DRAFT

Resources of the Altar Valley Subarea

Sonoran Desert Conservation Plan

March 2000

Pima County
Board of Supervisors

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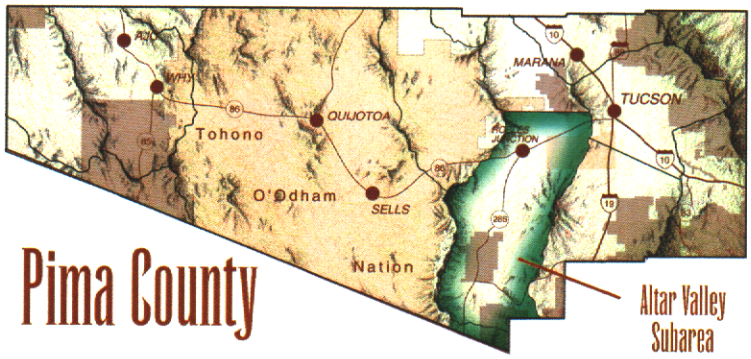
Sonoran Desert Conservation Plan



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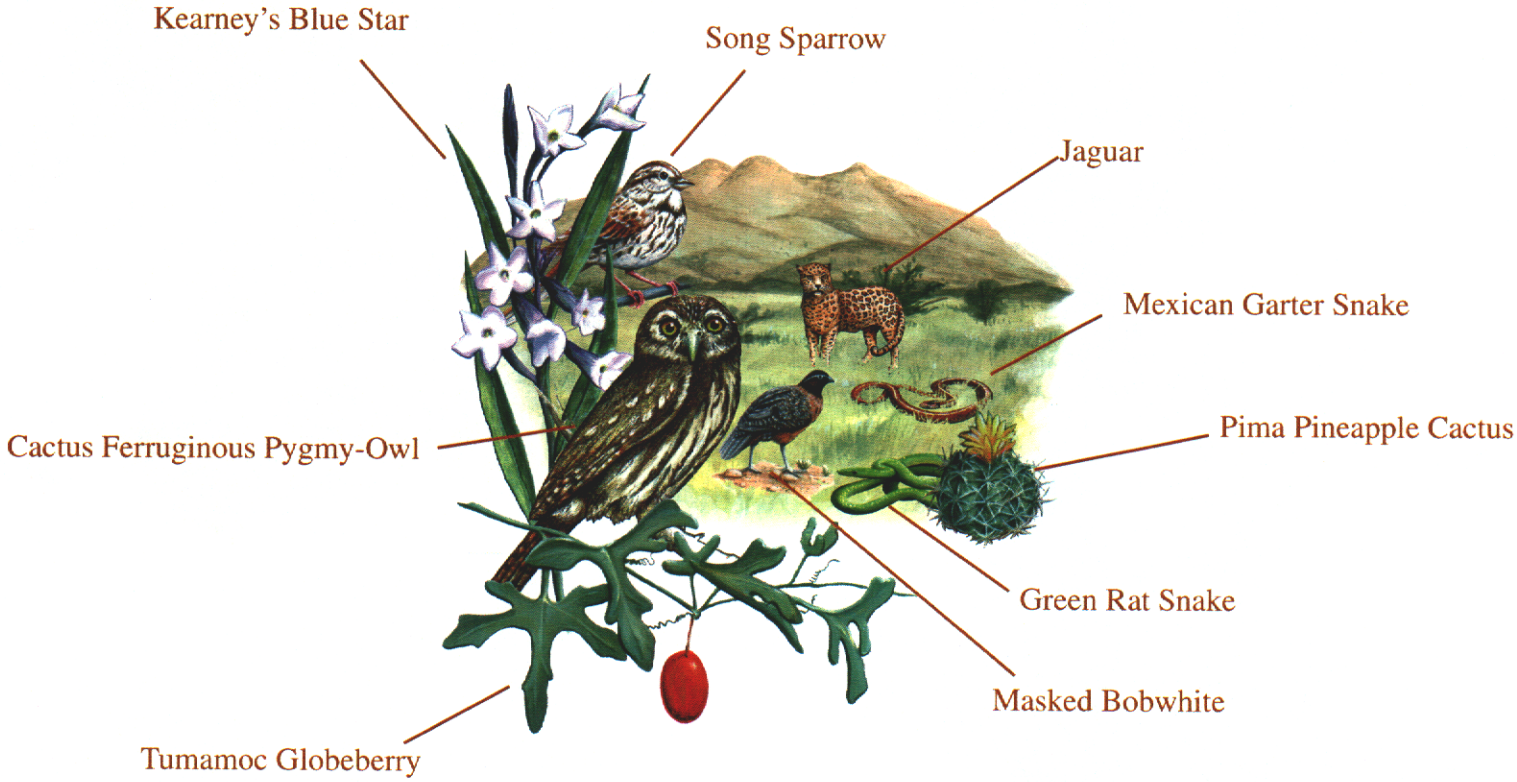

Current and former inhabitants of Altar Valley

MEMORANDUM

Date: March 24, 2000

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

From: C.H. Huckelberry
County Administrator

Re: *Resources of the Altar Valley*

I. Overview

This memorandum summarizes the attached resource reports that have been submitted so far to help develop the Sonoran Desert Conservation Plan within the watershed planning area of the Altar Valley. The Steering Committee, interested members of the public, and stakeholding governmental entities are invited to submit additional documents and comments. Presentations at the March 25, 2000 Steering Committee meeting will be followed by subarea land panel meetings for all interested parties so that topics ranging from biological, to riparian, to ranch, to cultural, land and fiscal resources can be discussed in greater detail. Contributions resulting from the subarea process will be forwarded to the Steering Committee and Technical Teams. It is of particular importance during future land panel discussions to develop landowner goals and a realistic picture of options and constraints.

II. Habitat and Corridors Elements

The health of the habitat community is dependent on availability of water resources. The Arivaca Watershed Education Task Force (AWET) has submitted a report found at Attachment A, entitled *Arivaca Resources and the Sonoran Desert Conservation Plan*. The report, which will be discussed at the March 25, 2000 meeting, makes these points:

- "There is not enough groundwater in the Arivaca watershed to support the maximum potential build-up allowable under current zoning. ... With a full build-up, many domestic wells, the cienega, and surrounding riparian habitat could go dry. This would threaten endangered species in the Arivaca Valley and negatively affect Pima County's Sonoran Desert Conservation Plan goals of compliance with the Federal Endangered Species Act."

- "Under current zoning an additional 2,177 residences could be built in the Arivaca Valley. This would result in an estimated usage of 1026 acre-feet of ground water annually (AFA). The estimated safe yield for the Arivaca aquifer is 300 AFA, resulting in a groundwater shortfall of 726 AFA."

- "If action is taken in the near future, the potential personal hardship, financial disaster and environmental degradation can be averted, and Pima County can protect its valuable resources through the Sonoran Desert Conservation Plan. We support financial incentives so goals can be met voluntarily."

III. Riparian Element

Barbara Tellman of the Arizona Water Resources Research Center will be presenting the Altar Valley chapter of a study about watersheds and watercourses that she is completing along with co-authors, for the Sonoran Desert Conservation Plan. Found at Attachment B, this document describes the watershed, Brawley Wash, Black Wash, tributary washes, and distributory washes. Human impacts on the Altar Valley subarea watershed are described, including flood management activities, transportation, water and wastewater-related land uses, along with existing public and private land uses and projected land uses.

The report identifies issues for discussion in achieving a goal of watercourse protection. These include population growth, subdivision and wildcat development issues, expansion of Ryan Airfield, abandoned farmland issues, recharge and terminal storage projects, Tucson Mountain Park issues, road expansion and the Brawley Wash restoration.

IV. Ranch Conservation Element

Ranching in the Altar Valley is described in a summary drafted by Ms. Linda Mayro, the lead staff of the Ranch Conservation Team. Attachment C includes narrative analysis and maps that show the ranches of the valley, grazing allotments, agricultural lands, carrying capacity, allotments in relation to vegetation communities, annual precipitation in the valley, stock tanks and well sites, springs and shallow groundwater, disposable lands for BLM and State Land, BLM Long Term Management Lands, and platted land within the valley.

V. Cultural Resources Element

Attachment D is a cultural and historic resources inventory report by Mr. David Cushman, the lead staff of the Cultural and Historic Resources Technical Team. Three types of resources are described and quantified: archaeological sites, historic resources, and traditional cultural resources. Maps depict: high sensitivity areas for cultural resources; archaeological site / survey locations; archaeological sites in relation to land ownership; and archaeological sites within private land.

VII. Land Use Considerations

Mr. Ben Changkakoti of the Planning Division is the author of Attachment E, a description of land use in Altar Valley. Information includes: current and planned land use, zoning on vacant land, residential rezonings, housing types, topography, viewsheds, infrastructure (including roads, access, water, sanitary sewer, natural gas, telephone and electricity), schools, parks, open space, real estate market conditions, capital improvement projects, and permits issued for residential and commercial activities.

VIII. Conclusion

A synthesizing evaluation will be drafted by the land panel members and county staff that includes landowner goals and suggestions for conservation strategies after a number of subarea meetings are held, additional contributions and comments are received, discrepancies are eliminated in the data of individual reports and resource reports are perfected by the work of consultants and technical teams. This initial presentation of resource information is intended to both educate and serve as an invitation to greater participation in crafting the Sonoran Desert Conservation Plan.

Arivaca Resources

and the

Sonoran Desert Conservation Plan

Presented by the Arivaca Watershed Education Taskforce (AWET)

March, 2000

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OVERVIEW

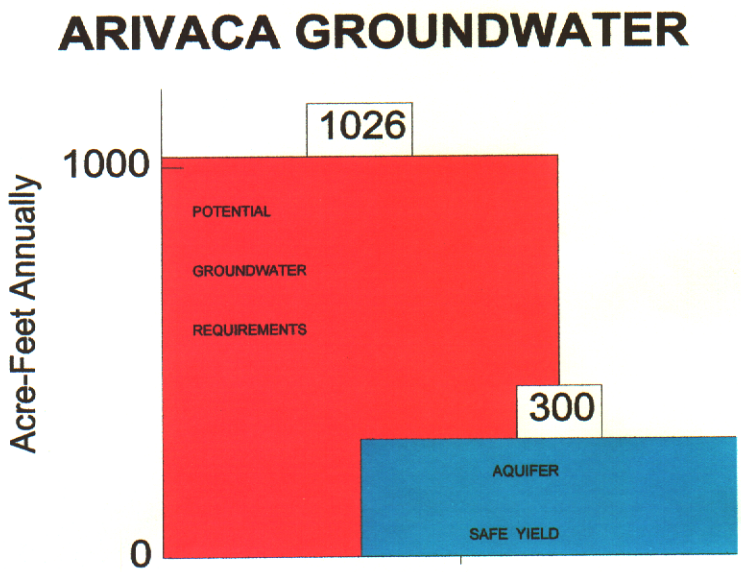
Arivaca, located on the Southern border of Pima County, is one of the few remaining riparian areas in Southern Arizona. The Arivaca Watershed Education Taskforce (AWET) has been gathering and dispersing information on the Arivaca watershed since 1997. This report will present collected data, show how the Arivaca area relates to the Sonoran Desert Conservation Plan, and make recommendations on how the plan could address pressing groundwater issues in the Arivaca Valley.

The Problem

There is not enough groundwater in the Arivaca watershed to support the maximum potential build-up allowable under current zoning. The watershed is an isolated microbasin without the possibility of water being imported to alleviate groundwater shortages. With a full build-up, many domestic wells, the cienega, and surrounding riparian habitat could go dry. This would threaten endangered species in the Arivaca Valley and negatively affect Pima County's Sonoran Desert Conservation Plan goals of compliance with the Federal Endangered Species Act.

The Numbers

Under current zoning an additional 2,177 residences could be built in the Arivaca Valley. This would result in an estimated usage of 1026 acre-feet of groundwater annually (AFA). The estimated safe yield for the Arivaca aquifer is 300 AFA, resulting in a groundwater shortfall of 726 AFA.



Conclusion

If action is taken in the near future, the potential personal hardship, financial disaster and environmental degradation can be averted, and Pima County can protect its valuable resources through the Sonoran Desert Conservation Plan . We support financial incentives so goals can be met voluntarily.

Who We Are

Arivaca is located on the southern boundary of Pima County, 23 miles southwest of I-19, on a tributary to Altar Wash. The town is adjacent to the Arivaca Cienega and most of the population of 1237 live to the east in the foothills surrounding the riparian corridor formed by Arivaca Creek. The cienega and some of the riparian areas are now part of the Buenos Aires National Wildlife Refuge. See Figure 1 for location map.

In 1997 a group of volunteers formed The Arivaca Watershed Education Taskforce (AWET) in response to widespread community concern about the future of Arivaca water resources and the lack of information about our aquifer. The volunteers are a diverse group of Arivacans including fourth-generation ranchers, professionals, business owners and retirees. AWET organized a network of forty people throughout the Arivaca Valley to measure rainfall and monitor well levels and has been collecting data for two years. The goal is to create a groundwater budget specifying maximum safe yield. There is a parallel effort to educate the community about the watershed, methods to promote recharge and the importance of land stewardship. Workshops on watershed preservation and restoration involve Arivaca residents in building water retention structures on their land to slow runoff and enhance recharge. Dozens of land owners in the valley have constructed gabions as a result of this project and have become aware of the importance of erosion control and land revegetation.

How Does Arivaca Fit Into The Sonoran Desert Conservation Plan?

Arivaca is rich in the resources sought by the Sonoran Desert Conservation Plan and its attempt to address the Federal Endangered Species Act.:

1. The Arivaca Cienega and creek is one of the few remaining riparian areas in Southern Arizona and is home to several threatened plant and animal species.
2. The watershed includes wetlands, sensitive uplands habitat, and functions as a wildlife corridor.
3. Ranching has been the dominate land use, and due to the isolation of Arivaca, the rural culture has been retained.
4. The Arivaca Valley has been intermittently inhabited for centuries and archaeological remains can be found across the valley floor.
5. Because Arivaca has low density development (approximately 1250 people on 10,000 acres), preservation of these resources would be compatible with current land use, and will not require vast expenditures to maintain.

One of the goals of the Sonoran Desert Conservation Plan is to reach safe yield in Pima County. In Arivaca, as well as the rest of the Southwest, groundwater is the crux of the issue.

Water

All life in the desert, including Arivaca residents, the riparian habitat, and the threatened species, depend upon water for their survival. The first step in establishing a groundwater budget for safe yield in the Arivaca watershed is to acquire an estimate of how many acre-feet of aquifer recharge there is on an average yearly basis. In this section we will present information AWET has accumulated on this issue.

Water has always been a concern in the Arivaca Valley and as the following quotes illustrate, sometimes it's plentiful and sometimes it's not. **"This** [Arivaca] **valley is large, but swampy and unhealthy.... The horse herds will enjoy good pastures, but the soldiers no health... .... The valley is large with considerable pasture, but without any water except in the marshes which in time of drouth hardly provides the necessary amount to satisfy thirst... "** *(Thomas)*

May 13, 1780
When I reconnoitered Aribac ...we found the houses in ruins. The surrounding area was entirely without water. The Tubac residents assured me that to their knowledge, this was the first time that such had ever been the case." *(Williams)*

Dr. Paul Sheppard from the tree-ring laboratory at the University of Arizona states: **"Tree-ring chronologies behave essentially as "integrating rain gauges" . Tree growth typically responds to moisture availability during the growing season... Prolonged droughts and wet periods are noted in the instrumental record of the Southwest. For example, no less than thirteen episodes of drought and ten episodes with above average precipitation are reported for southeastern Arizona for the years from 1866 to 1961 ...Long periods of generally below average moisture availability occurred from 1850 to 1905 as well as from 1770 to 1825. ....Several tree-ring chronologies from the Southwest show an unprecedented ramp of tree growth beginning in the mid-1970s....** *(Southwest Climate Assessment, 1999)*

The Arivaca area has long been susceptible to drought---in 1780 houses were abandoned and the cienega dried up. The tree-ring data shows prolonged periods of low rainfall have occurred in the past. The low moisture period including the 1780 drought lasted 45 years. The tree-ring data also indicates the period from 1980 to the present has been unusually moist. Population influx leading to increased groundwater pumping in the Arivaca Valley began in the mid-1970's.

In 1971 Arivaca Ranch sold 10,000 acres to Nationwide Land and Development Company which were in turn sold as forty acre parcels, creating an area in the Arivaca
Valley known as 'The Forties'. When this development was under review, both the Arizona Water Commission hydrologist, Briggs, and Nationwide's Hydrologist, Manera, put forward estimates of safe yield: **"The developer's consultant estimates that the basin's safe yield, as evidenced by its outflow, is 645 acre-feet/year.** ...**The** [Az Water Commission] **Committee felt that the safe yield, also as measured by the basin's outflow, was 300-400 acre-feet/year..."** *(1973 Letter to Pima County Planning & Zoning Department)*

Manera, the hydrologist hired by Nationwide Development Company , originally produced a report estimating recharge to be 2000-2500 AFA based on a standard percentage of the average 15" rain/year. *(Manera 1972)* The report was challenged and Manera issued a revised report in 1973, saying safe yield was 645 AFA. *(Manera Two, 1973)* The Arizona Water Commission hydrologist lowered the estimated safe yield even further to 300-400 AFA in the Arivaca Valley.

AWET has been monitoring wells across the Valley since 1998 when there was 20" of rainfall, much of it concentrated in the winter season. In 1998 well levels rose Valley-wide, suggesting aquifer recharge. However, during 1999 with only 14" of rainfall, well levels dropped up to 6' three miles upstream from the cienega, while remaining roughly the same on the Valley floor. This suggests there was little or no recharge during 1999. One upstream well on Arivaca Creek has been monitored for twenty-five years and has shown a water level variation of as much as twenty-six feet, reaching its highest points only when Arivaca Dam overflows. The water level in this well rose 8' in 1998 and dropped 6' in 1999. *(Regan)* This suggests a shallow aquifer which rapidly reflects variations in annual rainfall.

The Arivaca microbasin covers 87 square miles. Arivaca Dam, built in 1970, is managed by Arizona Fish and Game as a recreational resource. The dam retains 17% of the runoff from the basin. Only five times in the past twenty five years has the dam overflowed into Arivaca Creek and contributed to significant aquifer recharge; the last time was in 1993. *(Regan)*

There has been no scientific study of aquifer recharge in the Arivaca area which considers all the relevant factors, including the amount of rainfall needed per rainfall event for recharge to occur, the percentage which leaves the Valley in runoff during floods, the amount captured by Arivaca Lake and stocktanks, and the affect of prolonged drought on the aquifer. We do know, however, that in 1780 before there was groundwater pumping, and before Arivaca Dam and stocktanks captured any runoff, the cienega went dry. We further know extended periods of low moisture have occurred with some frequency in Southern Arizona.

Arivaca is an isolated microbasin and cannot rely upon CAP water being piped in to relieve the community in times of drought. The safe yield range the experts have settled upon is wide: from the Arizona Water Commission's hydrologist's estimate of **300 AFA**, to Nationwide's hydrologist's estimate of **645 AFA.** In order to avoid the personal hardship, financial disaster, and environmental degradation accompanying an extended drought, it seems prudent to use conservative safe yield estimates when planning our groundwater future.

MAXIMUM SAFE YIELD FOR THE ARIVACA VALLEY:	
NATIONWIDE HYDROLOGIST	**645 AFA**
AZ WATER COMMISSION HYDROLOGIST	**300-400 AFA**

How Much Groundwater Is Already Allocated?

Groundwater allocation and groundwater use are, fortunately, two different things. If and when the groundwater runs out, claims will be settled in court on a "first in time, first in line" basis.

ADWR records show there is currently **924 AFA** of grandfathered groundwater rights allocated in the Arivaca basin.

According to state law, each domestic 'exempt' well is allowed 10 AFA of groundwater use. There are 245 registered domestic wells in the Arivaca watershed. Domestic well allotment is **2450 AFA**.

GROUNDWATER ALLOCATIONS		
GRANDFATHERED RIGHTS	**924**	**AFA**
DOMESTIC WELLS	**2450**	**AFA**
TOTAL ALLOCATED	**3374**	**AFA**

There are about 10 times more 'rights to groundwater' than there is groundwater to have rights to, on an annual basis.

How Much Water Do We Currently Use?

According to Pima County Assessor 1999 land use records, there were 266 residences in the Arivaca watershed outside of the townsite. Household use is estimated at .42 AFA. (ADWR estimates per capita water consumption @ 150 gallons/day, and the Census Bureau uses 2.5 persons/residence as average.) This accounts for **111 AFA.**

The Arivaca Townsite Cooperative Water Company reported using **24.5 AFA** (a fifteen year average).

Irrigation use reported in 1998 was **68.6 AFA**.

Four commercial wells and 23 ranch wells are estimated to use **11 AFA**.

The total acre feet of groundwater used in the Arivaca watershed is currently estimated to be **215 AFA**.

ESTIMATED CURRENT GROUNDWATER USAGE:		
266 RESIDENTIAL UNITS OUTSIDE TOWNSITE	**111**	**AFA**
TOWNSITE (15 YR. AVERAGE)	**24.5**	**AFA**
4 COMMERCIAL AND 23 RANCH WELLS	**11**	**AFA**
IRRIGATION USE REPORTED IN 1998	**68.6**	**AFA**
TOTAL	**215**	**AFA**

Under Current Zoning, What Is The Potential Groundwater Usage?

Current RH zoning permits one residence/4.13 acres. This zoning covers all of The Forties, much of which has already been split into 10 and 20 acre parcels: there are currently 477 parcels. If all owners were to sell down to their last split there would be 1248 parcels in The Forties. This would amount to **524 AFA**, (1248 x 2.5 persons x 150 gallons/day). The 150 gallons/day figure is used by ADWR for estimating urban water use. Rural water use may be higher when stock watering and gardens are taken into account, but we have no figures to quantify this.

There are several working ranches in the Arivaca watershed. If all the privately owned land zoned RH, excluding The Forties, were to be split into parcels of 4.13 acres that would result in an additional 865 residences and amount to **363 AFA** groundwater use.

Some of that land is zoned GR-1 which allows one residence /36,000 sq.ft. There are 330 potential parcels with GR-1 zoning which would amount to **139 AFA**.

If all the land in private ownership in March 2000 were split into its legally smallest units there could be a total of 2,443 residences in the Arivaca Watershed, using **1026 AFA**.

POTENTIAL WATER USAGE UNDER CURRENT ZONING:	
FORTIES: 1248 POSSIBLE RESIDENCES	**524 AFA**
865 OUTSIDE FORTIES (INCL. RANCHLAND)	**363 AFA**
330 ON GR-1 LAND	**139 AFA**
POTENTIAL TOTAL.....	**1026 AFA**

See Figure 2 for map of existing private parcels and potential build-out display.

Conclusion

MAXIMUM SAFE YIELD FOR THE ARIVACA VALLEY:	
NATIONWIDE HYDROLOGIST	**645 AFA**
AZ WATER COMMISSION HYDROLOGIST	**300-400 AFA**
GROUNDWATER ALLOCATIONS:	**3374 AFA**
POTENTIAL GROUNDWATER USAGE	**1026 AFA**

Arivaca groundwater is already over-allocated. Further, if all the privately owned land in the Arivaca watershed were to be split down to the **currently legally allowable** smallest units, estimated groundwater usage would be 1026 AFA. That is nearly triple the safe yield estimate of 300-400 AFA by the Arizona Water Commission; it is 381 AFA over Nationwide's estimated safe yield. Both those safe yield estimates were made on the basis of data collected in 1972, a year with average rainfall of 16.30", following a year of above average rainfall in 1971 with 20".

AQUIFER SAFE YIELD.....	**300 AFA**
POTENTIAL GROUNDWATER USAGE.....	**1026 AFA**
GROUNDWATER OVERDRAFT.....	**726 AFA**

If the Arivaca Valley is to have adequate water for residents and habitat in the future, groundwater issues must be addressed.

