land in the

world. Established in 1948, SRM has over 4,000 members in 48 countries, including many developing nations. SRM's members are land managers, scientists, educators, students, producers and conservationists--a diverse membership guided by a professional code of ethics and unified by a strong land ethic.

National Cattlemen's Beef Association:

Initiated in 1898, the National Cattlemen's Beef Association is the marketing organization and trade association for America's one million cattle farmers and ranchers. With offices in Denver, Chicago and Washington, D.C., NCBA is a consumer-focused, producer-directed organization representing the largest segment of the nation's food and fiber industry. NCBA works to achieve the vision: "A dynamic and profitable beef industry, which concentrates resources around a unified plan, consistently meets global consumer needs and increases demand."

The NCBA Checkoff Division oversees beef and beef product promotion, research, information and related activities financed by the beef checkoff and similar market development investments. It also functions as the Federation of 45 Qualified State Beef Councils and carries out the duties and responsibilities assigned to the Federation by the Beef Promotion and Research Act and Order. In this way, NCBA coordinates state-national efforts to build demand for beef.

The NCBA Dues Division oversees policy-making, governmental affairs and related activities financed by sources other than the beef checkoff. In this role, NCBA is a trade association with about 40,000 individual members, 46 state cattle associations and 27 national breed organizations. Together these organizations represent more than 230,000 cattle breeders, producers and feeders. NCBA works to advance the economic, political and social interests of the U.S. cattle business and to be an advocate for the cattle industry's policy positions and economic interests.

As family farmers and ranchers, cattlemen have a vested interest in protecting the environment. As responsive producers, they share an interest in meeting the needs of consumers worldwide by providing high-quality, nutritious beef, while setting higher quality and safety standards than those required by the government. As individual entrepreneurs, cattlemen raise livestock in more states than any other commodity, helping sustain a way of life in thousands of rural communities.

NCBA members adhere to a statement of principles designed to ensure the well-being of the animals and resources in their care. By agreeing to the principles, members agree to the humane treatment of farm animals, the wise stewardship of natural resources and the implementation of good husbandry practices.

National CattleWomen Association:

The American National CattleWomen, Inc. was founded in 1952 as the American National CowBelles, to give women a voice in the beef cattle industry. The name was changed in 1984 to reflect the changing times. With over 36 affiliated CattleWomen organizations and more

than 500 locals, the American National CattleWomen organization has more than 5500 members and speaks for more than 25,000 CattleWomen from coast to coast.

ANCW's primary focus is promotion and consumer education regarding beef as a safe and nutritious food and the production of beef cattle as an industry. ANCW members strive to reach consumers, young and old, and to share the benefits, safety and wholesomeness of their product. The members remain current on food trends, nutrition and food safety. They address issues critical to the U.S. beef cattle industry and stay informed on issues of animal care and the environment.

ANCW is the sponsor and project leader of the National Beef Cook-Off, in cooperation with the National Cattlemen's Beef Association and the Cattlemen's Beef Board. The NBCO is the largest promotional event in the beef industry. This event gains national and international media exposure for its unique, volunteer-based structure. ANCW is also the sponsor of the National Beef Ambassador Program, in cooperation with the National Cattlemen's Beef Association and the Cattlemen's Beef Board. This program trains youth spokespersons for the beef industry and provides them with valuable public speaking training and experience.

ANCW keeps consumers informed about beef and the beef cattle industry with its resource information including The American CattleWoman newsletter; ANCW's Changing With The Times video, and brochures such as Wow That Cow! and Cattle and Beef: The American Industry. ANCW is respected among its peers in the beef cattle industry for the important work it does on behalf of preserving and promoting the beef industry and agriculture as a way of life.

ANCW's Legislative Action network allows members to participate in formulating the regulations that affect the business environment of the American Beef Cattle Industry. The network also allows quick responses to other public relations issues. The American National CattleWomen, Inc. has a joint operating agreement with the National Cattlemen's Beef Association and a close working relationship with other industry organizations such as the Cattlemen's Beef Board and State Beef Councils.

IV-8. State Cattlemen Organizations:

Arizona Society of Range Management:

Arizona Society of Range Management is the local organization of the Society of Range Management. It addresses local range issues.

Arizona Cattle Growers Association

The Arizona Cattle Growers' Association (ACGA) is a non-profit organization founded in 1904 to properly represent the ranchers of Arizona and to protect the cattle industry. It has grown to include more than 2,000 cow/calf producers, business associates, individual associates and friends of the industry from every county in Arizona.

ACGA offers member benefits such as group health insurance and workers' compensation insurance plans, discounts from local merchants and full-time representation in the legislative and executive branches of state and federal government. ACGA staff members monitor federal, state and county agency regulations and in recent years monitor court decisions that affect ranch families. Because of dozens of lawsuits filed in the past few years by activist organizations, ACGA has also established a litigation fund to defend ranching in both state and federal courts.