Riparian Habitat and Threatened Species

The cienega lies in the lap of the Arivaca Valley adjacent to the townsite where the geology creates a shale dike that holds back the water of Arivaca Creek, before it drains down to Brawley Wash and the Altar river. Eighty-seven square miles of upland watershed support and contribute to this wetland.

Established in 1985, the Buenos Aires National Wildlife Refuge includes parts of Arivaca Creek and the Arivaca Cienega. **"The species living on BANWR both directly and indirectly depend on Arivaca Creek as a source of water: mammals and birds use the creek as a source of drinking water; Arivaca cienega is directly connected to the creek; the creek supports a riparian corridor of cottonwoods and willows, among other trees and shrubs. This vegetation creates a forest of forage material, food and protection for the wildlife living on the refuge."** *(FWS,1999)* BANWR owns 1,619 acres of the Arivaca watershed.

Because of the rarity of wetlands in Southern Arizona and Northern Sonora, this area is home to a wide assortment of species. The endangered and threatened species located in the Arivaca Watershed include:

Chiracahua leopard frog
Large flowered blue star
Lowland leopard frog
Mexican long tongued bat
Greater Western mastiff bat
Cave myotis
Northern beardless tyrannulet
Pale Townsend's big-eared bat
Santa Cruz striped Agave
Tropical kingbird
Yellow-nosed cotton rat
Buff-collared nightjar
Black-bellied whistling-duck
Cactus Ferruginous pygmy-owl
California leaf-nosed bat
Gila topminnow
Mexican garter snake
Northern gray hawk
Rose-throated Becard
Thick-billed kingbird
Western Yellow-billed cuckoo

(AZGFD Heritage Data Management System, 1999)

The privately owned riparian areas and the open space in the uplands surrounding the Buenos Aires Refuge provide habitat and corridors for wildlife. The condition of the uplands is crucial to the life and health of the Arivaca Cienega. Hence, it is important to maintain good vegetative growth which slows runoff and promotes recharge; avoid depleting groundwater; repair and control erosion by installing gabions, revegetate damaged areas; and continue land stewardship education programs.

Historical and Cultural Resources

The first written notice of the Arivaca Valley was by Father Kino who marked the location of Arivaca (then called Aribac), on a 1695 map. Arivaca became the center for miners and ranchers of the surrounding area. *(See Appendix A)* The ranching culture continues to this day: fourth generation descendants of early ranchers and homesteaders still live and ranch in the Arivaca Valley. However, other Arivaca ranches have changed hands within the past few years.

Archaeological exploration of the Arivaca Valley has been limited. Due to road construction in 1992, a site was excavated and found to be a Trincheras-Hohokam Farmstead dated at A.D. 850 to A.D. 950. It is believed Arivaca was a contact area between the Hohokam of the Tucson Basin and the Trincheras of Sonora. The study concludes: **"Although extremely limited in scope, [these] archaeological investigations...provide the first detailed information about a previously unknown archaeological region. ..This upland area is characterized by mild climate, diverse natural resources, an expanse of arable land, and a perennial stream. These characteristics have made the area attractive to sedentary agriculturalists from early prehistoric times and imbued it with a rich cultural history."** *(1992, Dept. of Transportation)* Pottery shards, arrowheads, and spearheads are routinely seen. Residents have found burial sites, metates, and fire pits in areas previously inhabited prehistoric people.

Recommendations

The resources of the Arivaca Valley are at risk if groundwater use and further development proceeds as allowed under current law. It is still possible to meet the goals of the Tucson AMA for safe yield without major disruption of residents if actions are taken in the near future to conserve groundwater resources. U.S. Fish and Wildlife goals for the preservation of the Arivaca Cienega will be met only if the growth of groundwater use in the adjacent privately owned land is ameliorated.

We support voluntary inducements to meet these challenges. We believe it is just as important to reduce the number of potential 'splits' by small landowners as it is to preserve ranch land. Small and large landowners should receive financial incentives to meet these community goals voluntarily.

1. Take steps to ensure State Land remains undeveloped and available for agricultural and recreational use.
2. County, State, or Federal governments, or Conservation groups could purchase and retire groundwater rights from willing sellers.
3. Conservation easements could be purchased from willing ranchers to protect the ranching culture, open space and wildlife corridors in perpetuity.
4. Small land owners would need substantial incentives to forego potential profits from splitting their land.

(a.) A substantially reduced 'Land Stewardship tax-rate' could be established to encourage small parcel owners to sign over 'split rights' and take those potential splits off the table in perpetuity.

(b.) Established dwellings could be 'grandfathered' in the Pima County Building Code for those who enter the land stewardship program.

These incentives would make it possible for the current residents to remain in the area even if decreased land supply led to increased land values and hence higher land taxes. Tax increases could be indexed to specific improvements rather than estimated land value increases. Without this tax relief the culture of the area would be distorted because only those with high incomes could afford to live in the Arivaca Valley.
5. We recommend the Arivaca Road remain two-lane, with its curves, washes and grades intact. Not only does it preserve the arduous old wagon route, but it contributes to the sense of remote isolation which is an integral part of the historical culture.
6. Funding for continued watershed improvement would contribute to the preservation of the riparian habitat. Money for further educational workshops, gabion building materials and revegetation projects would enable land owners to participate in sound land stewardship.

These proposed Pima County expenditures and tax incentives would be offset by the reduced growth in infrastructure costs which result from expanded wildcat development through lot splitting. For instance, it would reduce increased road maintenance costs, flood control improvements, refuse and sewage management, etc. which are often expected County services when urbanites move to rural, developing areas. Protecting the Arivaca watershed will contribute to meeting the goals of the Sonoran Desert Conservation Plan.

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APPENDIX A

A History of Arivaca Valley Water Resources and Land Use

by Mary Noon Kasulaitis

The Arivaca valley and its surrounding hills had been home to Native Americans for centuries. The terrain supports numerous nutritious plants and trees, providing a year-round food supply, available for just a short trip from the cienaga in the valley to oak trees in the hills. An irrigation canal some two miles long snakes down the valley. It may date from Spanish times or even earlier, when the Hohokam resided there.

Father Kino was the first Christian missionary to Southern Arizona, marking the location of Arivaca, then called Aribac, on a 1695 map. In those days, if people lived here, there must have been water. There is no indication that Kino carried out much activity at Arivaca, and after his death in 1711, there was even less. Father Campos was assigned to this area, but his visits were few. After 1730, however, more Jesuits arrived to take over the mission field, bringing with them Spanish settlers. Arivaca became a visita of Guevavi Mission, and priests came here from time to time to baptise children and marry couples. There is no indication that there was any more than just a simple adobe building or ramada to serve as a church.

The 1740s were busy years in Arivaca, according to mission records. Don Antonio de Rivera employed a number of people on his ranch near Arivaca, both Pimas and gente de razón (Spanish settlers). The Jesuits at Guevavi also ran cattle in the Arivaca area. Then came the Pima Revolt which lasted from November 1751 through Jan 1752. Several ranch employees were killed by natives in an unexpected uprising known as the Pima Revolt. The Spanish retaliated and were able to subdue the revolutionaries in another battle near Arivaca.

After January 1752, Arivaca was abandoned and remained so for several decades. In 1764, Fr. Nentvig wrote that it had been destroyed and was not populated at that time. On the expedition to California in 1774, Capt. Juan Bautista de Anza noted in his diary that a stop was made at "La Aribac, a place which was occupied by some cattle ranches and Spaniards until the end of the year 1751, when it was abandoned because of the general uprising of the Pima tribe, which killed most of its inhabitants. The battle with the rebels themselves, which took place right here the year after the uprising, is memorable. For having come more than two thousand strong, led by their captain-general, to attack the Spanish forces composed of eighty soldiers and commanded by Don Bernardo de Urrea, now captain of the presidio of El Altar, the army of the enemy was completely put to rout, with many deaths on their side, from which resulted the pacification of this tribe.

"This place has the advantage of good gold and silver mines which were worked until the year 'sixty-seven, when they were abandoned because of greater persecution by the Apaches. . . It also has most beautiful and abundant pastures, and a number of permanent springs in the interior of the mountains. The chief one where the settlement was, is now running, although not with great abundance." (Anza Diary, Sun., Jan. 9, 1774)

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In 1766 the Marqués de Rubí was sent to the frontier of New Spain on an extremely lengthy trip, to reconnoiter the situation and make recommendations. These included setting presidios at carefully spaced sites across the northern frontier. Rubí would have changed the location of the presidio at Tubac to the Arivaca valley, because he felt it was a better location. But again it was not to be. Lt. Col. Hugo O'Conor was assigned to complete the realignment of the presidios. In 1774 he sent out his deputy, Don Antonio de Bonilla, to look at the situation again. Bonilla looked at the possible presidio sites and made his recommendation:

"The settlers of Tubac and the mission of Tumacacori are in the most unprotected condition and will, without support, emigrate as soon as the presidio is moved to Arivác.

"This valley is large, but swampy and unhealthy. . . The horse herds will enjoy good pastures, but the soldiers no health, and the only good which this transmigration will produce will be that the rich mines of silver called Longoreña, La Duri and others will be worked. But in Sonora where

minerals are plentiful, people and the spirit to work the mines are lacking."

O'Conor had to see for himself. He arrived here in 1775 and soon decided that Arivaca was too far south and "its only water was a ciénaga that all but evaporated during the dry season." O'Conor recommended Tucson instead, and so the Tubac garrison moved north in 1776.

Kessell, John L. *Friars, Soldiers and Reformers*
Thomas, Alfred Barnaby, ed. and transl. *Teodoro de Croix and the Northern Frontier of New Spain, 1776-1783*

The Ortiz family received a land grant in the Arivaca valley in 1812, but their family homes were in Tucson and Tubac. They attempted to maintain the ranch until the 1850s, but were constantly plagued with Apache attacks. According to testimony taken in 1880, Santos Aguirre stated that the Ortiz brothers were on the ranch and in possession of it until they were driven off by the Apaches. At that time, three persons and a child were killed in the house. After this, the Ortiz brothers abandoned the place and went to Tubac. Aguirre did not know when this happened, but Nasario Ortiz (no relation) testified that he thought it was in 1824. He added that they did not return to take possession of the ranch in person but held possession by agents and returned from time to time.

Jose Herreras stated that, besides having cattle and horses on the ranch, they or their employees cultivated the land and irrigated it. He claimed that the irrigation ditch was five or six miles long. José María Elias added that between 1846 and 1847 persons occupied the ranch with the consent and under the direction of the Ortiz brothers although they themselves did not go there. There were cattle and untamed horses on the ranch and, Elias explained, the consent of the Ortiz's was always asked to make a rodeo. It has been said that there were many wild bulls on the ranch in the mid 1850s, due to the fact that roundups could not often be held. It appears that anyone looking for a rodeo would have gone to the right place!

Arizona (Terr.) Surveyor General, *Journal of Private Land Grants*, 1881, in U. of A Library microfilm collection.

After the Gadsden Purchase, Charles Poston and mining engineer Herman Ehrenberg found Arivaca while out scouting for likely mining country. Along with Major Samuel P. Heintzelman, who had established a U.S. Army post at what is now Yuma, they formed the Sonora Exploring and Mining Company. In 1856, they began development. The 1856 report to the stockholders of the Company stated that the purchase of the Arivaca land grant was their first aim. According to Ehrenberg, "It is one of the finest places in the Purchase with splendid grass and abundance of water. I am told that on it and the adjoining hills there is room and food for 50 or 60,000 head of cattle at least..."

The Company used the Arivaca valley for its mill sites, utilizing the existing oak and mesquite for fuel. The pasture land served for raising cattle and horses. After a few years of this, the Civil War ended mining activity. Apaches and Mexican bandits were a constant problem. Ownership of the land grant was in limbo until after the turn of the 20th century. However, settlers had moved in and begun farming. Pedro Aguirre, owner of the stage line, began the Buenos Aires ranch and lived in Arivaca, where he built a school. In the 1870s many settlers moved into the area, most with mining interests, but a few were farmers.

North, Diane M.T. *Samuel Peter Heintzelman and the Sonora Exploring and Mining Company.*
Report of the Sonora Exploring and Mining Co. to the Stockholders, Cincinnati: Railroad Record Print, December, 1856 and September, 1857.

The conditions in Arivaca in 1881 were described by Owen P. White, whose father ran the Customs House there:

"I can remember the house we lived in...it had two doors and no window, and was located, for the convenience of malaria mosquitoes, which strange to say, operated ravenously down in that country, at the edge of a small swamp...my brother and I...ran away from home whenever we could, and I am really inclined to believe that my mother looked upon the fact that we had both yielded to the influences of the nearby swamp and acquired malaria as something that had come to her as a real blessing. Because for an hour or two every day, during the time when we

were having our regular chills, she always knew exactly where my brother and I were to be found.

However, nobody stole or scalped either of us. Just why they didn't is hard to say, but at any rate they didn't; and so for almost a year we hungered and suffered and shook with ague down at Arivaca."

White, Owen P. *A Frontier Mother*, New York : Minton, Balch & Co, 1929.

In the late 1870s Noah W. Bernard and John Bogan formed a partnership and became cattle barons. Noah W. Bernard was the first postmaster and owned the store in Arivaca. A number of miners and other settlers moved into the area. Reportedly the 70s were wet years, leading people to think that things would always be like that. The coming of the railroad in 1880 guaranteed a market for beef. Soon there were cattle everywhere, but thousands of head of sheep also grazed on the hills. The grass disappeared. By the time the golden years of the 80s were over, times were very different. The cattle industry faced setbacks in the 1890s. First there was an extended drought: Between 1893 and 1900 the number of cattle in Arizona declined by 50%. Many starved because they could not be sold, due to depressed economic conditions resulting from the Panic of 1893, equivalent in some ways to the Depression of the 1930s.

Wagoner, Jay. A History of the Cattle Industry in Southern Arizona.

In the early 1900s the settlers in the valley went through several years of battling over ownership of the valuable springs in this area. The Arivaca Land and Cattle Company had attempted to claim the old Mexican land grant and had been in court for more than twenty years. When the Supreme Court of the United States decided in 1902 that the Aribac land grant was not valid, thus opening up the valley to settlement, the fight was on to file homestead claims. All this time some people had been living on the land grant, farming and ranching with no actual claim to their land. It was open range, so ranchers could run cattle just about anywhere and usually only fenced the springs or pastures that they owned.

There were two kinds of homestead entries. The regular kind of 160 acres had been established in the eastern part of the country where it rains oftener and farming is common. 160 acres is not enough land for ranching in the desert, so a different type of homestead was established, the Desert land entry, with 320 acres. Now even that is not much for cattle ranching in dry country, but it was the most the government would do.

At the end of the court battle there was a land rush. John Bogan, Nonie C. Bernard (son of Noah, who had died in 1907) and partner George Pusch set out to file legal claims on as much of Arivaca valley as they could. Naturally they wanted the springs. Nonie Bernard's homestead took in a good section of what is now the USFWS Buenos Aires Refuge's part of the cienaga. His house was near the entrance trail. George Pusch, by some questionable but apparently legal method, filed on several 40 acre parcels, mostly springs, wetlands or just where there was good soil. On February 11, 1907, John Bogan filed a Desert land entry for 320 acres of the valley just east of Nonie's homestead.

Arthur Noon had been ranching his father's homestead at Oro Blanco. He was looking to file for his own homestead and saw the opening up of the Arivaca valley as a good opportunity. Other settlers like Phil Ward and Rita Sanchez Mora had been living on their claims in the Arivaca valley for years, but now had to find a legal way to obtain ownership. When Bogan filed for the Desert entry on land that everyone knew was not desert, Arthur Noon decided to file a protest. His brother, S. F. Noon, an attorney in Nogales, represented him.

Is the cienaga a desert? That was the question. Bogan had to prove it was, and the Noons that it wasn't. Valley residents took up sides and were called on to testify at the hearing, which began December 7, 1908.

One issue was whether or not you could farm without irrigation. Corn from Rita Sanchez' land and beans from Francisco Tapia's were presented as evidence that there was enough subsurface water that you need not irrigate to produce a crop. Billy Marteny, who homesteaded 3 miles upstream, said he had never seen the cienaga dry, even during relatively dry years. From the Bogans he had purchased native grass hay which had been cut from the cienaga. For eighteen years on his own land he had grown corn, beans and pumpkins, all without the aid of irrigation.

John Bartlett testified that the whole cienaga was subject to flooding from Cedar Creek and that if you wanted to farm some portions of the cienaga you would have to drain it first. He defined cienaga land as swamp that you would have to drain in order to farm.

Arivaca pioneer sheep rancher John Conti said he had never seen the creek dry, in fact, he

had caught and sold as many as a thousand dozen bullfrogs to buyers in Tucson. He proclaimed, "In general, what is flat is wet."

At the conclusion of the hearing, it was found that the part of the Arivaca valley claimed by Mr Bogan to be desert was indeed not desert. He was eligible to file on 160 acres and Arthur Noon filed on the other 160 acres.

Three years later John Bogan (4/20/1911) filed for all the water in Arivaca Creek from a point 300 feet south of the old Arivaca hotel to the junction of Cedar Creek and Montana Canyon (where Arivaca Lake now is) to the full amount and extent of 500 cubic feet per second. Arivaca valley residents retaliated eight days later. They filed with the county Recorder a document showing that the nine original owners of the Arivaca fields had regulated their own use of Arivaca Creek by alloting irrigation water to users on a regular basis. An individual would have the use of water from the ditch for six hours a week. This agreement had been in force since 1886. Furthermore, town residents used the creek for household water, taking it directly from the creek or irrigation ditches. That was common until at least the 1920s.

Pima County Records, Land ClaimBook 2, Page 311-12.
Transcript of Noon v. Bogan, 1908

The government was getting involved in other ways. In the summer of 1906 the newly created Forest Reserve sent a man named Lieberg to examine the region west of Nogales and the Baboquivari. The first Tumacacori Reserve was proclaimed on November 7, 1906.

Government Surveyor George Roskruge had done an extensive survey in the Arivaca area in the 1880s, followed by Contzen in 1907, and the plats and notes were available to the Forest Reserve surveyors. These maps clearly showed topography. Chosen boundaries ran along section lines and whole townships were included if possible. The intent was to include mountains and foothills: the whole watershed. Homesteaded lands that had already been proved up were excluded, and a 1906 law protected those who were in the process of filing. Land that appeared flat enough to farm, including rolling hills, was not included.

It was the value of the Tumacacoris, Pajaritos and the Cobre Range as watershed that led them to be included in the Forest Reserve, not their ability to produce lumber. The first Tumacacori Forest Reserve map clearly shows all the major washes and their tributaries. Grazing permits were allowed to those ranchers who had already been running cattle on what became the National Forests. In the early years Rangers attended the big area roundups to count cattle in order to calculate grazing fees.

In those early years, woodcutting restrictions probably affected the most people. The Nogales District paid expenses by selling fuel wood to mining operations.

"The Forest Reserve," by Mary N. Kasulaitis.
The Connection, November 1997

In 1916, the Mexican Revolution was in full swing and troops were needed to guard the border. The Connecticut National Guard arrived in Arivaca and kept a diary:

"We spent almost nine weeks at Arivaca encamped within the confines of a barbed wire enclosure, flanked by adobe walled store--adobe church and adobe residences occupied by both men and chickens and cattle. We guarded the old smugglers' trail leading southward from Tucson to Saric. We patrolled the mining and cattle country to the southward along the Border. Montana, California Gulch, the Stone House (Casa Piedra), La Osa, Tres Bellotas, Sasabi, Buenos Ayres and Oro Blanca became familiar names and still recall familiar scenes.

"It would take too long to tell every episode of interest which transpired during our tour of duty on the Border. But for the benefit of those of you who weren't there let me sketch for you a few of the incidents of our life at Arivaca together with now and then a portrait of some of the men who worked with us.

"Bugles blown by Haynes and Taylor cut the chill morning air, as one finds it before sunrise. . .

"After breakfast watering is in order. . . in a jiffy the whole troop is mounted bareback in column of twos and on the way to Arivaca Crick, which with full stream flows past the town and within two miles thereafter runs dry..."

Howard, James L., ed. *The Origin and Fortunes of Troop B*, Cavalry, Connecticut National Guard, 1917. Hartford, CT: The Case, Lockwood and Brainard Co, 1921.

1920-21 are the years Arivaca cattlemen remember best for a prolonged drought. It hurt everyone, but especially the Arivaca Land and Cattle Company. Ranchers had to go to great lengths to keep themselves solvent and their herd together. Every effort had to be taken. Katherine Grantham remembers her brother bringing calves in on his saddle, their mothers having succumbed to the drought. Many cattle became stuck in the mud of the cienaga, where a little water remained, and a breath of dampness attracted thirsty cows. In those days there weren't many windmills or manmade reservoirs, and animals depended upon natural water holes. The Arivaca Ranch lost a lot of cows, and little calves were wandering all over the creek bottoms.

Katherine Noon Grantham, interview

"We survived on water cress during the Depression. There was beautiful big water cress and there were no fences. You could go any where. We used to haul that stuff in by the bucket load. . . My mom always raised beans and those big Mexican pumpkins. . . There was an apple orchard down by the river going west toward the Piñeda house which was about a mile from the town itself. . . There were several old orchards. There were several old Spanish ranches especially down towards Las Jarillas and every one of them had their own orchard. If you came upon a tree that had fruit on it you picked the fruit. It was just there. Nobody ever said anything about it, as long as you didn't do any damage you were welcome to eat. . . We always had bellotas (acorns) and black walnuts. You would go up in the hills to get them. There was yerba del manzo, we used to dig it up in the meadow. Its an herb. I believe the leaf is a wide green leaf and it just grew above the ground, with little white flowers. They used the root for some kind of medicine. Yerba del Indio grew out there too. That was a real bitter root. We dug it up down below the Hubbell house: there was a meadow there.'

Armando Membrila, interview

When the Chiracahua Cattle Company, owned by the Boice Brothers, purchased the Arivaca Ranch in 1930, they brought their Herefords with them. Charlie Boice, the youngest brother, was in charge. He set out to improve the range and began a development program which made significant changes in the utilization of Arivaca Creek. Between 1930 and 36 Charlie built dikes across the creek, in the parcels now owned by the U.S. Fish and Wildlife Service. He diverted the water toward the south side of the valley and built the reservoir. Arivaca residents were used to having an irrigation ditch on the north side, near town. Upstream, near the ranch house, there were more diversion projects. Charlie built Stokes tank and Sapo tank, besides others further away from town. He had a cement mixer on wheels that was pulled by four mules to out-of-the-way dam sites. Wells were dug and windmills went up everywhere, including a gigantic one that rose high up out of Tres Bellotas canyon. The disaster of the drought of the early twenties would not be repeated if permanent water could be developed in strategic locations around the range. Other ranchers were also building stock tanks and reservoirs and cleaning out springs, learning to work with the Soil Conservation Service.

Arivaca Ranch history, part 5, by Mary N. Kasulaitis,
the Connection, May 1999

Malaria had always been common, but there were two cases of malaria in Arivaca in the 1930s which prompted some action. The State Health Department investigated, and in 1938 they decided to try introducing a mosquitofish, Gambusia affinis, into the ponds in Arivaca cienaga. These fish eat mosquito larvae. Within two years they had taken care of almost all the mosquitos, and do so to this day.

"Before Gambusia," by Mary N. Kasulaitis, the
Connection, August 1995.

In 1947, the Clarke Ranch built a dam across the Arivaca Creek, just downstream from the confluence of Cedar and Chimney Canyons and about five and a half miles southeast of Arivaca town. It was sometimes known as Bartolo Dam because Bartolo Caviglia had had his homestead in what was now the lake bottom. This location had been deemed desirable for a dam since the days of Bernard and Bogan. The Clarke dam was about 30 feet high and the capacity of the reservoir was about 990 acre feet. The Clarkes used it for recreation as well as for a ranch water supply. According to Fred Noon, as official Weather Observer for the area from 1931 to 1994,

and longtime valley resident and rancher, the dam only spilled over some six or seven times during its 18 year life. Some years it only reached half capacity. This dam was not sealed to bedrock and seeped water continuously to the great benefit of the underground water supply. The winter of 1965-66, however, was very wet, softening the dam and leading to the collapse of the dam in December, 1965 after some 8 inches of rain had fallen. The resultant flood, four to six feet deep and six miles long, caused the evacuation of and some damage to the Brouse/Casey home in Arivaca and much damage to fences in its path.

The Arizona Game and Fish Commission determined to rebuild the Clarke Dam and purchased acreage from Maynard Gaylor, who had purchased the Clarke Ranch. The Dept entertained the idea that it might buy the cienaga also. Before the dam was even built, Fred Noon apprised them of the fact that the cienaga downstream might suffer from lack of water because rainfall in the area is erratic. (letter dated 4/9/69 and a hearing in 1969) and reminded them of it later when the dam did not fill (letter dated 7/14/75). The dam was constructed and dedicated in 1970. It was firmly sealed on bedrock and holds at capacity some 1100 acre feet of water.

Subsequently, Fred Noon reminded them, "At the hearing in 1969 I asked Bob Curtis if a discharge pipe would be installed in the dam and if water could be released if the valley water supply became critically short and he replied affirmatively to both questions. Your Department Biological Report on the Arivaca Valley, compiled in April, 1969, had this recommendation: 'Should the land in question be acquired it may prove desirable and necessary to periodically release water from Arivaca Lake to maintain desirable conditions for wildlife downstream.'" In the 30 years since Arivaca Lake was constructed, Game and Fish has never done this.

Arivaca Slough Acquisition Proposal Biological Report submitted by David E. Brown and Richard L Todd to the Ariz. Game and Fish Dept., 4/28/69.
Fred Noon's files

In 1970 there were reportedly less than ten wells in the valley. There were a hundred or so folks living in the townsite and a few ranches scattered around the hills. Then Nationwide Land Development Co. purchased some 10,000 acres from the Boice family which had been ranching here since the 1930s and decided to sell out. The company set out to obtain rezoning which, if allowed, would radically change Arivaca valley. In September of 1971, Nationwide asked to rezone most of the property from General Rural to Suburban Ranch with some at higher density. 11,500 acres were involved, including some not in the Boice property. There would be four-acre homesites on 10,000 acres and one-acre homesites on 780 acres. Other land would be set aside for commercial use. Fifteen Arivaca residents appeared at the County Planning and Zoning Commission meeting to object to the rezoning. Part of their objection was to the inclusion of their land in the rezoning without their knowledge or consent. The County objected because the proposal had insufficient information regarding water, soil, and other technical aspects of development. The Company withdrew its request, pending the development of a comprehensive land use plan.

Fred Noon had begun to do his own research regarding the water resources in the valley, as he feared that the proposed dense development would negatively impact the water level in the cienaga. He began a letter writing campaign and enlisted the support of Robert Jantzen of the Arizona Game and Fish Department and the Department of Hydrology and Water Resources at the University of Arizona. Other residents joined him in the protest effort.

Nationwide employed Manera and Associates, Inc, Consulting Hydrologists, to do a study of the area, which they entitled Geophysical and Hydrological Reconnaissance of the Arivaca Area, Pima and Santa Cruz Counties, Arizona, dated March 14, 1972. They did a geologic reconnaissance of the area and measured depth to water. They gathered water samples and well data. They did an electrical resistivity survey of one quarter section to determine the electrical characteristics of the subsurface materials. Some of their conclusions were: 58,431 acre feet of water per year fall as precipitation on the Arivaca drainage area using the average of 15 inches of annual precipitation; between 2000 and 2500 acre-feet of water per annum would be recharged into the ground water reservoir; the minimum safe yield of the basin would be 1,200 gallons per minute; that the Arivaca basin is capable of yielding 1,200 gpm annually, and therefore the project area could be subdivided into 1,000 units.

Fred Noon provided a statement for the Planning and Zoning commission which refuted several of Manera's conclusions because he believed that there was less water available than their study showed. He said (referring to the records that he had kept as an official Observer for the U.S. Weather Bureau): Manera's report did not take into account the drought years, that there

have been more below-average precipitation years than above-average; that there have been several years when all the sloughs dried up and the stream ceased to flow; that Arivaca Lake (rebuilt 1970) has removed a significant number of acre feet of water from the Valley and due to its solid construction was not leaking water into the water table.

A Hydrological Study Committee was convened by the Planning and Zoning Dept. to study and review the water supply and surface water conditions as given in the Arivaca Ranch Area Plan. Members of this committee included representatives from the U.S.G.S., the University of Arizona, Tucson Audubon Society, the City of Tucson Water Dept and consulting hydrologists John Harshbarger and Leonard Halpenny. Halpenny did not do an independent hydrologic investigation, he noted, but served in a volunteer capacity. The committee was to find that more study was needed before they could make a decision. This study would take the better part of a year.

In January, 1973, the revised Manera report became available. It provided somewhat more information on the geology and topography of the area. Two test wells were monitored for about a week-long period late in 1972, with favorable results. (Fred Noon noted that these were drilled near wells that were known to be good) Runoff was monitored by the U.S.G.S. Recharge data was calculated as 765 acre-foot per annum. When all was said and done, the volume of water available was calculated to be enough to serve 1200 units.

In the meantime, Nationwide was going ahead with its other project: a new 120 acre lake to be built in Papalote Wash in the vicinity of Twin Peaks. (Hence the term, Arivaca Lakes Estates) Actually, the AZ Game and Fish Dept was going to buy the land and build the reservoir, but it was obvious Nationwide would directly benefit from its construction. Again, Arivaca and Sopori Valley residents protested, the two main reasons being the effect of the dam on water users downstream and the impact of increased numbers of people on the wildlife habitat. These in fact were the reasons given for the ultimate denial of the application by the State Water Department, in particular, the impact of a dam on the "already overburdened" water supply in the Santa Cruz Valley.

An Arivaca Area Plan was developed by Blanton and Co. for Nationwide to fulfill the other P & Z requirements, namely, percolation tests, a drainage study, available fire protection (none), and a cursory environmental impact study done by Ted Knipe. Recreational facilities were noted: the Coronado National Forest is the only thing listed. Knipe suggested making Yellow Jacket Canyon into a community park. Sahuarita School District was contacted for its input (not available).

The Hydrological Study Committee reactivated the Arivaca Area Plan Study in early 1973 when the revised Manera study was available. This time, however, instead of 765 acre feet as claimed by Manera, the minimum safe yield was determined by the Committee to be 300-400 acre feet per year and that amount would be used to plan land use within the Arivaca watershed basin.

The Pima County Planning and Zoning Dept held a hearing on September 25, 1973. Again, a number of Arivaca residents spoke. P & Z did not make a decision, but referred the matter to the Arizona Water Commission which was given (legislatively) the responsibility for evaluating the adequacy of water supply for new subdivisions. (It could not forbid development, but the developer would have to adequately advertise the lack of water.)

On November 14, 1973 the Commission made its decision. The opinion was: since the safe yield was 300-400 acre feet per year, there was not enough water for 1200 lots. The development should be limited to 300-500 units, but runoff alone (without mining groundwater) would only support 140 units. This put a damper on the efforts made by Nationwide.

Mort Freedman, the president of Nationwide, said that since they had put a lot of time and effort into the rezoning process and been thwarted, they decided not to proceed further with the development plans which they had made. Nationwide decided that they would just sell off 40-acre parcels. They did not subdivide these themselves, but purchasers were able to, under the law, divide them into smaller parcels.

"How we got the Forties," by Mary N. Kasulaitis, the Connection, October 1997. Manera Reports, Interviews of Fred Noon, Mort Freedman, Mary Jane Broadhurst, Don Honnas, Mary Nusbaum

Water is so important to life that it's not surprising that it is fought over. As old John Conti said in 1908, "Before I am in Arivaca anybody living there could cut hay, then they build the fence and everybody was kept off, now the government has surveyed it and everybody wants it."

GEORGE E. LEONARD
CHAIRMAN
JOHN S. HOOPES
VICE-CHAIRMAN
WESLEY E. STEINER
EXECUTIVE DIRECTOR
AND
STATE WATER ENGINEER

Arizona Water Commission
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MARSHALL HUMPHREY

November 14, 1973

Mr. Lance R. MacVittie
Principal Planner
Pima County Planning & Zoning Dept.
Pima County Governmental Center
131 West Congress Street
Tucson, Arizona 85701

Dear Lance:

As requested we have reviewed the reports, and minutes of the Hydrological Study Committee meetings, on Nationwide Land and Development Company's development at Arivaca. It is our opinion that proposed source of supply is <u>inadequate</u> for 1200 lots.

The developer's consultant estimates that the basin's safe yield, as evidenced by its outflow, is 645 acre-feet/year. The consultant recommends that the development be limited to this amount of water and finds that it will supply 1200 units. The Committee felt that the safe yield, also as measured by the basin's outflow, was 300-400 acre-feet/year, and noted that as the already recorded lots would yield about 300 units that the development be limited to 300-500 units. We too have estimated that the basin outflow is about 300-400 acre-feet/year, but have additionally estimated that the proposed development could recover only about 70 acre-feet/year of that amount without mining the underlying groundwater. This would supply about 140 units in the proposed development. We did not evaluate the adequacy of supply using groundwater in storage as there was no indication the developer desired to do so and thus found the intended supply inadequate.

Within limits, mining of groundwater is considered to be an adequate source of supply. If the developer wishes to revise his plans we will reevaluate the supply. At the moment, the available groundwater information is insufficient from which to make a reasonable evaluation. Should the developer wish to revise his water supply plans we would be happy

to provide guidelines for the requisite investigation and water supply adequacy demonstration.

I've attached a staff report detailing our review for your further reference. Please call me if you have any questions.

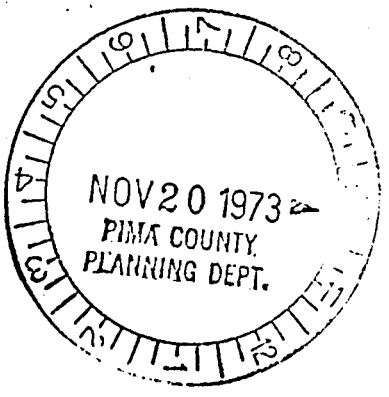
Sincerely,

Phil

Philip C. Briggs
Chief Hydrologist

Enclosures

cc: Mr. L. Linwood Schorr



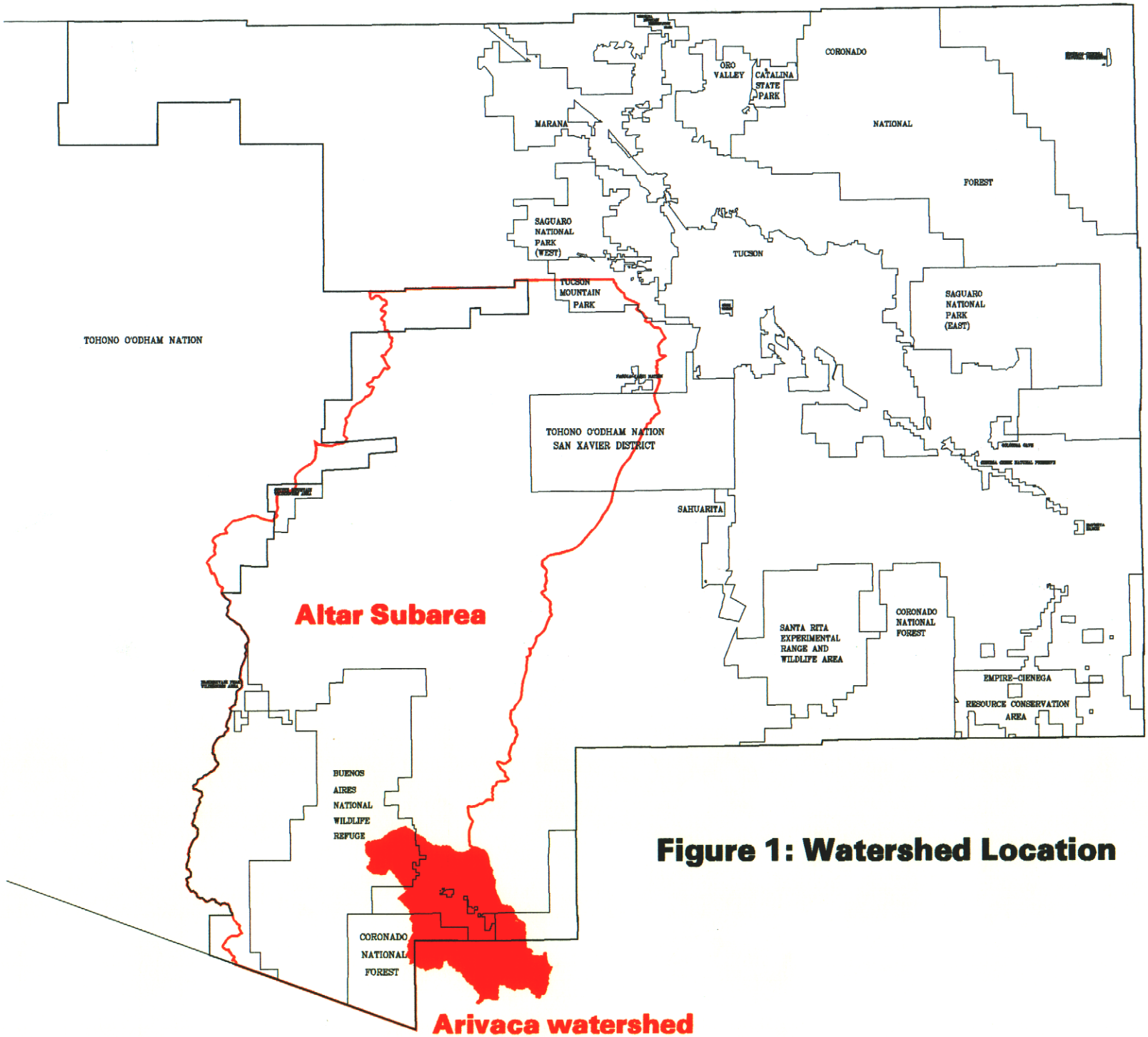
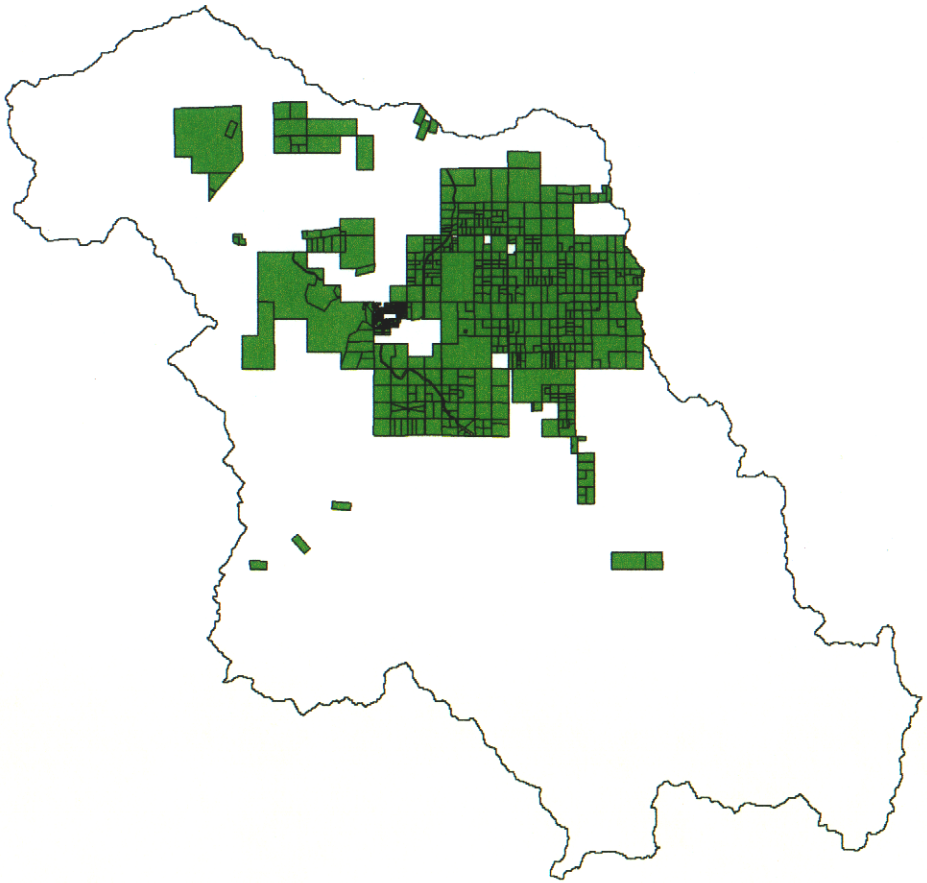


Figure 1: Watershed Location

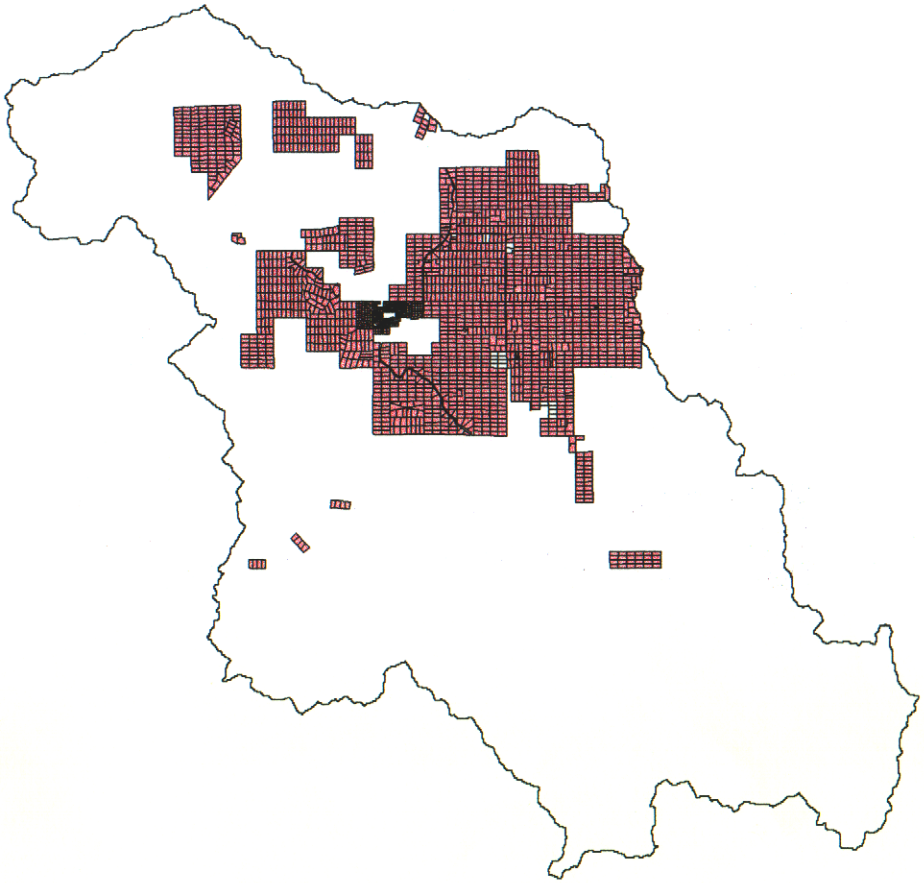
Figure 2

Existing



Private Parcels incl. ranches & mining claims (739)

Full Build-out



Private parcels incl. ranches & mining claims at full build-out (2,443)

Chapter 9
Subarea 6a - Altar Valley

WATERSHED/WATERCOURSE CHARACTERISTICS

THE WATERSHED

The Altar Valley Subarea of the watershed of the Brawley Wash upstream of Mile Wide Road. The subarea is bounded by the Baboquivari, Coyote and Roskruge Mountain ranges to the west and the Tucson, Sierrita, Cerro Colorado, Las Guijas and San Luis Mountain ranges to the east.

The Altar Valley consists of a long north-draining valley with tributary drainage into the Brawley Wash from the mountain ranges to the east and west. The foothills tributary areas generally consist of well-defined washes which drain in a tributary manner into the Brawley Wash. Washes on the flat valley floor tend to be ill-defined and shifting, with sheet flooding occurring in many areas. See Figure 9-1. for a map of the watershed.

BRAWLEY WASH

The main drainage feature of the subarea is the Brawley Wash which flows from south to north along the axis of the valley starting near the Mexican border. The Brawley Wash is also known as the Altar Wash south of State Highway 86 (Ajo-Tucson Highway). This wash has experienced considerable entrenchment during the last century, largely in response to overgrazing, especially in the southern portions of the wash.

Brawley Wash has a wide geologic floodplain which varies in width from 0.5 to 1.0 miles along the reaches through and south of Township 15 South. The floodplain width along the reach through Township 14 South ranges in width from 2.0 to 4.0 miles. Historically, the floodplain was occupied by a series of distributary channels which functioned to slow velocity and spread flow across the floodplain. The floodplain environment was generally aggradational but sediment transport capacity changed with flood volume to maintain a quasi-stable channel system. The channel entrenchment that has occurred in more recent times is probably associated with overgrazing of the watershed and with the construction of farm levees which narrowed the floodplain and increased flow velocity. The result of entrenchment is an increase in flood peaks, sediment conveyance and bank erosion, all of which translate to channel instability and higher flood stages along downstream reaches. A continuation of the entrenchment would lead to further loss of overbank storage capacity, more downstream flooding, and the possible propagation of the entrenchment toward tributary washes in some locations. The area should be studied to determine the likelihood that entrenchment will continue based on future practices in the watershed and in the wash itself. Other measures such as check dams or bank stabilization may help to reduce the entrenchment if the underlying causes are corrected . These measures are critical not only to Brawley Wash but also to tributary watersheds which support riparian vegetation and wildlife. Severe, unrecoverable degradation to the quality of these resources will occur if entrenchment is allowed to propagate into the tributary washes and the sub-watersheds which they support.

BLACK WASH

A major tributary to the Brawley Wash is the Black Wash located between the Tucson Mountain and Sierrita Mountain foothills. The Black Wash is a poorly defined drainage path with flow splits and flat areas causing widespread flooding in times of heavy rains. Black Wash

remains a stable geomorphic environment not having been subjected to the entrenchment associated with man-made changes within the Brawley Wash watershed. This is probably due to the geology of the contributing watershed and the mild slope of the valley floor. Future change should be limited because of these factors.

TRIBUTARY WASHES

Tributary washes are generally well defined throughout most of the watershed. Drainage density on the alluvial pediments between mountain front and valley floor is relatively high because of the steep surface slopes and soil type. A large area (approximately 100 square miles) of distributary washes occurs along the north and west slopes of the Sierrita Mountains within Township 15 South, Range 11 East and 12East, and within Township 16 South Range 10 East and 11 East. This distributary flow area extends from the mountain front to confluence with Brawley Wash or Black Wash. Distributary drainage systems commonly occur upon the pediments adjoining mountainous areas. A distributary channel form evolves as a result of sediment deposition induced by slope reduction. The washes aggrade which in-fills the channel and forces flow to spread onto adjoining areas of the pediment. Flood peaks dissipate as the distance from the mountain front increases (via surface storage and infiltration) ultimately leaving little or no trace of a channel.

DISTRIBUTARY WASHES

Distributary washes add an element of uncertainty to land use planning. The uncertainty is the inability to predict future flow paths and sediment loads. Usually, the uncertainty to predict flow patterns is dealt with by constructing a collector channel and/or berm along the upstream side of a land use area.. This channel/berm functions to intercept, then route the flow around the area being protected. The approach has been used many times throughout Pima County to provide flood protection for residential, commercial, and agricultural development as well as transportation facilities. Degree of success has varied depending upon design factors such as slope and stabilization measures and upon watershed size and sediment load. This is because a collector channel introduces an abrupt change to the hydraulic and geomorphic characteristics of distributary washes. The most commonly observed change is sediment deposition within the collector channel, then erosion along the downstream reaches where flow is returned to natural wash.