Arizona Cattle Feeder's Association

The Arizona Cattle Feeders' Association (ACFA) is a separate non-profit organization of about 400 feedlot owners and operators, ranchers who also feed cattle, business associates and individual associates. Founded in 1934, ACFA was the first organization for cattle feeders in the United States. It offers membership benefits similar to those available to ACGA. ACFA helps its members develop the best feeding practices and marketing approaches possible and works with other organizations across the United States to keep abreast of regulatory and industry changes.

Arizona Beef Council:

Arizona Beef Council (ABC) is a not-for-profit organization, funded by the beef checkoff (For every beef animal sold, one dollar from the sale is given to the beef checkoff).ABC works to drive demand for beef through promotion, consumer education and retail and food service support.

The Arizona Beef Council (ABC) was created by the State of Arizona in 1970 to establish a self-financed program to help develop and maintain state, national and foreign markets for Arizona beef and beef products. It is governed by Board of Directors, appointed by the Governor of Arizona. The board is made up of nine industry representatives from the cattle producer, cattle feeder and dairy industries of the state. With the passage of the Beef Promotion and Research Act in 1985, ABC was certified as the state council to collect the beef checkoff. The checkoff is a $1 per head assessment on all sales of cattle in Arizona. Of the checkoff collections, half goes to the National Cattlemen's Beef Association for national programs and half is used to fund state promotion, education, information and retail support activities.

The education effort centers on "Ag in the Classroom" programs for school children on how beef fits into a balanced diet, food safety, the many uses of beef byproducts, ways Arizona ranching families protect the environment and the tools and lifestyle of cowboys. Beef Council staff members also take the message to festivals for children such as the Phoenix Family FunFest, Arizona National Stock Show and U.S. West Festival of the West.

The Beef Council is one of the organizers of Arizona Envirothon, a contest for high school students which measures their knowledge of natural resources and the environment and challenges them to find solutions to environmental problems.

Nutrition educational programs are provided for school cooks, nurses, teachers and coaches. Beef Council staff members also work with dietitians and provide educational programs for corporate health programs. In addition, ABC is a high-profile presence at the Arizona Heart Association's Heart Walk and the Phoenix Health and Fitness Expo, trade shows such as Warm-Up to Wellness, Cardiovascular Conference and Women's Wellness Symposium and conventions of the Arizona Dietitians Association and Arizona School Nurse Association. ABC helps plan and provide information for the Safe Food 2000 Conference.

ABC also encourages food service distributors and operators to actively promote and utilize beef. The staff provides safe food handling demonstrations, beef short courses and materials to food service personnel around the state. On the retail side, ABC offers information, posters and training materials to five major retailers and many independent supermarkets around the state. ABC partners with providers such as Maverick Beef, Omaha Steak House and Harris Ranch Beef in demonstrations at events such as the Arizona State Fair, Scottsdale Culinary Festival, Heart Walk and Health and Fitness Expo.

Administrative services, accounting and office support for ABC is provided under a contract with the Arizona Cattlemen's Association.

Arizona Cattlemen's Association:

The Arizona Cattlemen's Association is the management organization for the Arizona Cattle Growers' Association, Arizona Cattle Feeders' Association and Arizona Beef Council. It was established in 1985 as an umbrella company to administer the policies and programs of the Arizona Cattle Growers' Association, Arizona Cattle Feeders' Association and Arizona Beef Council. The primary goal of Arizona Cattlemen's Association is to preserve an important basic industry and lifestyle that makes up the very fabric of Arizona.

Arizona's family ranchers -- cattle producers and feeders -- produce $437 million worth of cattle each year, which generates a total $2.8 billion in economic impact for the state, along with more than 94,000 jobs. Cattle production makes up 5 percent of Arizona's gross product. In many rural areas of the state, cattle production is 75 percent of the gross product.

Arizona State Cowbelles:

The Arizona State Cowbelles are a unified, professional organization of generations of Arizona women who play a vital role in the cattle industry. In 1939, a group of rancher's wives in Douglas began the Cowbelles to cement good will and friendship among the wives and mothers of cattlemen in southeast Cochise County. The club, besides meeting socially began doing charitable work in their community. By 1940, Wyoming and Texas formed Cowbelle groups and by 1947, Arizona formally organized a state group. A total of 16 local Cowbelles groups have been organized around the state.

Having began doing community work, today the Cowbelles around Arizona have turned their focus to beef promotion and public education about the nutritional value of beef and the lifestyle of ranch families. The Cowbelles host several activities, including the annual Arizona

Beef Cook-Off, held in April as part of the Scottsdale Culinary Festival; the Beef Ambassador program, which provides opportunities for youth to speak up for beef; and Agriculture in the Classroom, which informs students about the value of beef in the diet, the many essential items made from beef byproducts and the basics of ranch life and cattle production.

IV-9. Local Cattlemen Organizations:

Southern Arizona Cattle Protection Association:

The Southern Arizona Cattle Protection Association is a local organization of the Arizona Cattle Growers Association. It encompasses Santa Cruz, Pima and Pinal counties and addresses local cattle grower issues.