HUMAN IMPACTS ON THE WATERCOURSES

General land use in the area is indicated on Figure 9-2. Human impacts on the watercourses are discussed below and the major impacts summarized generally on Figure 9-3.

FLOOD MANAGEMENT ACTIVITIES

In 1990 the Flood Control District issued a study of the Southwest Basin which includes most of the area between Tucson Mountain Park and the San Xavier District, extending almost to Sandario Road. A further study in 1994 addressed flooding problems in the Tierra Conita/Camino Verde area and Tucson Estates. Floodplain maps and policies were developed.

Drainage and flooding along the Black Wash has historically been a problem. In July 1990 numerous homes were flooded in response to a high-intensity summer monsoon storm in the area. To address flooding problems in the Black Wash area, the Pima County Flood Control District adopted the Black Wash administrative floodway in 1991 to set aside a corridor associated with the heaviest concentration of flow during storms where residential construction would not be permitted. The district also acquired about 70 acres of floodprone land along Black Wash to

protect it and downstream land from flood damage. Pima County has designated the portion of the Black Wash watershed upstream of Ajo Way a critical basin because flooding is severe and occurs annually. (See Chapter 3 for information on this designation).

TRANSPORTATION

Highway 86 (Ajo Way) is the main east-west thoroughfare in the area, going from Tucson to Why, through the Tohono O'odham Nation. Highway 256 extends from Robles Junction on Highway 86 to the Mexican border. The Arivaca Road connects Highway 256 with Interstate 19 at Amado. Sandario Road is a major north-south road on the north side of Highway 86 extending to Marana. Gates Pass Road connects Tucson with the area and meets Kinney Road which goes to the Arizona Sonora Desert Museum and Saguaro National Park to the northwest and Highway 86 to the south. Other roads, mostly unpaved, intersect the area. Roads can affect drainages in ways described in Chapter III.

Along two-lane Highway 256, for example, most of the crossings are dip crossings with minimal impact on the watercourses. At some locations, however, these crossings create a point where the wash cannot erode naturally. When flows reach the downstream side of the road erosion occurs, creating a big drop off on the downstream side of the road. Asphalt or rocks then protect the road from erosion. In another location a culvert diverts the water under the road. Where the culvert discharges rushing flood waters, a deep arroyo has been cut which extends all the way to Brawley Wash. The Ajo Highway, on the other hand which is wider and much more heavily used, has been designed with more complex crossing structures, culverts and bridges that span the floodplain of the wash. Other roads in the area rely mainly on dip crossings, especially the unpaved roads and the roads within the County Park and the National Park. Many of these roads are sometimes inaccessible at flood time, creating safety problems for residents especially when emergency vehicles cannot reach them. Pima County has installed precipitation and flood sensors in Brawley and Black washes to give advance warning of flows that might make those roads impassable.

WATER AND WASTEWATER-RELATED LAND USES

Water Supply

Depth to water in the Altar valley ranges from 150' along the sections of Brawley Wash south of Ajo Way to more than 400' in the wellfield area, with a very high water table in the Arivaca area and at places between Arivaca and Arivaca Junction.. There are numerous shallow wells south of Arivaca, indicating a high water table there also. Two intermittent streams flow down from the Baboquivari Mountains in the subarea.

Starting in the 1960s, the City of Tucson began to purchase farms in order to use the water underneath them for municipal purposes. Most of the approximately 10,000 acres are now abandoned farm land and not being used for other purposes since the water is reserved for use in the city. The Avra Wellfield provided about 18 percent of Tucson Water's 1999 water supply. A pipeline extends underground to Tucson along Ajo Way. There are also many private wells in the region and a private water company. There has been some land subsidence in the heavily pumped portions of the valley.

In the 1980s, the Bureau of Reclamation began construction of the Pima County portion of the Central Arizona Project which comes through this area as an underground pipeline. The City's Hayden-Udall Water Treatment Plant is located at the intersection of Ajo Way and Tucson Estates Parkway, where there are also a number of homes. An underground pipeline extends from the treatment plant to Cat Mountain and under Starr Valley, a large valley within Tucson Mountain Park adjacent to Cat Mountain, to the eastern side of the Tucson Mountains. Another pipeline extends south towards the San Xavier District and Pima Mine Road. As mitigation for

habitat loss when building the CAP, the Bureau of Reclamation established a Wildlife Mitigation Corridor at the eastern boundary of the Tohono O'odham Nation in the planning unit.

In the 1980s and early 1990s the Bureau of Reclamation examined possible sites for a terminal storage facility (reservoir) for CAP water. The original proposal involved a large reservoir in Starr Valley, within Tucson Mountain Park. This project was dropped because of protests from people who did not want to see such encroachment into the park. Other proposals included a multi-purpose lake in this valley that could have recreational uses. Tucson Water did not encourage the concept of a recreational lake related to a water supply system. There is currently a proposal to build a terminal storage reservoir near Black Wash and the Pasqua Yaqui Reservation where there is a turnout to the reservation.

Wastewater

Most of the region depends on septic systems for wastewater treatment. Pima County operates a facility at Arivaca Junction and in the Avra Valley.

Recharge

Many acres of land in this area have the appropriate properties for recharge projects. The CAVSARP (Central Avra Valley Storage and Recovery Project) is located to the northwest of the treatment plant in the Avra Subarea (See Chapter 9). If the initial project is found to accomplish the goals as projected, additional acreage in the Altar and Avra subareas will probably be devoted to recharge. (Also see recharge discussion in Chapter III)

EXISTING PUBLIC LAND USES

Much of the valley is in public ownership: City of Tucson, Pima County, state or federal, with some Tohono O'odham land projecting into the region from the west (Shuck Toak) as well as the San Xavier District on the east side of the subarea. In the last century, the Altar Valley was an open grassland with wildlife such as pronghorn antelope, Aplomado falcons, masked bobwhite quail, Mexican wolves, black bear, and an occasional jaguar traveling between mountain ranges.

The 121,308 acre Buenos Aires National Wildlife Refuge occupies a considerable part of the south end of the valley, abutting a section of the Coronado National Forest. The Refuge was created in the 1985 to preserve the grasslands environment of the upper Altar Valley as a refuge for unique wildlife in the area. A cienega and creek-based wildlife area are located near the town of Arivaca. Seven springs form this rare desert wetland. Arivaca Creek flows downstream from the wetland seasonally with a high enough water table to support giant cottonwoods and lush vegetation. The refuge also includes Aguirre Lake which was built in the 1880s to water fields and stock. Migrating waterfowl, wading birds, and shorebirds use the seasonal lake today. The most recent addition to the refuge is Brown Canyon, at the foot of the Baboquivari Mountains. This canyon features sycamores and live oaks and a 47-foot natural bridge in the upper canyon. This area is only open for scheduled tours.

As settlements sprang up in the Altar Valley in the 1860s, the delicate balance of the ecosystem was changed. Overgrazing left the ground bare, exposing it to torrential summer rains that quickly eroded the soil. With the grass gone and natural fires suppressed, mesquite gained a foothold. The grassland could no longer support masked bobwhite quail or aplomado falcon. Pronghorn, wolves, bear, and jaguar were hunted or trapped out. Lehmann's lovegrass, an African grass, was introduced in the 1970s to help stop erosion. While the grass did hold the soil down and was drought resistant, it was a poor ecological substitute for the diverse native grasses it replaced.

More than 320 species of birds have been recorded at Buenos Aires NWR. Antelope (reintroduced) mule deer, coyote, and javelina are some of the mammals seen today along refuge roads. Mountain lion, coatimundi, ring-tailed cats, and badger are also present. In addition to the masked bobwhite quail, Buenos Aires NWR protects habitat for six other endangered species (cactus ferruginous pygmy-owl, Pima pineapple cactus, Kearney bluestar, peregrine falcon, southwest willow flycatcher, and razorback sucker). Bullfrogs, introduced from the eastern United States have reduced populations of native amphibians and fish. A Heritage Fund sponsored program is attempting to reduce their numbers.

The Pima County-owned Tucson Mountain Park and the federally-owned Saguaro National Park (initially established in the 1930s) preserve a good portion of the Tucson Mountains, their western foothills and a part of the valley floor in this region, but are mostly in the adjoining Avra Subarea and are more fully described in that chapter. The Tucson Mountain Park and Saguaro National Park in the Avra and Altar Valleys include many miles of trails, a campground, and picnic areas. In the past there have been proposals for other activities within the park, such as a tourist railway or mining, but these have been rejected. If the land within Tucson Mountain Park is used for other than the originally intended purposes, parts are subject to reversion to BLM ownership. Visitor use of the area has increased dramatically in recent years.

The area also includes many acres of State Trust Land. Many of these lands are leased for grazing, especially in the grasslands regions of the subarea. State Trust Land is generally available for lease or sale and could eventually be used for subdivisions and other purposes.

The BLM Coyote Mountain Wildlife area (5,103 acres), and Baboquivari Wilderness Area (currently claimed by the Tohono O'odham), and the Bureau of Reclamation's Wildlife Mitigation Corridor (2,717 acres) are managed for wildlife benefits and have very little recreational use. The Wildlife Corridor was located at a strategic location to maintain a wildlife corridor from the Tohono O'odham Nation to the Tucson Mountains. Clearing of land for agriculture on the area adjacent to the wildlife corridor may diminish its value somewhat.

EXISTING PRIVATE AND INDIAN LAND USES

The primary private land uses in the valley are ranching, agriculture, tourism, and residential, some commercial uses, and the Ryan Airfield. The only active mining in the area currently is a gravel pit, although parts of the area were heavily prospected in the past and some historic mines and ghost towns occur in the southeastern section. Parts of the area are within the "copper belt" and could possibly be mined in the future.

This area has three small unincorporated communities: Sasabe, at the Mexican border crossing, Arivaca, and Robles Junction (also called Three Points) and a large mobile home development at Tucson Estates. Sasabe is a small remote town at the Mexican border on Highway 256, whose economic base depends on the lightly-used border crossing. Arivaca, too, is a small community, but its economic base is ranching and tourism to the Buenos Aires Wildlife Refuge. Residents of Robles Junction at the intersection of Highways 86 and 256 commute to Tucson, and work in small local businesses.

The Altar Valley has been grazed since the late nineteenth century and some of the grassland ranches are still in the ownership of the original pioneer families. Part of the grazed land is privately owned, but the majority is leased from the State Land Department. Although overgrazing caused severe problems in the past, grazing management has improved and rules have become more stringent and the impacts of today's grazing are less severe. Some of the ranchland in the area is in excellent condition. Some ranchers feel that their management is more protective of the land than management of the wildlife refuge.

The valley to the north of the grasslands was at one time more intensively farmed than it is today. There is still some agriculture north of State Highway 86. The largest remaining farm is

the well-known Buckelew Farms on Route 86 which grows cotton and where hundreds of school children visit each year to collect Halloween pumpkins.

The Tohono O'ohdam Nation is developing 2,668 acres of land for irrigated agriculture in the Shuk-Toak farming district in order to utilize a portion of its CAP allocation. The CAP line was designed with a turnoff for that purpose. No groundwater pumping is involved, but desert vegetation is being cleared for this project and drainages are being collected and channelized in this sheet flow area. This is expected to affect flooding conditions downstream.

Many people who live in the Altar Valley choose to do so because they prefer a low-density rural lifestyle. In some cases this results in houses or mobile homes on large lots, sometimes bunched together to share services. Some large-lot wildcat subdivision development (often mobile homes) has occurred in the part of the valley north of State Highway 86 and near Black Wash.

Some people prefer to live in planned subdivision settings. Several small subdivisions have developed south of the Highway between Kinney Road and Robles Junction, most notably Diamond Bell Ranch (south of Robles Junction) which has zoning and provisions for utilities for many more homes than now exist there. This subdivision has a checkered past. A 1994 Star article predicted that "Diamond Bell Ranch may come out of its long sleep when home building and lot sales get underway later this year. ..." This was twenty five years after its opening. At some time in the future this development will probably be a major feature in the area.

Tucson Estates is a mobile home area at the foot of Cat Mountain occupied largely by retirees and winter visitors. New subdivisions are being constructed near the Tucson Estates Mobile Home Park as a result of a 1998 rezoning, and some commercial development is occurring in connection with that development and at the intersection of Kinney Way and Ajo Way. There are currently no large shopping centers or supermarkets in the area, but this could change as the population increases.

Millstone Manor is a subdivision in the northwestern part of the subarea. When platted in the 1950s, little consideration was given to drainage patterns even though it is in a floodprone area. A map for this area identified special permit conditions for new construction.

PROJECTED LAND USES

The Pima County Comprehensive Plan designates a large swath of land running along the drainages between Saguaro National Park and the Tohono O'odham Nation as low to medium density residential and commercial areas along Ajo Way and Kinney Road. Resource Transition Zones buffer the public lands.

Change is liable to come to much of the area in future years. Arivaca is a somewhat remote part of this subarea, but its beauty and its access to I-19 and the rapidly growing parts of Santa Cruz County and southern Pima County make it a likely site for population growth. Although Arivaca is currently a small community, privately owned land is available for development as is some state land, as illustrated by the numerous "for sale" signs in the area. If pumping increased significantly, the water table would be lowered and the cienega and creek affected. When the Fish and Wildlife Service considered applying for an instream flow permit for the cienega and creek, questions arose about whether a permit would actually protect the area from pumping and some local landowners feared that their right to develop would be affected. Survival of the cienega is a delicate issue which would have to be addressed, especially since the options for other water sources are very limited.

With the passage of the North American Free Trade Agreement (NAFTA) border activity throughout the Southwest generally increased. Nogales has become a very busy crossing point. Some people project that the Sasabi crossing could be expanded and more heavily used, especially by truck traffic. If this happened it would probably lead to pressures for road

improvement and additional services (both in Arizona and Sonora). It is possible that in the distant future Sasabi could be a link between Mexican Highway 2 and I-10 near Marana. All of this activity could affect the town and the valley.

As the density in the Tucson Estates area increases, based on approved rezonings as well as possible additional rezonings, there are impacts on the watercourses. Additional paved areas and land grading, especially on slopes, change the runoff patterns as discussed in Chapter III and may contribute to downstream flooding, depending on how they are designed. Since this area tends to be subject to flash floods with little warning, drainage problems need to be carefully handled. Additional residential development will also lead to the demand for community wastewater treatment facilities with possible reuse options. Road construction, widening, or paving, to serve these developments also has impacts on the drainages, whether the water is directed through dip crossings, culverts, or bridges.

Wildcat subdivision is liable to continue to occur throughout the area and rezonings for additional subdivisions may well be sought throughout the flatter portions of the valley.

Most of this population growth will have to be served by additional or improved roads including all-weather crossings, water, wastewater, and other public services as well as more places for shopping. These will, in turn, require adaptation to the floodplain whether in the sheet flow areas or the areas with more defined washes.

ISSUES FOR DISCUSSION

This section describes some of the land use changes that may occur in this area that might affect watercourses in ways described in Chapter III in order to provide information as a basis for community discussion. As described above, the area is characterized by many ill-defined washes and sheet flooding, as well as flooding problems in Black Wash. The following issues must be considered as they would impact drainage patterns and flood potential and in terms of what kinds of flood control policies are needed to address these problems. Another SDCP report "Biological Stress Assessment, " looks more specifically on the impacts of many of these same potential changes on vegetation and wildlife.

Many of these issues are complicated and a variety of options is available for dealing with them ranging from land acquisition and preservation to full utilization of the land for housing or other purposes, with various kinds of limits on how the development will affect the watercourses. This sections raises questions, but does not advocate any solutions.

The major general options for watercourse protection and improvement are summarized in Figure 9-4.

POPULATION GROWTH AND ARIVACA CIENEGA/ARIVACA CREEK

Arivaca is the only populated area in this subarea with groundwater near the surface. The Arivaca Cienega and Arivaca Creek are dependent on a high water table. At the present rate of pumping this is not endangered, although water levels do decline in very dry years. If groundwater pumping in this area were to increase significantly, the cienega and creek would be threatened. Should measures be taken to limit new pumping in this area? If so, what measures such as importation of water, strict conservation rules, or limits on construction are appropriate?

SUBDIVISION AND WILDCAT DEVELOPMENT ISSUES

If any of the large ranches (probably including State Trust Land) in the grasslands areas south of Ajo Way were to be available for sale, what would be the best use of the land? Options could include county purchase as open space land, expansion of Buenos Aires Wildlife Refuge, planned subdivision development, or piecemeal development. If areas are developed, what measures

should be taken to reduce the impacts on the watercourses? Are current county floodplain management strategies adequate to deal with potential flooding problems and road access problems caused by increased growth?

North of Ajo Way, near the Tucson Mountains, and in the Robles Junction area the predominant pattern of wildcat and small subdivision development could continue or it could change character to larger planned subdivision development, following the example of Diamond Bell Ranch. Some State Trust Land in the valley could be sold for these purposes. Is continued population growth in this area desirable? Should additional restrictions be placed on construction? If the population continues to grow, how should wastewater be managed?

Should rezonings be allowed for large commercial development, such as a shopping center or "large box stores" to serve residents? If so, how should the watercourse and flooding issues be addressed with the addition of impervious surfaces such as parking lots and buildings in mind?

EXPANSION OF RYAN AIRFIELD

As the Pima County population grows there may be more demand for airport space. With its large flat area and existing airfield, some of the Tucson Airport traffic, such as private planes, military training, or shipping, could be diverted to an expanded Ryan Airfield. Further paving of the area for parking or runways would alter drainage patterns. Is this a desirable land use? How should drainage issues be managed?

ABANDONED FARMLAND ISSUES

What should be done with abandoned farmland in this area? Should these lands be available for other uses such as residential development, commercial uses (using CAP water), or preserves? Should projects be undertaken to rehabilitate any of those lands towards native habitat?

RECHARGE AND TERMINAL STORAGE PROJECTS

The City of Tucson has examined several possibilities for constructing additional CAP recharge projects in this valley. These could occupy many acres of land, making it unavailable for other kinds of development. The current design for recharge projects does not include public recreational use or wildlife habitat. Recharge projects in some other places do have these features. Should some recharge projects be multiple purpose? Is recharge a good use for land in this valley? If a terminal storage facility is built near Black Wash, how should it be designed?

TUCSON MOUNTAIN PARK ISSUES

Tucson Mountain Park was established to preserve a significant scenic and wildlife area from housing development. How should increasing tourism be handled? Should additional land be acquired for the park or more strict buffer requirements be established to separate the park from the kind of dense development occurring near Tucson Estates?

ROAD EXPANSION ISSUES

Since signing of the NAFTA Treaty there has been some talk of expanding the border station at Sasabe to accommodate more traffic. Such expansion could be accompanied by additional use of Highway 256, especially by truckers, and the road might then require widening as well as all-weather crossings or bridges instead of the current dip crossings, which themselves create problems as described above. Is this a good option for the valley? Should road crossings be designed with more attention paid to minimizing impacts on the watercourses?

Additional park and scenic area visitation could necessitate road and parking area expansions within the Tucson Mountain Park and its access roads. The road currently uses dip crossings for the most part with some impact on the many washes as described above. Other types of crossings

as part of road improvements could negatively impact the washes in other ways or could improve the situation. How can these demands best be accommodated? Should road widening be encouraged or allowed within the Park?

As population growth continues, pressures are liable to develop to pave some currently unpaved roads or to widen access roads such as Tucson Estates Parkway, Sandario Road or Kinney Road. This would probably impact the drainages in the area as well as attract population growth and land use in some areas. The same road-related questions arise as mentioned above. How should these impacts be managed?

BRAWLEY WASH RESTORATION

At several times in recent years the Natural Resources Conservation Service (formerly Soil Conservation Service) has proposed building a series of check dams along Brawley Wash and some tributaries, in an attempt to reduce the incision of the wash. These dams would be designed like check dams in the San Simon Valley which have managed to halt the severe erosion and add sediment to the channel to build it back up to its former level. Most ranchers were in favor or this project, but funding was not available. Should efforts be renewed to restore the wash by this or other methods?

Region Within the Subarea	Grazing	Wildcat Subdivision	Planned Subdivision	Copper Mining	Sand & Gravel Mining	Pumping	Agriculture	Recreation
Arivaca & Buenos Aires Refuge	X-	X+	X+	X		X+		X+
Brawley Wash Ranchland Area	X-		P			X		
Remainder of Valley	X-	X+	X+			X	X+-	X+

Key: X = Existing X+ = existing with potential to increase X- = Existing with potential to decrease
X+- = Existing with potential to increase or decrease P = Potential

Figure 9-3. Generalized Matrix of Potential Impacts on Watercourses in the Altar Valley Subarea

Region within the Subarea	Alternate Water Less Pumping	More Non-structural Floodplain Management	Stricter Land Use Management	Federal Public Lands Expansion	State Trust Land Preserved	Other Preserves Increase	Better Grazing Management
Arivaca & Buenos Aires Refuge	X		X	X			X
Brawley Wash Ranchland Area				X	X		X
Remainder of Valley	X	X	X			X	
Key: X = Is possible and could have significant impact if it occurred.							

Figure 9-4. Generalized Matrix of Potential Options for Reducing Stress on Watercourses in the Altar Valley Subarea

Ranching in the Altar Valley: Descriptive Summary

Introduction:

The Altar Valley, the largest of eastern Pima County's valleys remains largely rural and is characterized by significant unfragmented expanses of natural open space, comprised principally of ranchlands and public preserves. The initial occupation of the valley by the prehistoric Archaic peoples dates perhaps as early as 5000 B.C. followed by Hohokam farmers who occupied villages and smaller hamlets from about A.D. 300 to 1450 along the Altar Wash floodplain and near spring sites in the adjacent mountains. Following the Hohokam collapse, little is known of the area until the Spanish missionaries and explorers entered the region in the 1690s and encountered Piman or Tohono O'odham peoples who are likely to be the descendants of the Hohokam. The region was known during Spanish Colonial and Mexican periods as "Pimeria Alta." Arriving about the same time as the Spanish, the Apache, too, frequented this region to search for seasonally available foods and often to raid O'odham settlements for their stores of cultivated foods.

With the acquisition of this region by the United States following the 1854 Gadsden Purchase, some of the first Americans to enter the area were prospective miners in search of gold and silver. Lured to the region by Spanish accounts of rich ore bodies and the discovery of gold and silver elsewhere in southern Arizona, prospectors staked numerous small claims and established sizable mines at Gunsight Mountain in the foothills of the Sierrita Mountains, at Cerro Colorado, and in the Arivaca area. Settlement of the Altar Valley with miners, homesteaders, and ranchers began in earnest in the 1860s and 1870s. Its principal roads, the Sasabe Road and the Ajo road began as stagecoach and freight lines connecting Tucson to Altar in Mexico in 1868 and to the Quijotoa and Ajo mines in 1883. The valley's principal settlements are Robles Junction (Three Points), Sasabe, and Arivaca. Today, the valley continues its ranching tradition and holds the largest number of ranches of any of the eastern Pima County valleys. Many of these ranches date to the initial settlement and homesteading of the valley, comprised of approximately 713,807 acres (1115.3 square miles).

Land & Environmental Setting:

Located to the southwest of the urban Tucson Basin and running parallel to the Santa Cruz valley, the Altar Valley Wash flows north from a divide at Compartidero Flats just north of Sasabe at the Mexican border, and then flows north past Robles Junction into the Avra Valley where it becomes the Brawley Wash. It continues to flow north into the Los Robles Wash and then to its confluence with the Santa Cruz River and then north to the Gila River. Unfortunately, erosion and significant flooding events have caused the Altar Wash to become deeply channelized in portions of the valley.

Unlike the urbanized Tucson area, the Altar valley is largely rural and undeveloped, with its principal settlements at Robles Junction, Arivaca, and Sasabe. Indian lands comprising the San Xavier and Schuk Toak districts of the Tohono O'odham Nation and the Pasqua Yaqui tribe extend into the valley. Suburban areas southwest of Tucson Mountain Park and north of the Ajo Highway represent the only urbanized areas in the valley, although significant lot-splitting and wildcat subdivisions occur along the Ajo Highway in the Robles Junction area and to the

north, west, and south of the San Xavier District. The Diamond Bell Ranch is the largest platted subdivision located south of the Ajo Highway.

The Altar Valley is bounded by the "Garcia Strip" of the Tohono O'odham Nation on the north, and adjoins the Avra Valley. On the east, the Altar Valley runs along the ridgeline of the Tucson Mountains south across the San Xavier District of the Tohono O'odham Nation to the ridgeline or divides of the Sierrita Mountains, Cerro Colorado Mountains, and the Atascosa Mountains in Santa Cruz County and the Mexican border on the south. To the west, the Altar Valley is bounded by the ridgeline of the Baboquivari, Quinlan, Coyote, and Roskruge mountains, which is also the boundary of the main reservation of the Tohono O'odham Nation. The Altar Valley watershed reflects a significant range in elevation from 2257 to 7505 feet.

As with much of the Basin and Range province of the greater Southwest, the rugged mountain terrain and river valley support a variety of environmental zones and vegetation types, ranging from the Altar Wash floodplain to higher elevation evergreen forests of the Baboquivari, Sierrita, and San Luis mountain ranges that surround the valley. Much of the valley is characterized by a broad, gently sloping bajada that accommodates broad expanses of grasslands that extend into the foothills of the surrounding mountain ranges.

Table 1. Major Vegetation Zones in the Altar Valley Watershed in Pima County

▸ Agriculture/Pasture	6683	acres	0.9 percent
▸ Urban	9572		1.3
▸ Unclassified	392		0.0
▸ Water surface	280		0.0
▸ Creosote-Tarbush	1678		0.2
▸ Cottonwood-Willow	156		0.0
▸ Cattail-Marshland	356		0.0
▸ Paloverde Scrub	133,837		18.7
▸ Creosote-Bursage	58,915		8.3
▸ Deciduous/Riparian	10,483		1.5
▸ Scrub Grassland	461,773		64.7
▸ Mixed Broadleaf	1122		0.2
▸ Chaparral Scrub	230		0.0
▸ Manzanita	1466		0.2
▸ Oak- Pine Forest	6263		0.9
▸ Evergreen Forest	20,601		2.9
TOTAL	713,807	acres	99.8 percent

Because of the range in elevation, rainfall, too, is highly variable ranging from about 11 inches annually at the lowest elevations to an estimated 31 inches at the highest elevations. Most of the rainfall in this watershed is estimated to average about 11 - 19 inches annually. This amount of rainfall covers nearly 86 percent of the subarea acreage.

Water is available from a number of springs found mostly in the Baboquivari, Quinlan, and Coyote mountains on the west side of the valley and in the Sierrita Mountains to the east and

the Coronado National Forest on the south. Surface water covering some 280 acres is found along perennial and intermittent streams at Arivaca Creek, Brown Canyon, and Thomas Canyon and impounded in Mormon Lake, Aguirre Lake, and Arivaca Lake. The Altar Wash runs for some 89 miles through the valley. Shallow ground water has been identified in the Arivaca area and along Arivaca Creek. Numerous stock tanks and wells supplement these natural water sources for cattle and wildlife use. Domestic wells account for approximately 196 wells that are recorded with the Arizona Department of Water Resources.

Table 2. Natural & Constructed Water Sources in the San Pedro Watershed in Pima County

Springs	Intermit-Streams	Peren-Strms	Lakes	Stock Tanks	Shallow Grnd-Water	Wells
24	ca. 7 mi.	ca. 2.7 mi.	280ac	1099*	3311 acres	1088

*Note that 840 stock tanks occur on ranchlands; there are 259 on Buenos Aires Refuge that are no longer in use.

As a consequence of its natural environmental setting that includes an abundance of grassland totaling about 65 percent of the major vegetation type in the valley, numerous natural and created water sources, and a range of environmental zones, which can be seasonally grazed, ranching in the Altar Valley watershed comprises a significant and sustainable land use.

Land Base & Land Uses:

All of the Altar Valley subarea is located in unincorporated Pima County, and like much of Pima County, the Altar Valley is comprised of a mosaic of land ownership including federal, state, and private lands, but a significant portion of this land is publicly owned. Approximate acreages are provided below for each kind of ownership.

Table 3. Land Ownership & Jurisdictions

National Forest	29,889 acres	4.1 percent
National Wildlife Ref.	112,345	15.7
National/County Parks	6154	0.9
Indian Reservation	73,223	10.3
BLM	27,169	3.8
State Lands	320,706	45.0
Private Lands	144,230	20.2
Unknown	91	
TOTAL	713,807 acres	100 percent

Robles Junction, Arivaca, and Sasabe are the principal settlements in the Altar Valley watershed, and the total population in the entire valley is currently estimated at 23,902 people. Private lands, comprising some 20 percent of the land base, are located throughout the Altar Valley. While some 66 percent of these private lands are classified as used for ranching or agricultural purposes, some 34 percent of all private lands are categorized as non-

agricultural lands. A significant area of these non-ranching private lands characterizes much of the northeast portion of the subarea lying to the southwest of the Tucson Mountains and north of the San Xavier District. This area, which is experiencing urbanization from the Tucson metropolitan area, essentially marks where the transition from ranching to real estate development is occurring. Some of these lands have been formally platted and other areas reflect lot-splitting or wildcat subdivision areas. Elsewhere in the Altar Valley, clusters of private lands that are not used for ranching are found in the settlements of Arivaca, Robles Junction, and Sasabe, in the platted subdivision of Diamond Bell Ranch, and in clusters near the Coyote Mountain and Baboquivari Peak wilderness areas, and to the west of the Sierrita Mountains. Throughout the Altar Valley, there are a total of 22,037 parcels recorded with the Pima County Assessor's Office.

Ranches:

As noted earlier, much of the Altar Valley was initially explored by Spanish missionaries including Fr. Kino; however, no permanent Spanish missions or settlements were established here. Instead, Spanish settlement focused on the Piman communities in the Santa Cruz and San Pedro valleys where permanent water was more reliable. It was not until the Gadsden Purchase of 1854 that the Altar Valley experienced its first significant wave of immigrants who were largely American mining prospectors brought to the region in search of gold and silver beginning the 1860s to 1870s.

With the establishment of a freight and stagecoach line by the Aguirre family in 1868 that ran north through the length of the Altar Valley from Altar, Mexico to Tucson, the Altar Valley became more easily accessible for exploration and settlement. With the success of the stage line, Pedro Aguirre established the Buenos Aires Ranch and stage stop in the 1870s at the south end of the valley. With the opening of the mines at Gunsight and Quijotoa, Bernabe Robles established a stage line from these mines running eastward to Tucson in 1883. At the junction of the Aguirre and the Robles stage lines, Bernabe Robles established his Robles Ranch and stage line. These original stage line roads opened the valley for settlement and homesteading and remain the principal routes of access to the valleys today.

The Robles Ranch and the settlement that grew up around it became known as Robles Junction or Three Points, and just south of the Buenos Aires the settlement of Sasabe grew up at the border. With the depletion of the rich ore bodies in the mines that initially brought settlers to the Altar Valley, settlers like Robles and Aguirre refocused their enterprises to ranching. Soon other homesteaders came to the valley and sought to capitalize on its rich grassland environment and the growing cattle market.

Ironically, with the exception of the Robles and Buenos Aires ranches, some 31 ranches, many of which include lands from the original homesteads, continue in operation in this subarea, utilizing private lands, 30 state trust land grazing leases, 28 BLM leases of various parcels, and 3 National Forest leases.

These ranches are listed in the following table and are identified by either their ranch name or the name of the grazing lease. Please note that relatively small ranches comprised of only private lands are not noted below; however, their use of private lands in ranching is included

in the total acreage in ranch use calculated for the entire watershed. Tohono O'odham and Yaqui tribal lands comprising some 73,230 acres are not included in the analysis; however, it is recognized that portions of these tribal lands in the Altar Valley are probably used for agriculture and for livestock grazing.

Table 4. Ranches in the Altar Valley Watershed in Pima County

Ranch/Lease Name	Private Land	State Lease	BLM	National Forest Lease
Tortuga Ranch	X	X	X	
Lopez		X	X	
Claves		X		
Dicochea		X		
Ripley		X		
N. Wolverton		X		
S. Wolverton		X		
Dobbs Butte		X	X	
Three Points	X	X	X	
Buckelew		X		
King Ranch	X	X		
KQ Ranch	X	X		
Chilton 3-PTS	X	X	X	
Anvil Ranch	X	X	X	
Gunsight	X	X	X	
Sierrita Ranch	X	X	X	
Treasure Rockhound	X	X	X	
Palo Alto Ranch	X	X		
Elkhorn Ranch	X	X	X	
Chiltipines Ranch	X	X		
Marley Ranch	X	X	X	
Brown Canyon	X	X		
Baboquivari Peak	X	X	X	
Santa Margarita	X	X	X	
Rancho Seco	X	X	X	
Los Encinos	X	X		
Arivaca Ranch	X	X	X	
Chilton Ranch	X	X		X
Rancho El Mirador	X	X		
Carrizo				X
La Osa	X	X		
Cross S				X

These larger ranches, which include principally cow-calf and some stocker types of livestock operations, all utilize grazing and ranch management plans under which they implement their state and federal grazing leases.

Unique to the Altar Valley is the former Buenos Aires Ranch, now a National Wildlife Refuge. Formed from the original ranch established by Pedro Aguirre in the 1860s, the Buenos Aires Ranch, comprising more than 100,000 acres, was purchased in 1985 by the US Fish and

Wildlife Service to serve as a National Wildlife Refuge for the masked bobwhite quail, which had been extinct in the United States since about 1900 and was threatened in Mexico. Prior to its purchase, releases of captive bred birds on the ranch started in the 1970s. When real estate speculation resulted in the break-up of the Victorio Land & Cattle Company and threatened the ranch with development, the US Fish and Wildlife Service purchased the ranch in 1985, ceasing its grazing and livestock operation. At the present time, data provided by the Buenos Aires Refuge indicate that approximately 1500 captively bred birds are released each year, with an estimated 400-700 birds surviving the winters. Their present goal is to reach 500 breeding pairs.

Except for the Buenos Aires Refuge, Tucson Mountain Park, platted and wildcat or lot-split subdivision areas, and the townsites, the Altar Valley watershed has 472,295 acres of ranch or agricultural lands, or about 74 percent of the entire watershed if tribal lands are subtracted from the total watershed acreage. If tribal lands are included in the ranching and agriculture category, total agricultural use in the Altar Valley increases to 545,518 acres, or 76 percent of the entire watershed.

Lands not used in ranching or agriculture comprise some 168,289 acres or about 26 percent of the Altar Valley watershed, excluding tribal lands. If tribal lands are included as ranchlands, the percentage of lands not used in ranching is only 24 percent. As noted elsewhere, much of the non ranch lands comprise townsites, platted and wildcat subdivision areas, the Buenos Aires Refuge, and Tucson Mountain Park.

Of all private lands in the Altar Valley totaling 144,230 acres, approximately 94,531 acres, or 66 percent, are used in ranching, and 49,699 acres, or about 34 percent, have other uses. Virtually all of the 320,706 acres of state trust lands appear to be used in grazing, and much of the BLM lands totaling 27,169 acres and National Forest lands totaling some 29,889 acres are designated in grazing leases. Forest lands used in grazing leases distinguish between "capable" range land and "incapable" range land due to rugged terrain and poor access in the higher elevations. For the purposes of this analysis, however, it is assumed that approximately 29,889 acres of National Forest lands are available for grazing in this watershed.

Table 5. Ranchlands in the Altar Valley Watershed in Pima County

Land Owner	Ranch Use	Non-Ranch Use	Total
National Forest	29,889 ac	(Rugged terrain?)	29,889 ac
State Trust Land	320,706		320,706
BLM Lands	27,169		27,169
National Wildlife Ref.		112,345	112,345
National/County Parks		6154	6154
Private Owners	94,531	49,699	144,230
Unclassified		91?	91
TOTAL	472,295 ac	168,289 ac	640,584 ac*

*Total Acreage shown does not include 73,223 ac. of tribal lands.

Ranch improvements that have been made include ranch headquarters, residences, stables, corrals, irrigated pasture, fencing for lease boundaries and pasture rotation, roads and fire breaks, erosion control, and development of stock tanks and wells as water resources for cattle and wildlife. While many of these improvements have not been quantified for this report, water sources that are critical to the success of ranching and for maintaining wildlife have been researched. It has been noted above in Table 2 that natural water sources are relatively abundant in the mountain areas, with 24 springs located mostly in the Baboquivari Mountains, the Sierritas, and in the Coronado National Forest, and there are about 10 miles of perennial and intermittent streams. To supplement natural water sources, approximately 1099 stock tanks have been constructed over time. There are about 840 stock tanks that have been recorded on ranchlands in use today, and approximately 259 stock tanks that are no longer in use on the Buenos Aires Refuge, now closed to grazing. Wells, recorded for both domestic use, for cattle and wildlife, and other uses number 1088 for the entire Altar Valley.

The "animal unit capacity," which defines the number of animals that can be grazed on leased ranch lands is determined by range managers for the US Forest Service, the BLM, and the State Land Department in cooperation with the rancher or lease holder. This capacity is not static but reflects current range conditions that are determined by a variety of factors including soils types, tendency to erosion, natural vegetation and forage types, elevation, rainfall, the success of grazing rotation, and the recovery of natural forage following periods of grazing or catastrophic events such as fire. Periodic review of these and other factors determines the animal unit capacity or permitted use and determines the upper limit of how many cattle can be grazed to maintain the viability of the rangeland. It does not necessarily mean that ranchers always graze at the permitted maximum level. More often than not, many ranchers graze animals at lower than the permitted levels to further ensure the stability and health of the rangeland. If lands are overgrazed such that range health is compromised, the consequences of diminished capacity and lower economic viability for the rancher in future years are obvious.

Based on current state and federal grazing lease numbers, the current animal unit capacity of the Altar Valley watershed ranges from 3 to 16 animals per square mile depending on the terrain, location of the lease, the health of the range, rainfall, and how it is used. At the present time the 3 National Forest grazing allotments, 28 BLM leases, and 30 State grazing leases allow for a maximum of 6640 animals to be grazed in the entire Altar Valley watershed in Pima County. When this number is considered together with the total acreage of 472,295 acres or 738 square miles, dedicated to ranching, the maximum average number of animals allowed to be grazed is approximately 9 animals per square mile. Grazing capacity corresponds with higer elevation and rainfall as shown on the enclosed figure. However, please note again that this number reflects only today's range conditions and lease terms. The total number of animal units is likely to be changed in the future dependent on climate, rainfall, vegetation cover, and range health.

Table 6. Animal Units Allowed to be Grazed in the San Pedro Watershed in Pima County

Range of AUs Allowed	Acres/Sq.Miles in Grazing	Total AUs Allowed	Avg.AU/Sq.Mi.
3 -16	472,295 ac. or 738 Sq.Mi.	6640	8.9

In addition to grazing, federal and state public lands may be used for hunting, fishing, hiking, riding, and other recreational uses. Although these kinds of uses have not yet been quantified, it is likely that recreational use of public lands in the Altar Valley watershed is high due to its relatively close proximity to the Tucson metropolitan area and its relatively easy access.

Current Farms:

At the present time, there are only limited areas where food or fiber crops are being commercially grown in the Altar Valley watershed. Cotton became particularly important to Arizona's economy during World War I, but it was not grown commercially in the Altar Valley until 1956, when Robert Buckelew purchased the current Buckelew Farm near Robles Junction. This farm is reported to have once been 900 acres in size, but has now been reduced to 300 acres as a consequence of the City of Tucson's efforts to purchase water rights. Cotton, corn, pumpkins, and other crops are still grown, and seasonal pumpkin harvesting is opened to the public at the Buckelew Farm.

Available GIS data indicate there are some 526 acres of land currently irrigated for crops and pasture in the Altar Valley. Assuming the Buckelew Farm comprises some 300 acres, there approximately 226 acres currently in use for irrigated pasture located along the Altar Wash floodplain. With irrigated pasture producing sufficient alfalfa and other forage, cattle may be pastured together in greater numbers while natural range land is rested from grazing for portions of the year. Water for irrigation to these pastures is typically derived from wells.

The total area in the Altar Valley that was ever in agricultural use as croplands or irrigated pasture is 5070 acres. However, the City of Tucson currently owns a total of some 7329 acres, which includes 4544 acres of former agricultural lands that were purchased for their water rights. These areas that were once irrigated farmland tend to be located north of the Ajo Highway in the northern Altar Valley. Approximate acreages for current and historically irrigated agricultural lands are provided below.

Table 7. Current Farms or Irrigated Pasture in the Altar Valley Watershed in Pima County

Acres Ever in Agriculture	Food or Fiber Crops	Irrigated Pasture	COT Farms
5070	300	256	4544

Development Pressure & Threats to Ranching:

Development pressure in the Altar Valley watershed in Pima County is variable and dependent on transportation corridors, proximity to the urbanizing Tucson area, where private lands are becoming a commodity for development due to rising real estate values near townsites, and in areas adjacent to existing platted or wildcat subdivisions. As noted above, growth and urbanization is occurring in the northeast portion of the watershed near the Tucson Mountains. Here, ranching is no longer viable, and the transition of ranchlands to real estate is increasing. In fact, there are no state or BLM grazing leases in the area, and the "urban boundary" here

may be defined by the boundary of the Tortuga Ranch lease to the west and the San Xavier District of the Tohono O'odham Nation to the south. Both platted and wildcat subdivisions characterize the area located principally to the east of the Brawley Wash. Moreover, due to its proximity to the Tucson metropolitan area, there remains the threat that additional private lands will be developed either as subdivisions or as wildcat subdivisions.

At the present time, there are 114 platted subdivisions comprising some 14,985 acres in the entire Altar Valley watershed in Pima County, and there are approximately 22,037 recorded parcels of land. Approximately 9572 acres have been characterized as urbanized area in this portion of the Altar Valley.

Areas of ranchland fragmentation may be defined as those parcels that are not used in ranching and that have been subdivided or have the potential to be subdivided. Approximately 49,699 acres of private lands are currently not used in ranching and may be developed. When reviewed on a map, these areas of non-ranch private land holdings cluster in the urbanizing northeast portion of the watershed, to the east of Brawley Wash, at the Diamond Bell Ranch subdivision, in the foothills of the Coyote and Sierrita mountains, and at the townsites of Arivaca and Robles Junction. With these exceptions, the Altar Valley is comprised of largely unfragmented ranchlands and natural open space that are extensive and uninterrupted, crossing the valley from east to west and north to south.

At the present time there are no areas of committed high density zoning for development outside the platted subdivison areas. Consequently, there are also no areas for "rent-a-cow" operations where a developer uses ranch land designation by the Assessor's Office to lower property taxes while waiting for the opportune time to develop lands that have been zoned for high density residential or commercial use.

However, the BLM and Arizona State Land Department (ASLD) have identified various parcels for either sale, trade, or commercial lease that total some 21,751 acres. These include a number of BLM parcels located in the Arivaca vicinity, near the Diamond Bell Ranch subdivision, and scattered elsewhere in the valley. These BLM lands total some 19,771 acres.

In addition, the ASLD has identified one Special Land Use Permit (SLUP) area located just north of the San Xavier District and south of the Ajo Highway in the developing northeast portion of the watershed. This SLUP is currently a 5-year grazing permit on lands that have been classified by ASLD for commercial use. Although a 5 year permit, the permit can be canceled at any time by the ASLD. Known as the Claves SLUP, this area comprises some 1980 acres. While much of the BLM land identified for sale or lease may remain in ranch use or as open space due to their more remote settings and proximity to other ranchlands, there is a much higher probability that the ASLD parcel identified for commercial use will be developed because of its proximity to the developing urban area and it location along transportation corridors.

In summary, the development pressure in the Altar Valley watershed in Pima County is variable at the current time. In the southern and middle portions of the Altar Valley, development pressure is relatively low due to the stability of ranch land use, largely unfragmented lands, the lack of committed high density zoning, and the distance from any major transportation corridors such as Interstate 10 or 19 or even the Ajo Highway. The principal threat to the stability of ranching in these portions of the Altar Valley is likely to be due in the future to the

transition of ranchlands to real estate, especially in the Arivaca and Sierrita Mountain areas, which will result in development of private lands into either platted or wildcat subdivisions.

In the northern portion of the Altar Valley, urbanization is occurring near the Tucson Mountains, north and south along the Ajo Highway, east of the Brawley Wash, near the Coyote Mountains, and in the vicinity of the Diamond Bell Ranch subdivision. While a land value analysis has not been completed for this assessment, it is likely that land values are increasing and sufficiently high in these areas that private land owners are selling land for development rather than retaining their land for agricultural or ranching use.

Ranchland Conservation Potential:

Several factors will contribute to the very good potential for much of the Altar Valley to remain a viable area for sustainable ranching. These factors include: the relative stability and long-term tenure of ranch lands comprised of private lands, State lands, BLM, and National Forest leases; the relatively small acreage of public lands designated for sale or commercial use; low population pressure outside the urbanizing northeastern portion of the valley; the lack of major transportation corridors; relatively long distance and access to the valley south of the Ajo Highway from the Tucson area; its proximity to existing preserves that allow grazing; a high proportion of productive grasslands; good average rainfall; the availability of some irrigated pasture to diversify grazing strategies; and relatively high grazing capacity.

The natural open space of ranchlands will further enhance the existing preserves that surround the valley, which include the Coronado National Forest, the Tohono O'odham Reservation, the Buenos Aires Refuge, and the proposed BLM long term management area comprising some 36,330 acres along the Baboquivari Mountain Range that encompasses the Baboquivari Peak Wilderness Area and the Coyote Mountain Wilderness Area.

While none of these factors guarantees long-term ranchland conservation, the available information suggests that the potential for sustainable ranching is high in portions of the Altar Valley watershed in comparison to some of the other subareas of Pima County. Other portions of the Altar Valley, however, will continue to be susceptible to fragmentation and development as discussed above.

Summary & Conclusions:

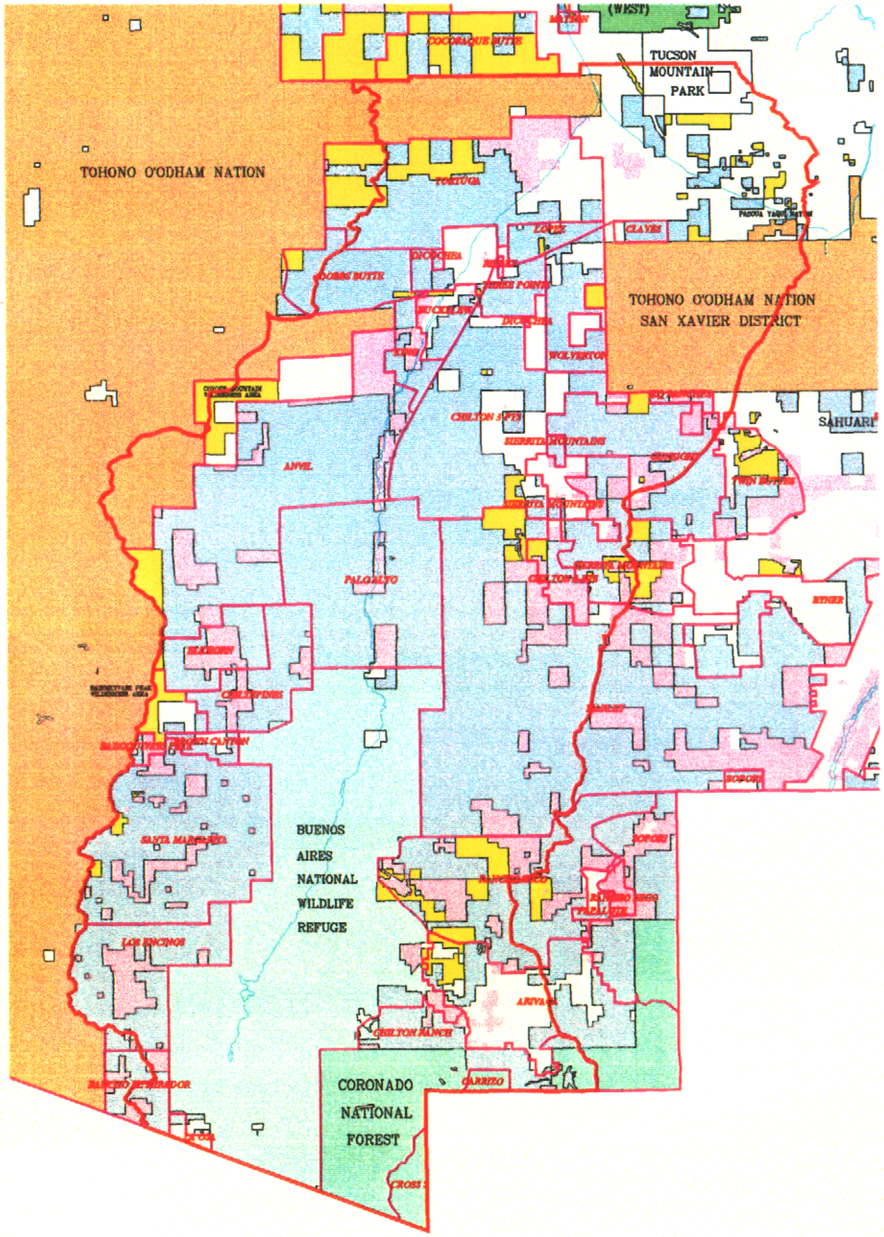
To conclude, the Altar Valley watershed continues to support stable and sustainable ranching operations in large part because of its environmental setting and the connectivity of its ranchlands and open space. The valley is located in a rich and varied environment that expresses a range of environmental zones from riparian bottomlands to high elevation evergreen forests, offering the opportunity to use different areas of the valley for grazing as forage becomes available seasonally. The principal vegetation type is scrub grasslands, which comprises some 65 percent of the vegetation in the subarea.