Altar Valley Conservation Alliance:

The Altar Valley Conservation Alliance has a vision for stewardship of the Altar Valley watershed during the next 50 years. First, open space should be maintained and enhanced, while respecting private property rights. Second, economically productive use of the valley lands, both private and public, should continue. Third, management efforts should accelerate the rate of improvement of the Altar Valley watershed.

These three elements of the vision are interwoven--none can be achieved independently, nor can they be achieved without cooperation between all land stewards within the Valley. This vision will guide Alliance projects, and efforts to work cooperatively with public and State land managers and others who have a stake in the future of the Altar Valley watershed.

The objectives of the alliance states that open space should be maintained and enhanced, while respecting private property rights. The alliance would establish a fund to acquire private ranch lands within the watershed that may come up for sale. Lands acquired by the Alliance would be sold to an interested rancher at a price suitable for agricultural use of the lands. The Alliance would maintain control of the development rights through a conservation easement while the members would agree to grant the Alliance the opportunity to meet or exceed the highest price offered by the bidder should a member choose to sell their ranch.

Economically productive use of the valley lands, both private and public, should continue. Ranching would continue to be a dominant economic activity in the Altar Valley watershed. Public recreation, particulary hunting would continue to be a component. Lands purchased by the Alliance could be used fro grass-banking to enable members to undertake watershed improvement projects wich would otherwise not be feasible. The Alliance would assist members with constructive solutions to economic, governmental or environmental challenges, if requested to do so, in the interest of preserving ranching as on of the historic multiple uses of the Alter Valley.

Management efforts should accelerate the rate of improvement of the Altar Valley watershed. The Alliance would encourage and support projects designed to control erosion, increase perennial grass cover, increase watershed permeability, and control and decrease invasive

species within the Altar Valley watershed, by utilizing best-science approaches with advice from the Natural Resources Conservation Service of the U S Department of Agriculture. The Alliance would play a role in gathering funding and political support for completion of the Brawley Wash restoration project. The Alliance would continue to work with the State Land Department to completer and use the prescribed natural fire management plan begun during 1996. The plan would be updated annually during the spring. The Alliance would support efforts to use Geographic Information System technology to facilitate plan updates and accurate analysis. The Alliance would support prescribed fire efforts undertaken by members.

Pima Natural Resource Conservation District:

The mission of the Pima Natural Resource Conservation District are to provide leadership, coordination and services to the statewide network of local Conservation Districts, which promotes the wise use, management and conservation of Arizona's natural resources.

At the time they were first organized in 1942, Conservation Districts reflected a completely new national concept in the role of representing the interests of the individual land owner and land user in the cause of soil and water conservation in cooperation with local, state, and federal levels of government. At President Roosevelt's request in 1937, Governors in each state agreed to: create legal charters establishing districts, provide oversight to each district, establish state support and provide financial assistance. The federal government, through the Secretary of Agriculture, agreed to: provide funding for technical assistance, establish offices and staffing and provide financial assistance for special projects.

Arizona's 39 conservation districts are legal subdivisions of state or tribal government. They link 1) private landowners, 2) local units of government, 3) state or tribal agencies and 4) the federal government in a unique cooperative relationship. Districts are established and governed by local landowners.

V. Summary & Conclusions:

- Ranch conservation is a key element of the Sonoran Desert Conservation Plan because of its singular and fundamental role in maintaining the integrity of natural open space and in continuing the stewardship of ranchers in managing the land for its natural productivity. Sustainable ranching can:

    - preserve natural habitat
    - restore natural ecosystems
    - increase biodiversity
    - conserve water resources
    - preserve cultural resources
    - maintain a traditional industry
    - diversify the local economy
    - preserve western heritage and culture
    - provide both a natural and working landscape
    - define the urban boundary

- Pima County has approximately 2.9 million acres classified as agricultural and grazing lands. In an arid region, land use is primarily determined by the availability of water, and Pima County ranks third of all Arizona counties in grazing land.

- While the number of farms and ranches in Pima County has remained relatively stable and productivity has increased, the value of land has increased 111 percent in five years.

- When land once valued for its productivity becomes valued as a commodity, this marks the transition of ranching to real estate, allowing the urban form to expand one ranch at a time.

- Urban growth in the metropolitan Tucson area consumes 13 acres of land each day, at the rate of ½ acre every hour, and nearly 40 percent of this growth is unregulated.

- Nearly 64 percent of eastern Pima County comprised of private and State Trust lands could be developed in the future, and the State Land Department has already identified more than 50,000 acres for development and future urban expansion.

- Most ranches are comprised of a mosaic of land ownership and include relatively small private parcels, usually the original homestead claims, that encompass some of the most biologically sensitive lands near natural springs and riparian areas.

- Traditional ranching areas are still found in every valley system in Pima County. These ranchlands currently define the urban boundary and encompass our remaining open space. However, with development pressure, increasing land values, and the uncertainty of long-term tenure, many ranches are being sold for development, resulting in the fragmentation of habitat and the loss of open space.

- The Sonoran Desert Conservation Plan recognizes the contributions of ranching and the stewardship of ranchers in preserving what remains of our natural and cultural landscape — our common ground.

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