Numerous water sources, both natural and constructed, provide water to both cattle and wildlife throughout the watershed in all elevations.

Land use remains largely rural, and significantly, some 472,295 acres, approximately 76 percent of the land in the subarea, are used in ranching and agriculture. This includes 94,531 acres, or 66 percent, of all private lands. Some 168,289 acres, or approximately 24 percent, of the entire area are not used for ranch purposes.

At the present time there is limited threat from development pressure in the middle and southern portions of the valley; however, urbanization characterizes the northeastern portion of the valley. Population is relatively low and is estimated at 23,902 people, and there are no committed lands other than 14,985 acres of platted subdivisions that have been zoned for high density development.

The Altar Valley watershed in Pima County currently has a reasonably high potential to continue in sustainable ranch use. This conservation potential derives from a productive environmental setting, the availability of water and relatively high rainfall, the apparent stability of ranchlands and grazing leases comprised of private lands, BLM, State lands, and National Forest lands, the relatively high grazing capacity, the lack of significant ASLD lands for sale or commercial lease, the lack of major transportation corridors, and the valley's proximity to existing preserves, much of which is used in ranching.

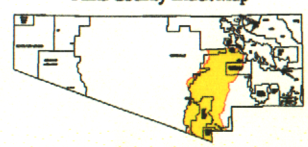


Pima County Ranches

SDCP PLANNING UNIT 6a

- Planning Unit Boundary
- Ranch Boundaries
- Major Washes
- BLM - 27,169 ac.
- INDIAN - 73,223 ac.
- NATIONAL FOREST LANDS - 29,889 ac.
- NATIONAL WILDLIFE REFUGE - 112,345 ac.
- NATIONAL PARKS AND MONUMENTS - 6,154 ac.
- STATE LANDS - 320,706 ac.
- PRIVATE LANDS - 144,230 ac.
- RANCH USE - 94,531 ac.

Pima County Index Map



Index Map Scale 1:1,500,000

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Scale 1: 120, 000

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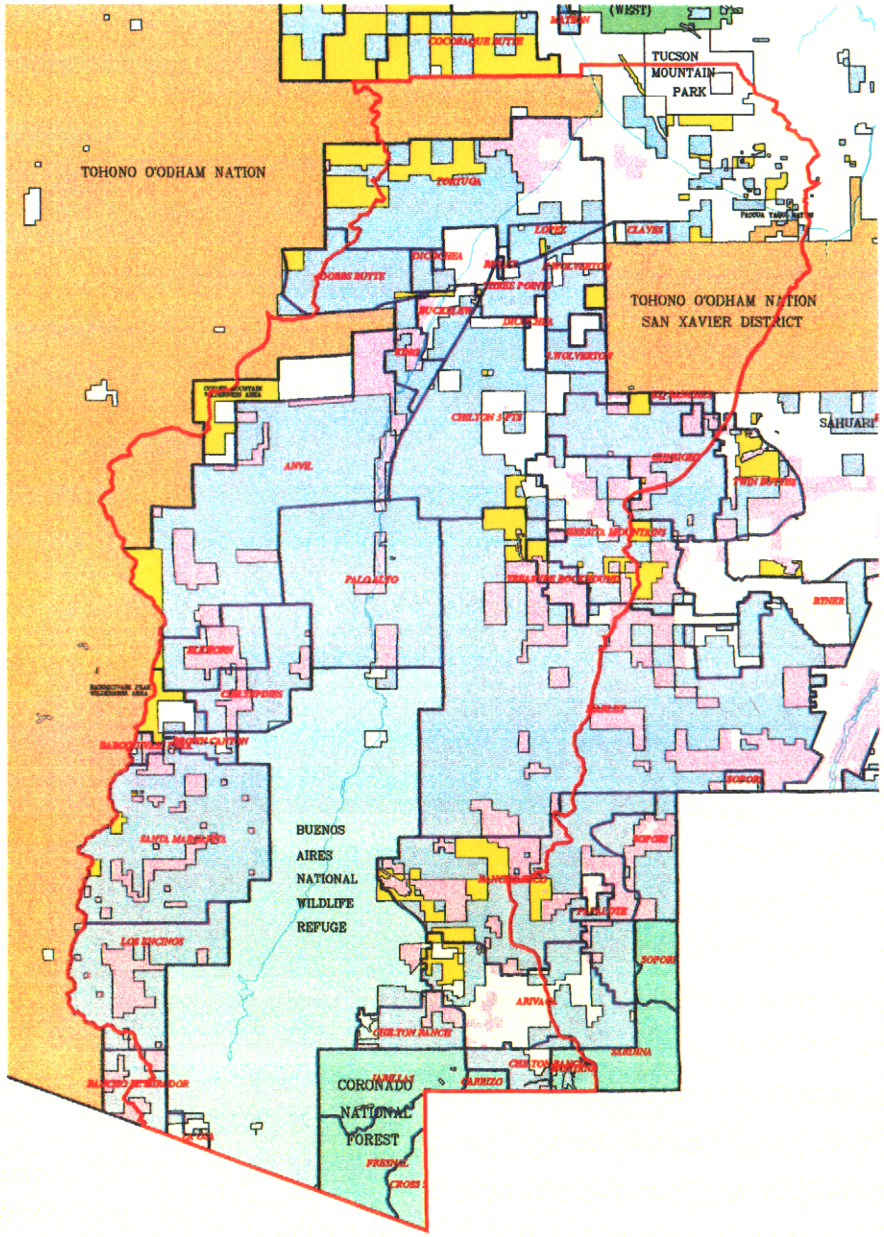
/pygmyowl2/sonora/cultural/ssmjoined/plan6a/amls/ranch6a.aml-op Plotted 3/8/00



Ranch Lands and Grazing Allotments

SDCP PLANNING UNIT 6a

- Planning Unit Boundary
- Grazing Allotments
- Major Washes
- BLM - 27,169 ac.
- INDIAN - 73,223 ac.
- NATIONAL FOREST LANDS - 29,889 ac.
- NATIONAL WILDLIFE REFUGE - 112,345 ac.
- NATIONAL PARKS AND MONUMENTS - 6,154 ac.
- STATE LANDS - 320,706 ac.
- PRIVATE LANDS - 144,230 ac.
- RANCH USE - 94,531 ac.

STATISTICS FOR PLANNING UNIT 6a

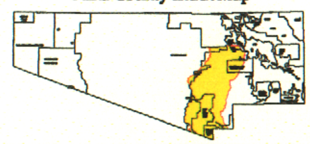
BLM	27,169 AC
INDIAN	73,223 AC
NATIONAL FOREST LANDS	29,889 AC
NATIONAL WILDLIFE REFUGE	112,345 AC
NATIONAL PARKS AND MONUMENTS	6,154 AC
STATE LANDS	320,706 AC
PRIVATE LANDS	144,230 AC

of the private lands.

RANCH USE	94,531 AC
NON RANCH USE	49,699 AC

22,037 parcels

Pima County Index Map



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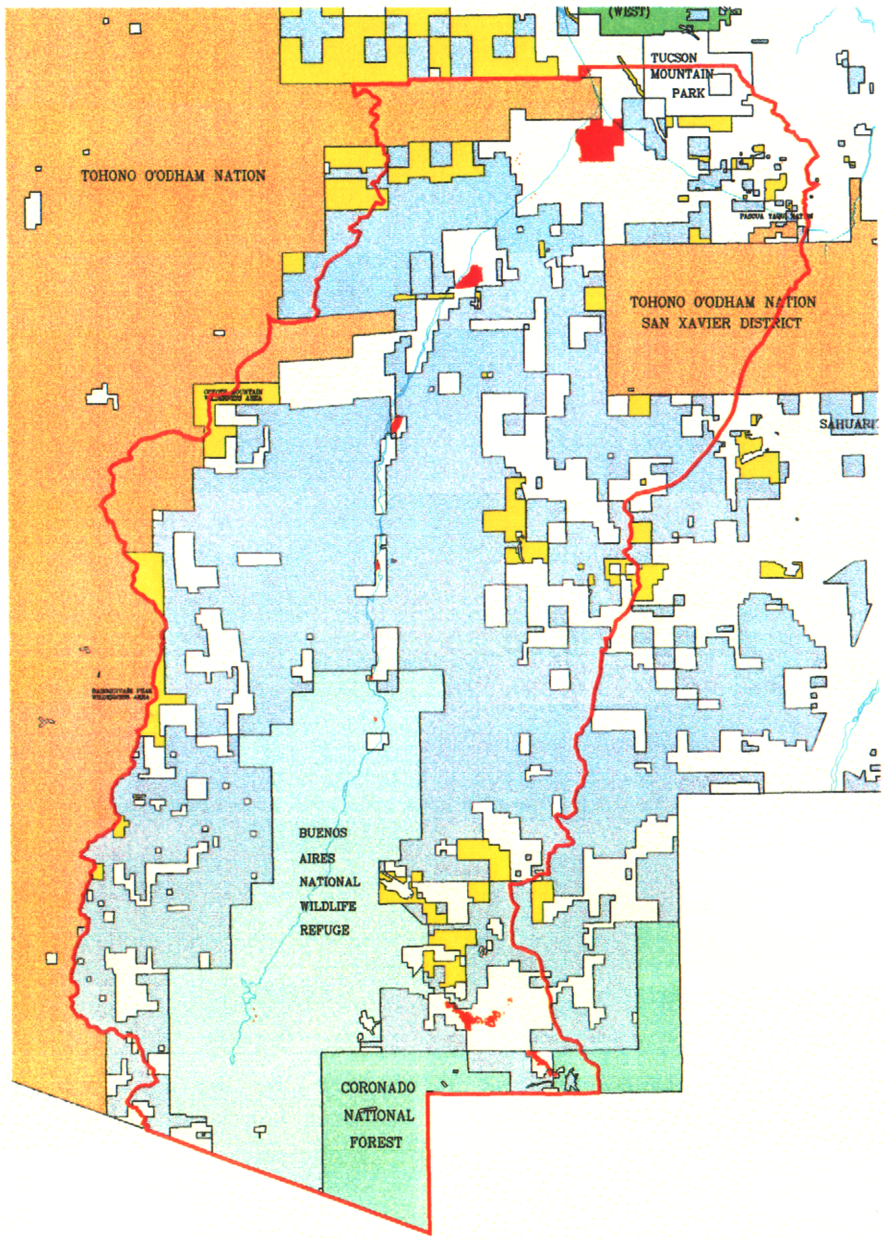
THE SEAL OF PIMA COUNTY ARIZONA

/pygmyowl2/sonora/cultural/asmjoined/plan6a/amls/allot6a.aml-op Plotted 3/8/00



Agricultural Lands

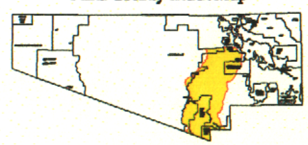
SDCP PLANNING UNIT 6a

- Planning Unit Boundary
- Major Washes
- AGRICULTURAL LANDS
- BLM
- INDIAN
- NATIONAL FOREST LANDS
- NATIONAL WILDLIFE REFUGE
- NATIONAL PARKS AND MONUMENTS
- STATE LANDS
- PRIVATE LANDS
- RANCH USE

STATISTICS FOR UNIT 6A

ACRES OF AGRICULTURAL LAND: 3, 279

Pima County Index Map



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3/9/00

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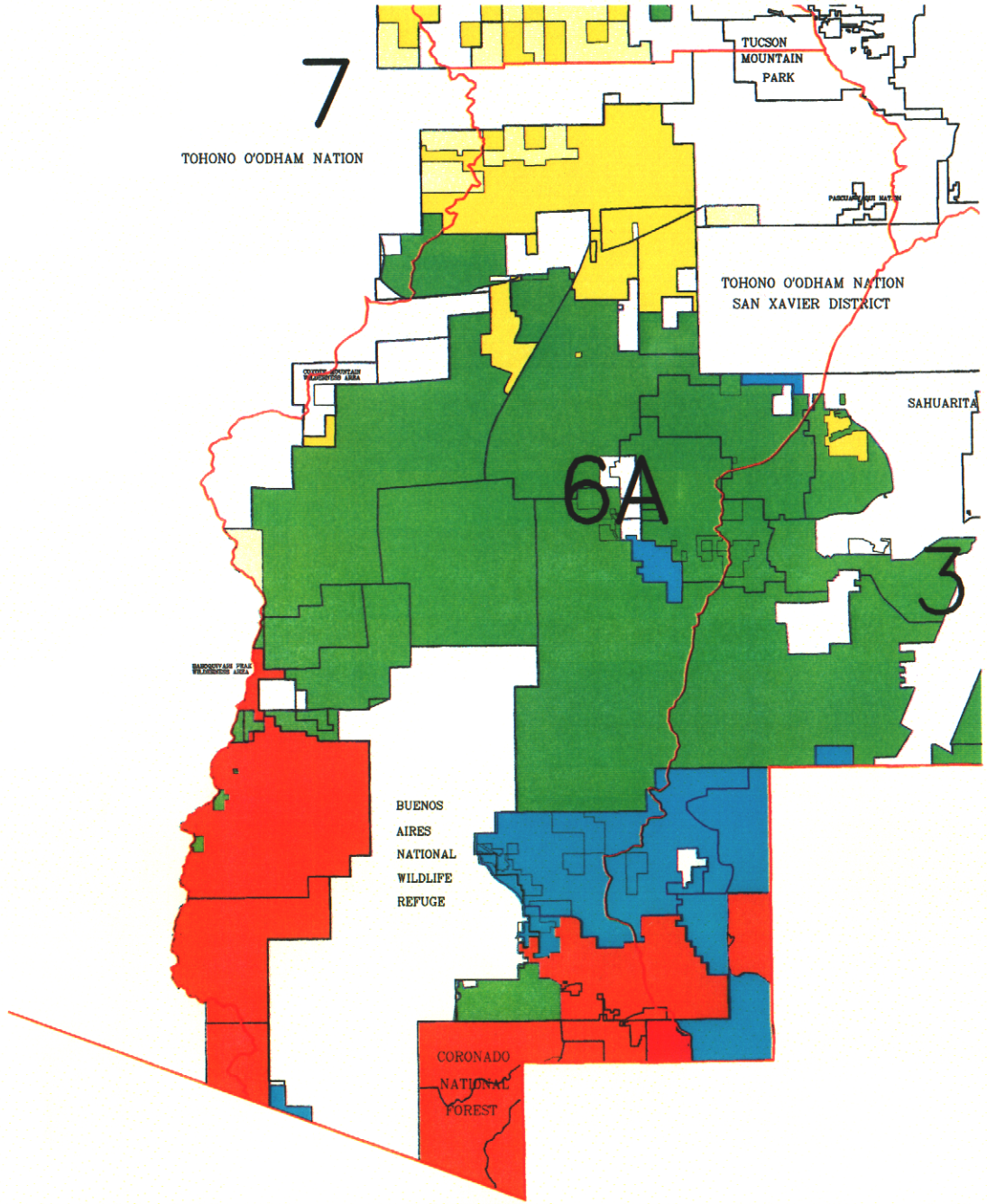
Carrying Capacity per Square Mile by Grazing Allotment

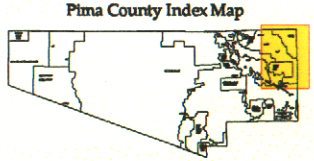


SDCP PLANNING UNIT 6A
Altar Valley

- Administrative Boundaries
- Grazing Allotment
- Planning Boundary

- Not Grazed
- 1 to 3 AUs
- 4 to 6 AUs
- 7 to 9 AUs
- 10 to 12 AUs
- 13 to 15 AUs
- 16 or greater AUs

Pima County Index Map



Index Map Scale 1:1,500,000

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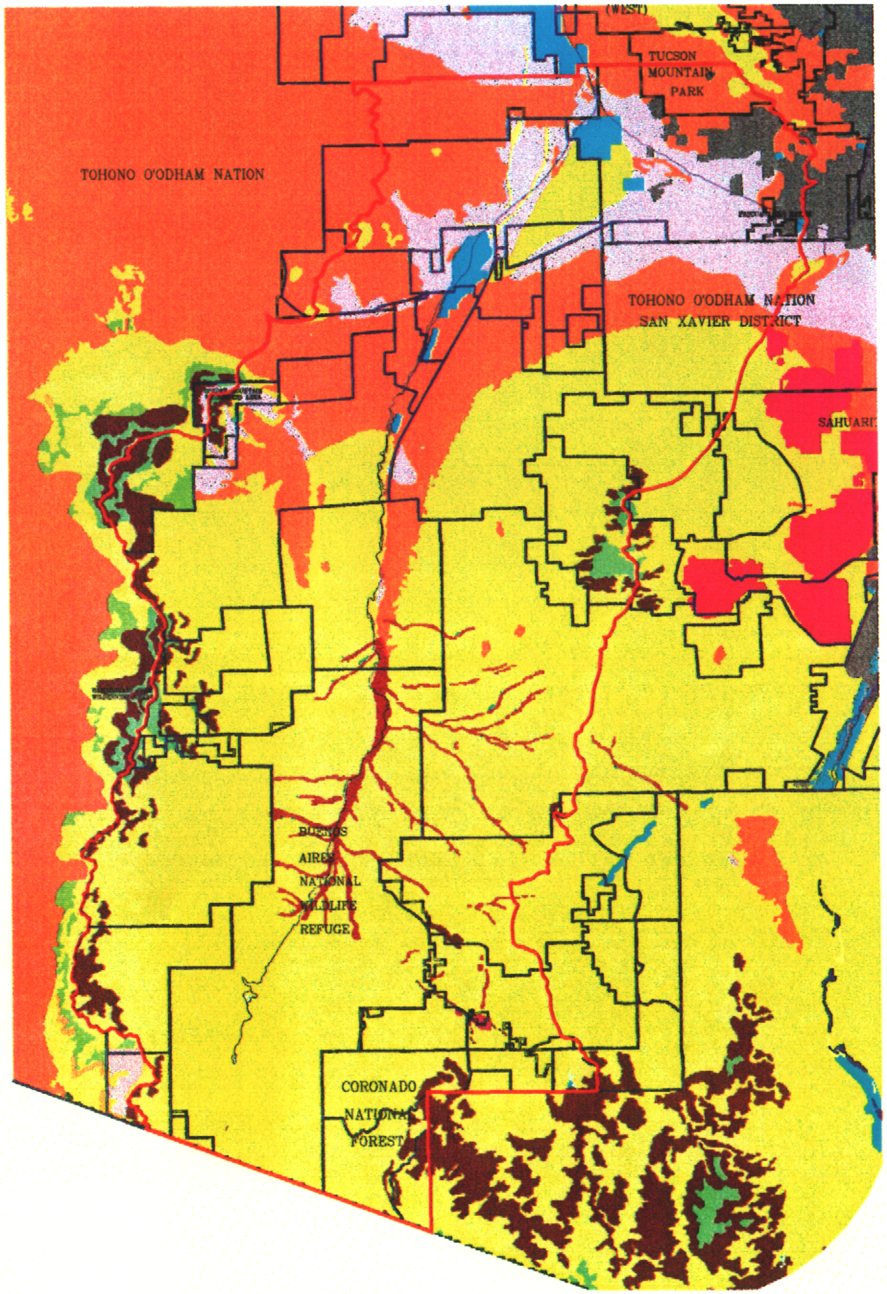
/pygmyowl2/sonora/ranch/covers/altar_carry.aml Plotted: 3/6/00

GAP Vegetation and Grazing Allotments

SDCP PLANNING UNIT 6A



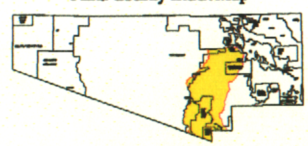
Minimum Elevation: 2,257 ft
Maximum Elevation: 7,505 ft

****
VEGETATION ACREAGE

ACRES	BIOME (SERIES)
6,683	Agriculture
1,678	Chihuahuan Desertscrub (Creosotebush--Tarbush)
20,601	Madrean Evergreen Forest (Encinal)
6,263	Madrean Evergreen Forest (Oak--Pine)
1,466	Mogollon Chaparral Scrubland (Manzanita)
230	Mogollon Chaparral Scrubland (Mixed Evergreen Sclerophy)
1,122	Mogollon Deciduous Swampforest (Mixed Broadleaf)
461,773	Scrub Grassland (Mixed Grass--Scrub)
10,483	Sonoran Deciduous Swamp and Riparian Scrub (Mixed Scrub)
58,915	Sonoran Desertscrub (Creosotebush--Bursage)
133,837	Sonoran Desertscrub (Paloverde--Mixed Cacti)
356	Sonoran Interior Marshland (Cattail)
156	Sonoran Riparian and Oasis Forest (Cottonwood--Willow)
351	Unclassified
9,572	Urban
280	Water

- Watershed Planning Unit Boundary
- Administrative Boundaries
- Washes
- Agriculture
- Urban
- Mining
- Chihuahuan Desertscrub (Creosotebush--Tarbush)
- Chihuahuan Desertscrub (Mixed Scrub)
- Chihuahuan Desertscrub (Whitethorn)
- Madrean Evergreen Forest (Encinal)
- Madrean Evergreen Forest (Oak--Pine)
- Madrean Montane Conifer Forest (Douglas-Fir--Mixed Conifer)
- Madrean Montane Conifer Forest (Pine)
- Mogollon Chaparral Scrubland (Manzanita)
- Mogollon Chaparral Scrubland (Mixed Evergreen Sclerophyll)
- Mogollon Deciduous Swampforest (Cottonwood--Willow)
- Mogollon Deciduous Swampforest (Mixed Broadleaf)
- Playa
- Scrub Grassland (Mixed Grass--Scrub)
- Scrub Grassland (Sacaton--Scrub)
- Sonoran Deciduous Swamp and Riparian Scrub (Mixed Scrub)
- Sonoran Desertscrub (Creosotebush--Bursage)
- Sonoran Desertscrub (Paloverde--Mixed Cacti)
- Sonoran Desertscrub (Saltbush)
- Sonoran Interior Marshland (Cattail)
- Sonoran Riparian and Oasis Forest (Cottonwood--Willow)
- Unclassified/Mixed
- Water

Pima County Index Map



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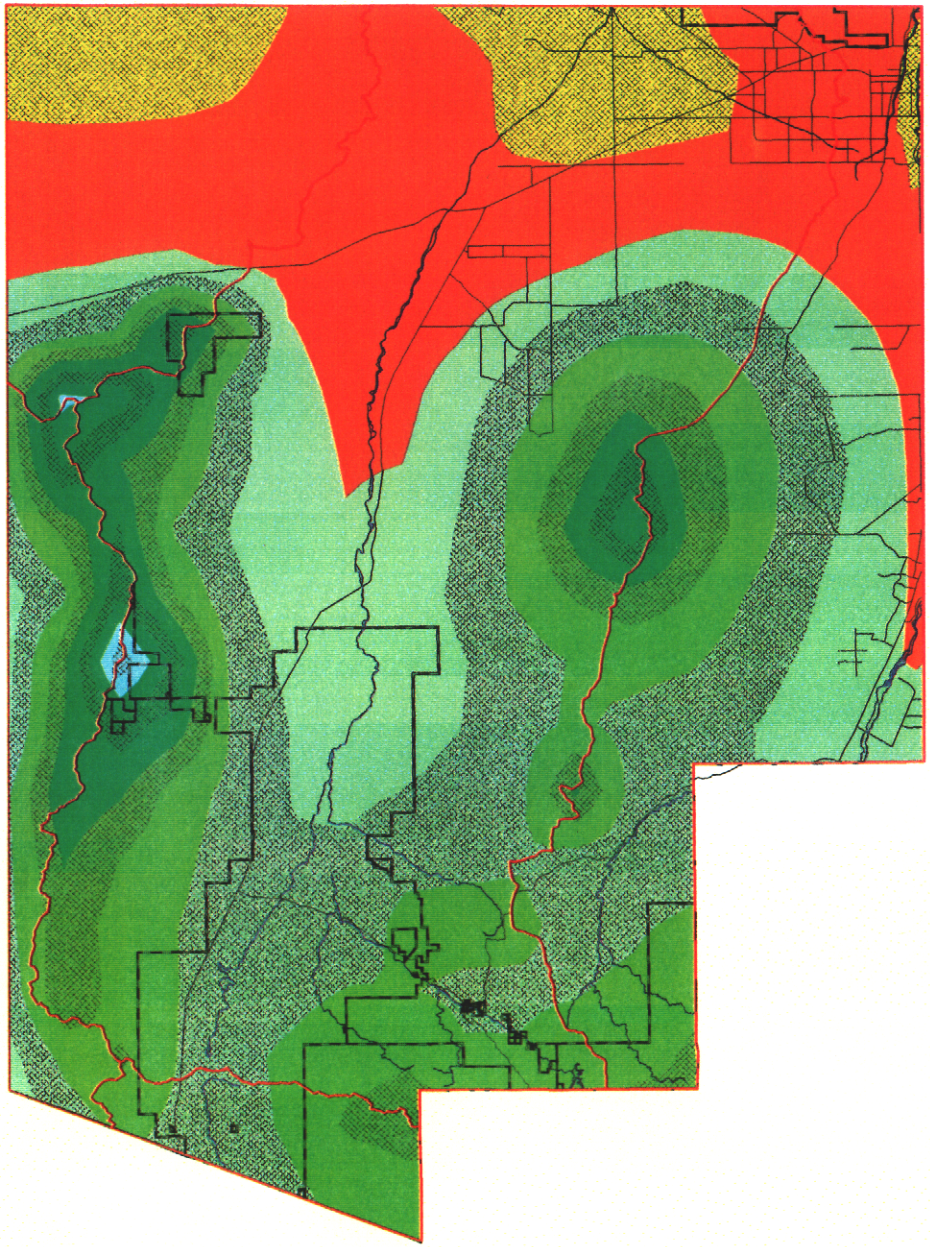
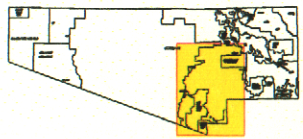


Annual Precipitation for Altar Valley Subarea

- 5 INCHES
- 7
- 9
- 11
- 13
- 15
- 17
- 19
- 21
- 23
- 25
- 27
- 29
- 31
- 33
- 35
- 37
- Major Washes
- Watershed Planning Unit

Pima County Index Map



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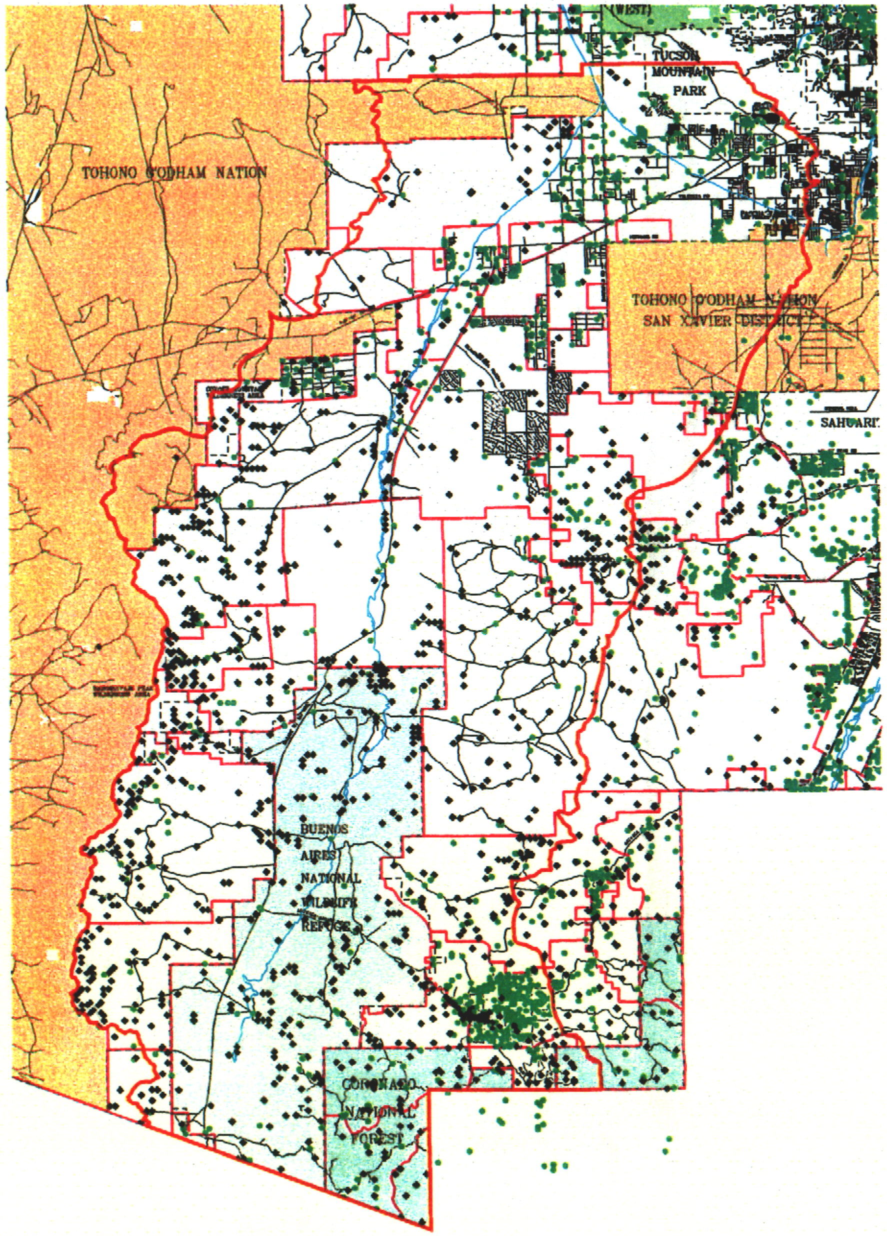


Stock Tanks and Well Sites

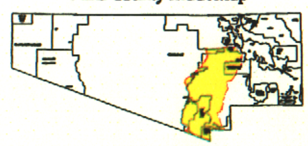
SDCP PLANNING UNIT 6a

- Roads
- Administrative Boundaries
- Major Washes
- Grazing Allotments
- Watershed Planning Unit
- Stock Tanks
- Well Sites

STATISTICS FOR UNIT 6A

Well Sites: 1,088
Stock Tanks: 1,099

Pima County Index Map



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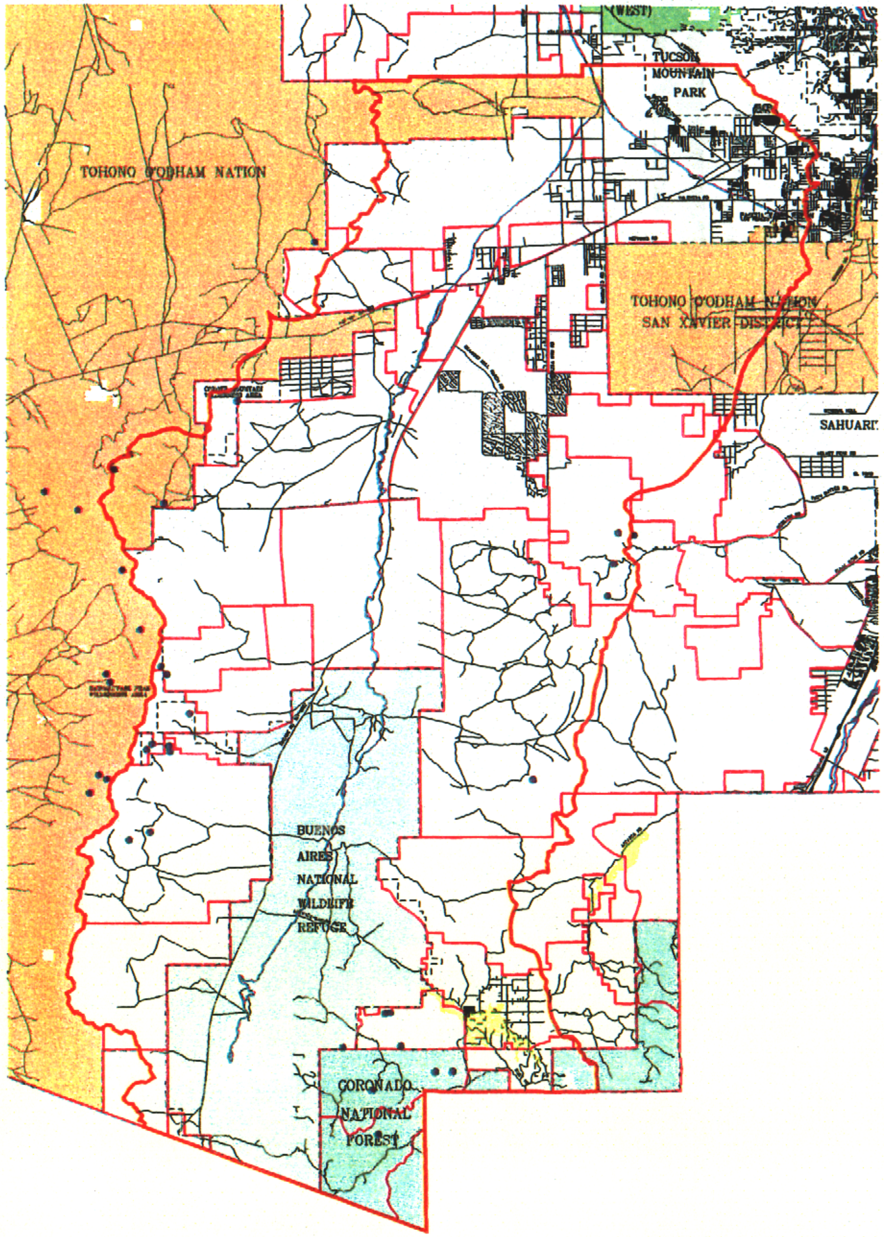
Major Washes Springs and Shallow Ground Water

SDCP PLANNING UNIT 6a

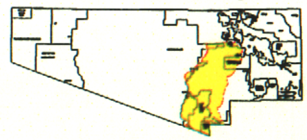


- Shallow Ground Water
- Streets And Roads
- Administrative Boundaries
- Major Washes
- Subarea Boundary
- Grazing Allotments
- Springs

STATISTICS FOR UNIT 6A

Springs: 24
Length of Major Washes: 471,663 ft. (89.33 mi.)
Area of Shallow Ground Water: 3,311 ac.

Pima County Index Map



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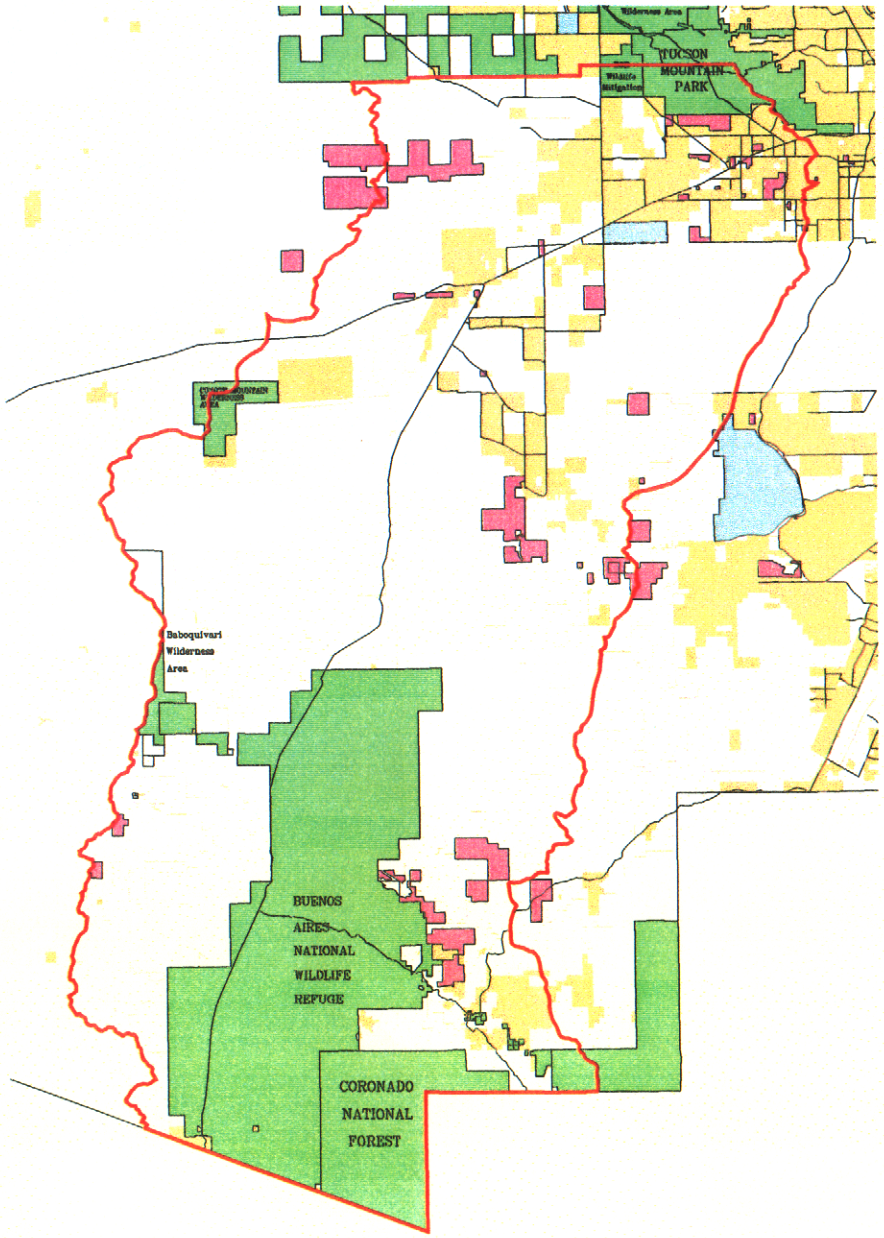
/pygmyowl2/sonora/cultural/bamjoined/plan6a/amls/ranch_wash6a.aml Plotted 3/8/00

Disposable Lands for BLM and State of Arizona

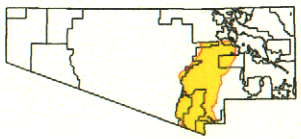


- Watershed Planning Unit
- Preserves
- Private Land, Non-Ranch Use
- Disposable BLM Lands
- Disposable State Lands

STATISTICS FOR UNIT 6A

DISPOSABLE BLM LAND: 19,771 AC.
DISPOSABLE STATE LAND: 1,980 AC.

Pima County Index Map



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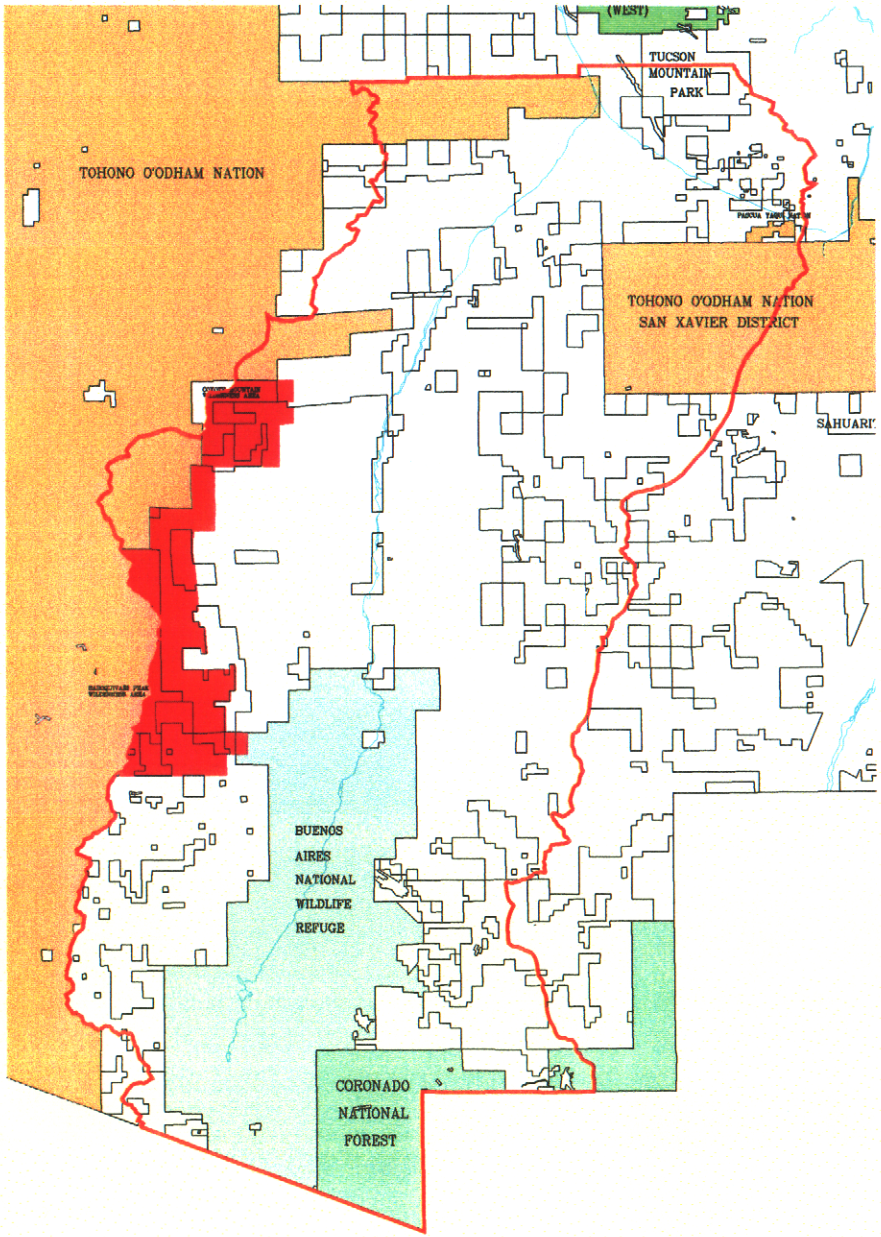


BLM Long Term Management Lands

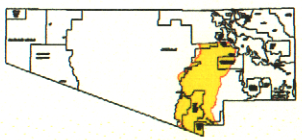
SDCP PLANNING UNIT 6a

- Planning Unit Boundary
- Major Washes
- BLM LONG TERM MANAGEMENT LANDS
- INDIAN
- NATIONAL FOREST LANDS
- NATIONAL WILDLIFE REFUGE
- NATIONAL PARKS AND MONUMENTS

STATISTICS FOR UNIT 6A

ACRES OF BLM LONG TERM MANAGEMENT 36,330

Pima County Index Map



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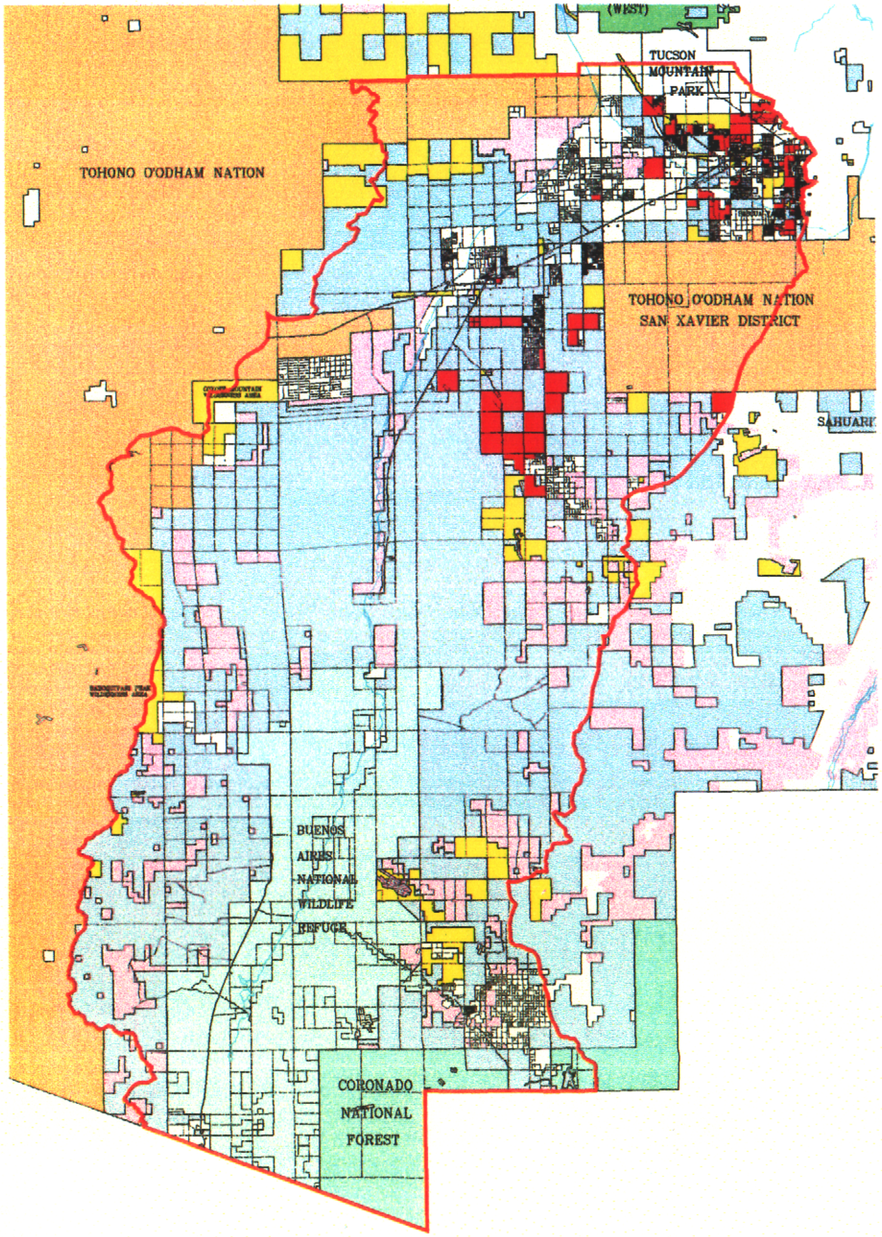


Platted Subdivisions

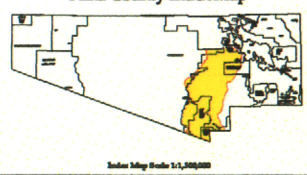
SDCP PLANNING UNIT 6a

- Planning Unit Boundary
- Major Washes
- Parcel Lines
- PLATTED SUBDIVISIONS
- BLM
- INDIAN
- NATIONAL FOREST LANDS
- NATIONAL WILDLIFE REFUGE
- NATIONAL PARKS AND MONUMENTS
- STATE LANDS
- PRIVATE LANDS
- RANCH USE

STATISTICS FOR UNIT 6A

NUMBER OF PLATTED SUBDIVISIONS: 114
ACRES OF PLATTED SUBDIVISIONS: 14,985
NUMBER OF PARCELS 22,037

Pima County Index Map



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/pygmyowl2/sonora/cultural/ssejoined/plan6a/amls/ranch_sub.aml-op

Sonoran Desert Conservation Plan
Altar Valley Subarea
Cultural and Historical Resources Inventory Report
March 10, 2000

DRAFT (Revised)

Purpose: The purpose of this report is to describe in summary form what is known about three kinds of cultural resources in the Altar Valley subarea: archaeological sites, historic resources, and traditional cultural places, each of which is defined below. This report is intended to provide baseline information needed to consider cultural resources in the Sonoran Desert Conservation Planning process.

Subarea: The Altar Valley subarea is a long, narrow trough approximately 52 miles (83 km) long and 20 miles (32 km) wide characterized by high mountains on either side and a wide valley floor through which the Altar Wash flows northward from the Mexican border. The subarea is defined by the eastern edge of the Tohono O'odham reservation along the Baboquivari and Coyote Mountains on the west. Its northern edge is marked by the Garcia Strip of the Tohono O'odham Nation and passes through a portion of the Tucson Mountains just west of the City of Tucson. On the east, the boundary follows along the tops of Black Mountain, the Sierrita Mountain chain, the Cerro Colorado Mountains and skirts the town of Arivaca to the east. The southern limit is defined by the Pima/Santa Cruz County line and the U.S. Mexican international border.

The population level in the Altar Valley Subarea for the year 2000 is estimated to be approximately 23,902. There are several principle communities in the subarea, the towns of Sasabe and Arivaca on the southern end of the planning unit and the community of Three Points (Robles Junction) at the northern end. However, significant population is concentrated in the northeast corner of the subarea in the vicinity of the Ajo Highway (State Route 86) and west of the San Xavier District of the Tohono O'odham Nation at Diamond Bell Ranch. These areas represents settlement along the rural edge of the greater Tucson Metropolitan area, which is experiencing rapid growth. Other sources of population exist in an unplatted development north and east of the Coyote Mountains and on ranches spread throughout the area on private lands in close association with state trust and federal lands open to grazing. Grazing remains a principle part of the local economy; however, approximately 6600 acres along the Altar Wash are presently under cultivation.

The Altar Valley subarea contains approximately 713, 807 acres, 320,706 (44.9.%) of which is state trust land. Private lands follow in rank with 144,230 acres (20.2%). Third, is the land in the Buenos Aires Wildlife Refuge that covers the southern third of the Alter Wash and its tributaries. This area contains 112, 345 acres (15.7 %). Indian lands, Forest Service lands, BLM lands, and non federal park lands makes up the majority of the remainder as indicated in the table on the map entitled **"Modern Communities, Transportation and Ownership."**

Cultural Resources: This section presents information and analysis of current data on archaeological sites, historic resources and traditional cultural places within the subarea.

Archaeological sites

Archaeological sites are any material remains of past human life or activities which are preserved in their original setting that are important to understanding prehistory or history. These sites or districts may include occupation sites, work areas, farming sites, burials and other funerary remains, artifacts, campsites, hearths, rock art, intaglios, trails, battle sites, religious or ceremonial sites, caves

and rock shelters, the architectural or other remains of structures of all kinds, such as pit houses, pueblo rooms, adobe or rock foundations, and other domestic features, usually dating from prehistoric or aboriginal periods, or from historic periods at least 50 years old, for which only archaeological vestiges remain.

Archaeologists learn about the past by collecting information in the field in two ways: through survey and by excavation. Survey involves inspecting the ground surface in a particular area and recording concentrations of artifacts and features (hearths, roasting pits, pit houses, etc.) as archaeological sites. A site represents the physical remains of past human behavior in a single location dating to one or more periods of use through time. Surveys are often done systematically by groups of archaeologist who sweep the land in regularly spaced lines looking for artifacts. Some surveys, however, are judgmental in that archaeologists only look where sites are expected to be found and not elsewhere. In all cases, survey offers an extensive perspective on past land use.

The second kind of information on archaeological sites is gained through excavation. This is the systematic recording, recovery, and analysis of artifacts and features from within a site's limits. Critical information is gained by understanding the spatial relationship of all artifacts and features within a three dimensional context. This enables interpretation about how the site was used, by whom, when, whether the site was used more than once and what happened after it was abandoned. Often, archaeological sites are not fully excavated but are only partially sampled. This saves what is left of the site for future investigations. Archaeological excavation provides highly detained information about the use of one limited spatial area during one or more use episodes. Archaeologist use survey information in conjunction with site excavation information to build regional time lines over broad areas such as a river valley.

Survey data: There are two kinds of systematic investigations of the ground surface called surveys that archaeologists perform: Linear and block. Linear surveys involve inspection of a right-of-way for construction of a road, sewer line, telephone cable or other linear feature. These surveys tend to be done in compliance with legal mandates requiring environmental studies during project planning. Block surveys involve the examination of properties ranging from a few acres to 1000s of acres. These are typically done either in compliance with legal mandates, or through academic or preservation related research projects. The Map entitled **"Archaeological Survey Locations"** shows the areas within the subarea that have been archaeologically surveyed. Some linear surveys are evident on the map as are the few block surveys most notably south of Tucson Mountain Park and in the Gunsight Mountain area. Overall, the map demonstrates that very little of the subarea has been surveyed. Presented below is a breakdown of survey data by acreage and survey type including the percentage of the subarea that has been investigated. Please note that the data include survey performed on the Tohono O'odham Nation, within the limits of the San Xavier District, and the Pasque Yaqui reservation, but survey locations are not plotted for Indian lands.

Table 1. Altar Valley Subarea Survey Acreage by Survey Type			
Survey	**Number**	**Acreage**	**Percent of Subarea**
Linear	43	2,294	0.3
Block	98	35,577	5.0
Total	**141**	**37,871**	**5.3**

The total acreage figures indicate that more than 94 percent of the area has not been formally investigated. This limits what can be said about cultural resources in general and archaeological sites in particular. However, the Altar Valley, particularly the northern third, has been the focus of limited research, much of it within the last ten to fifteen years.

The Altar Valley has been investigated on and off since the 1920s with individual researchers conducting informal surveys and excavations in areas of interest to them. Many of these researchers were from the Arizona State Museum or were members of the faculty at the University of Arizona in Tucson. However, systematic investigations didn't begin until the 1970s and 1980s and were conducted for both research purposes and in compliance with environmental laws. Several large scale block surveys were conducted in 1980s, the most notable of which are the Coyote Mountains Project and the Gunsight Mountain survey. The Coyote Mountains survey conducted in 1989 was a research project directed to investigating the transition between the prehistoric and historic periods in southern Arizona. The Gunsight Mountain Survey conducted a few years earlier was also research driven and sought to understand the prehistoric occupation of the northern Altar Valley in comparison to other better known locations. Both surveys identified dozens of site spanning the period from approximately B.C. 7500 to A.D. 1450. The Gunsight Mountain survey eventually resulted in a nomination to the National Register of Historic Places. In the 1990s, several smaller surveys have been conducted on the Buenos Aires National Wildlife Refuge on the southern end of the subarea, and two surveys were conducted along 45 miles of State Road 286 to the north. Beyond these few projects, very little systematic and intensive archaeological investigation has occurred in the Altar Valley subarea.

Site data: The following is a summary of archaeological data for the subarea that is presented by gross time period and site function. The data have been broken down by the number of identifiable components or occupations, not by the number of sites per se. Since a site can be occupied more than once over time, the number of components is a more accurate reading of land use. This information uses data from the Arizona State Museum, University of Arizona.

Table 2. Atlar Valley Subarea Archaeological Site Data - Time Period by Site Function					
PERIOD	**Prehistoric**	**Historic**	**Both**	**Unknown**	**Total**
FUNCTION					
Agriculture	5	1	0	0	**6**
Art	11	0	4	0	**15**
Communication	0	1	0	1	**2**
Disposal	1	1	1	0	**3**
Government	2	3	0	0	**5**
Habitation	45	5	5	1	**56**
Resource Processing	121	1	8	1	**131**
Resource Procurement	1	0	0	1	**2**
Religion	1	0	0	0	**1**
Storage	3	0	0	0	**3**
Transportation	1	2	1	0	**4**
Unknown	245	4	6	31	**286**
Total	**436**	**18**	**25**	**35**	**514**

As can be seen in Table 2, prehistoric components vastly out number the historic components and in some cases, components from both major time periods are present on the same site. In all, Resource Processing and Habitation are the most common of the identifiable functions, followed by Art (rock art) localities and Agricultural uses. The "Unknown" category consists of artifact scatters, such as pottery and stone chips, a wall feature, an ambiguous depression, and other items where function cannot be assessed. That so many components (286) have unidentifiable functions and dates (35) is to be expected because the data presented here are collected during survey where only surface characteristics of sites are recorded without the benefit of excavation.

Tables 3 and 4 tally the number of components within each of the two major time periods.

Table 3. Altar Valley Subarea Archaeological Site Data Prehistoric Components				
PaleoIndian 12,000 B.C. - 8,000 B.C.	**Archaic** 8,000 B.C.- A.D. 200	**Ceramic** A.D. 200- A.D. 1500	**Unknown Prehistoric**	**Total**
2	**12**	**95**	**327**	**436**

Two occupations from the PaleoIndian time period are known with the subarea and twelve components date to the succeeding Archaic Period. Together, these two time periods represent approximately 12,000 years or 600 human generations. These low numbers are a product of very low estimated populations levels, the low visibility of these archaeological sites, and a lack of formal investigation in the Altar Valley

The term "PaleoIndian" describes the earliest period of human occupation in the Americas. This was a time following the end of the ice age when the environment was cooler and wetter than it is today. Many species of now extinct animals including mammoth, horse, camel, bear, bison, and lions lived during this period. Numerous archaeological sites found in the west indicate that hunting these large animals was an important part of the subsistence of PaleoIndian people and as such they are commonly referred to as "big game hunters." While very little is known about these people, it is believed that they lived in small groups or bands by hunting and gathering as food became seasonably available throughout the year. Archaeological evidence suggest that they were highly mobile covering thousands of square miles in a year as they moved across the landscape. Toward the end of this period, the climate changed becoming warmer and drier, the big game animals disappeared, and new plant and animal communities emerged.

The Archaic Period represent a time span of approximately 6000 years during which human beings adjusted their way of living in response to new conditions. In order to survive, people became generalists in their subsistence practices, hunting and gathering a wide diversity of plants and animals and becoming more efficient in how they processed their food as indicated by the advent of grinding stones found on sites of this period. Again, people appeared to have lived in small groups by hunting a gathering wild plants and animals over large areas through a seasonal round. Sites from the early and middle parts of the Archaic are rare in southern Arizona suggesting low population levels in response to the unfavorable environmental conditions believed to exist at that time; however, toward the end of the period several significant changes occurred laying the foundation for subsequent cultural development. First, the environment stabilized by 4500 years ago approaching modern conditions by that time. Second, population levels appear to have increased and some evidence suggests that people roamed within more restricted territories as a result. Third, by approximately 3500 years ago, people began to experiment with growing their

own food as a supplement to their diet. This change also co-occurred with more permanent settlement along well watered reaches of the major drainages in the region.

A total of 95 components dating to the Ceramic Period in prehistory are known within the Altar Valley subarea. The Ceramic Period covers the time between the adoption of ceramic technology in the third and fourth centuries after Christ to the end of the prehistoric sequence around A.D 1540. It was during the early part of the period between approximately A.D. 200 to A.D . 700, that Archaic Period populations completed the transition from mobile hunting and gathering to settled, village based, agricultural existence in southern Arizona and elsewhere. The principal pottery bearing people in the region during prehistory were the Hohokam, who emerged as a distinct culture in the eighth century and dominated central and southern Arizona until around A.D. 1450. The Hohokam flourished along the river valleys of southern Arizona but were also well adapted to the desert lands to the west. They lived in settled, permanent villages, grew their own food using irrigation and dry farming techniques, developed a rich ceremonial life, and traded extensively with their neighbors throughout the region. A period of environmental instability during the A.D. 1300s is believed have weakened the agricultural economy to the point where the Hohokam were no longer able to produce food in sufficient quantifies and with enough consistency to support large populations and the culture collapsed after A.D 1450. Of interest to research in the Altar Valley, another culture group centered in northern Mexico co-existed and interacted with the Hohokam. The Trincheras culture refers to agriculturalists who lived between approximately A.D. 750 and A.D. 1300. Trincheras sites, typically identified by rock terraced hillsides and distinctive purple on red pottery, have been recorded in the southern reaches of the Altar Valley; however, little is known of this prehistoric culture.

Following the collapse of the Hohokam, the region is believed to have been occupied in very low numbers by an O'odham (upper Piman speaking) people whose settlement and subsistence practices reflect a return to an earlier, simpler way of living. Life continued to involve the cultivation of crops supplemented by hunting a gathering, but the level of technical sophistication and social and religious cohesion characteristic of the Hohokam is missing in these later populations. These people are believed to be the descendants of the Hohokam, but are recognized as separate culture groups. Archaeologists know very little about the period that represents the end of the Hohokam and the beginning of the Spanish Colonial presence in southern Arizona. It appears to have been a time of flux when the vacuum left by the disappearance of the Hohokam was filled by groups that the Spanish recognized as the Sobaipuri and the Tohono O'odham in the 17th and 18th centuries. No components dating to late prehistoric times are known in the Altar Valley.

Table 4. Altar Valley Subarea Archaeological Site Data Historic Components (Post A.D 1540)			
Euro-American	Native American	Unknown	Total
12	**4**	**2**	**18**

The Historic Period spans the years between A.D. 1540 and 1950. European occupation of the Altar Valley subarea dates to the early 19th century with the establishment of the Rancho del La Osa near Arivaca in 1812. By the 1860s and 1870s, large ranches were owned by Pedro Aguirre, Estaban Aros, Jesus Robles, and the Redondo family in the Avra and Altar Valleys. The Aros ranch, established in the 1880s, was situated 17 miles north of Sasabe, and the Santa Marguerita ranch , owned by the Ronstadt family, lies farther to the north. The Native American populations also lived in the subarea during this time; Arivaca is said to be the location of an 18th century O'odham village site that was abandoned after the Piman revolt of 1751. A total of 12 Historic components have been identified in the subarea, four of which are habitations, two are transportation (roads, trails, stage stops, etc.) related features and three are related to government (public buildings, park, plaza, big house, etc.). Four historic Native American occupations have also been identified, all of which are believed to be Tohono O'odham. There is also two components that could not be securely identified as to cultural affiliation. The low numbers of components dating to the historic time period is probably a reflection of research bias and not a lack of resources dating to this time period.

The Map entitled **"Archaeological Sites in the SDCP SubArea"** presents the locaiton of archaeological sites in relation to topographic relief. It is evident from this immage that clusters of archaeological sites exist, most notably in the area of Gunsight Mountain (the National Register District), on the western margin of the subarea near the Coyote Mountains, and further to the south along the base of the Baboquivari Mountains. Individual sites and site clusters have also been reported in other locations scattered throughout the subarea. Overall, the site distribution pattern suggests occupation of the ecotonal break between the upper bajada areas and the mountain pediment in association with known springs. Only a few sites are plotted along the central axis of the valley itself, but archaeological research does suggests that Hohokam village sites dating to the period from A.D. 800 - A.D. 1150 will be found close to the Altar Wash. This pattern of settlement between the valley bottom and upper bajadas is consistent with historic Winter/Summer village locations practiced by Tohono O'odham in historic times.

Historical Resources

Historical resources are sites, districts, structures, objects, or other evidences of human activities that represent facets of the history of the nation, state, or locality. Also pl aces where significant historical or unusual events occurred even though no evidence of the event remains, or places associated with persons significant in our history that have gained importance in the last 50 years.

Historical resources are largely constructed or engineered elements of the built environment

including buildings used for residential purposes such as houses but also commercial stores, industrial facilities, civic centers, and places of worship. Roads, bridges, irrigation canals, mining works, and rail road tracks are also historical resources . Information on these places is recovered through drawings and design plans, photographs, maps, surveys, and personal recollections.

The Altar Valley has a number of places of historic importance including occupied historic communities, abandoned settlements or ghost towns, and places that have been recognized for their historical value and registered on the National Register of Historic Places.

Historic communities:

- Arivaca was the site of a Tohono O'odham village site prior to the Piman Revolt of 1751 and subsequent efforts at silver mining by the Spanish. In the early 19th century, Spanish settlers attempted to ranch land in the vicinity. By mid century, silver mining in the nearby Cerro Colorado mining district influenced Euro-American settlement in the area. A post office was opened in Arivaca in 1878.

- Sasabe is also believed to have originated as the site of a village occupied by the Tohono O'odham called "Shashovuk." Various settlements named Sasabe have existed on both sides of the U. S. Mexican border and for a time the location of the mode rn town of Sasabe was called "San Fernando" until 1926 when the name was changed.

Ghost towns:

Many historic communities developed only to be abandoned. These places were typically mining towns, or in some cases, milling towns, that thrived until economic forces eliminated the driving force of their existence. Established during the later part of the last century and early 20th century, these places remain time capsules that reflects a by-gone era.

- Cerro Colorado was a mining town that grew in association with silver mining in the Cerro Colorado mining district on the eastern edge of the Altar Valley. Mining began after the Gadsden purchase in 1853 and the town site developed near the mine works. Operations continued through the Civil war until the Union Troops pulled out of the region and Apache attacks disrupted mining activities. Mining continued intermittently throughout the rest of the 19th century and the town associated with the mines was abandoned in the early 20th century. A post office was established at the settlement in 1879 (note, the Cerro Colorado ghost town is technically located in the Upper Santa Cruz subarea but historically it is linked to both Arivaca and Tubac, so it will be discussed in both subarea reports).

National Register properties:

The National Register of Historic Places were created as a part of the National Historic Preservation Act of 1966. It is the nation's premier honor roll for places deemed of national, regional, or local importance. The criteria for listing include a) association with a person who has contributed to history; b) association with an event important to history; c) associated with the work of a master artist or craftsman or typical of a style or type of workmanship; d) yielding or having the potential

to yield information important to history or prehistory. Listing in no way effects the rights of private property owners to do what they wish with their property. Federal agencies; however, are required to consider the effects of their actions on listed properties.

- Gunsight Mountain Archaeological District: The Gunsight Mountain Archaeological District was listed on the National Register of Historic Places in 1991 for its extraordinary potential to yield information about the history and prehistory of the Altar Valley. Located in the northern most peak of the Sierrita Mountains, the District encompasses some 3,334 acres of private and state trust lands containing 123 archaeological sites spanning the last 9000 years of human history.

Rural Historic Landscapes:
There may also be individual ranches or farmsteads within the subarea that qualify as having importance to the history of the settling of the Altar Valley. Some of these may be part of larger historic landscapes that are recognizable entities that have historic value. Historic Landscapes a special subcategory of historic resources. As defined by the National Park Service, a rural historic landscape is "that portion of the exterior natural environment that has been modified, influenced, or given special cultural meaning by people who shaped the landscape to serve human needs. A rural historic landscape is a geographical area that historically has been used by people or shaped or modified by human activity, occupancy, or intervention, and that possesses a significant concentration, linkage, or continuity of areas of land use, vegetation, buildings and structures, roads and waterways and natural features. Historic landscapes may reflect the beliefs, attitudes, traditions, and values of these people."

- The Buenos Ayres Ranch, founded by Pedro Aguirre in 1870, and incorporated within the Buenos Aires National Wildlife Refuge, is an example of a rural historic landscape because of its association with ranching as a historic activity that affected how the land was used and is perceived today.

<u>Traditional Cultural Places</u>
A traditional cultural place is a historic site or district that is important because of its association with cultural practices or beliefs of a living community that (a) are rooted in that community's history, and (b) are important in maintaining the continuing cultural identity of the community. The traditional cultural significance of an historic property is derived from the role the property plays in a community's historically rooted beliefs, customs, and practices.

Pima County has been occupied by indigenous peoples for thousands of years and the modern descendants of these prehistoric cultures still live in the region today. All of Pima County is claimed as ancestral lands by the Ak-Chin Indian Community, the Gila River Indian Community, and the Tohono O'odham Nation. The Tohono O' odham claim direct ancestral affiliation with the prehistoric Hohokam Indians who inhabited much of southern and central Arizona. Other Indian groups also claim ancestral ties to the Pima County area including the Zuni of central western New Mexico and the Hopi of northeastern Arizona based on both a recognition of prehistoric

archaeological sites as ancestral and based upon oral histories and myth that identify southern Arizona as a place of origin for these tribes. The Apaches also lived in the region for hundreds of years and therefore they too can claim an ancestral connection to the land and the places of traditional value to them that it may contain. Other groups with potential claims to places of traditional cultural value include the Hispanic and Anglo communities.

Places of traditional cultural value, as defined, are special to the community and must often remain secret to non-members; this is particularly true among Native Americans. These might be places where in the past natural resources were collected for ceremony or where natural features on the landscape are still recognized as having significance. One such place is known in the Altar Valley Subarea.

- Baboquivari Peak: This natural prominence is located on the western edge of the subarea in the Baboquivari Mountains. It is well known as a place with high traditional cultural value to the Tohono O'odham who believe it to be the center of their world and part of a cultural landscape that they identify as their homeland.

Other places with traditional cultural value of particular importance to Native Americans are rock art sites and all archaeological sites containing human graves. Fifteen of the components within the Subarea are identified as rock art localities, and an additional 45 were used for habitation purposes, which often contain human graves. It is reasonable to assume, that Native Americans would identify these places as having traditional cultural value.

Discussion

The next map, entitled **"Archaeological Sites and Land Ownership"** shows the distribution of sites in relation to land ownership. Note that with few exception, the bulk of the 338 reported sites in the subarea are on state and private lands. Legal protections against unauthorized disturbances are afforded archaeological sites and other cultural and historical resources on federal and state lands with varying degrees of efficacy, but only one law, the Arizona State Burial Protection Act, applies on private land. Cultural resources on county lands are also covered by legal protections defined under county law and policy. Data are presented in the table below showing site count by land status and degree of legal protection for cultural resources.

Table 5. Archaeological sites by landownership and legal protection		
Jurisdiction	**No. of Archaeological Sites**	**Protection Status/Level**
BLM	6	Protected/high
National Forest Lands	1	Protected/high
National Wildlife Refuge	14	Protected/high
State Lands	216	Protected/moderate
County owned Lands	2	Protected/moderate
Private Lands	99	Unprotected/low
Total	**338**	

Only 21 of the 338 sites have high protection status, 218 are moderately protected from public and private actions, and the remaining 99 have low protection status. Since state lands can be sold for development, and private lands are subject only to local zoning, the majority of known archaeological sites may be affected by development, should that occur within the subarea. Furthermore, since 94% of the land base in the subarea has never been archaeologically surveyed, potentially hundreds, even thousands of sites that exit but have never been recorded could be affected.

The loss of cultural and historical resources and the threat of further loss in the Altar Valley subarea can be summarized as follows.

Resource Loss:

- Relatively low levels of public and private development have occurred in the Altar Valley with the exception of residential growth at the north end of the valley, west of the Tohono O'odham San Xavier District, and north of the District in the vicinity of the Ajo Tucson Highway. Furthermore, the historic communities of Arivaca and Sasabe have not experienced rapid population growth. Because of this, cultural resources have not been affected to the same degree as elsewhere.

Resource Threat:

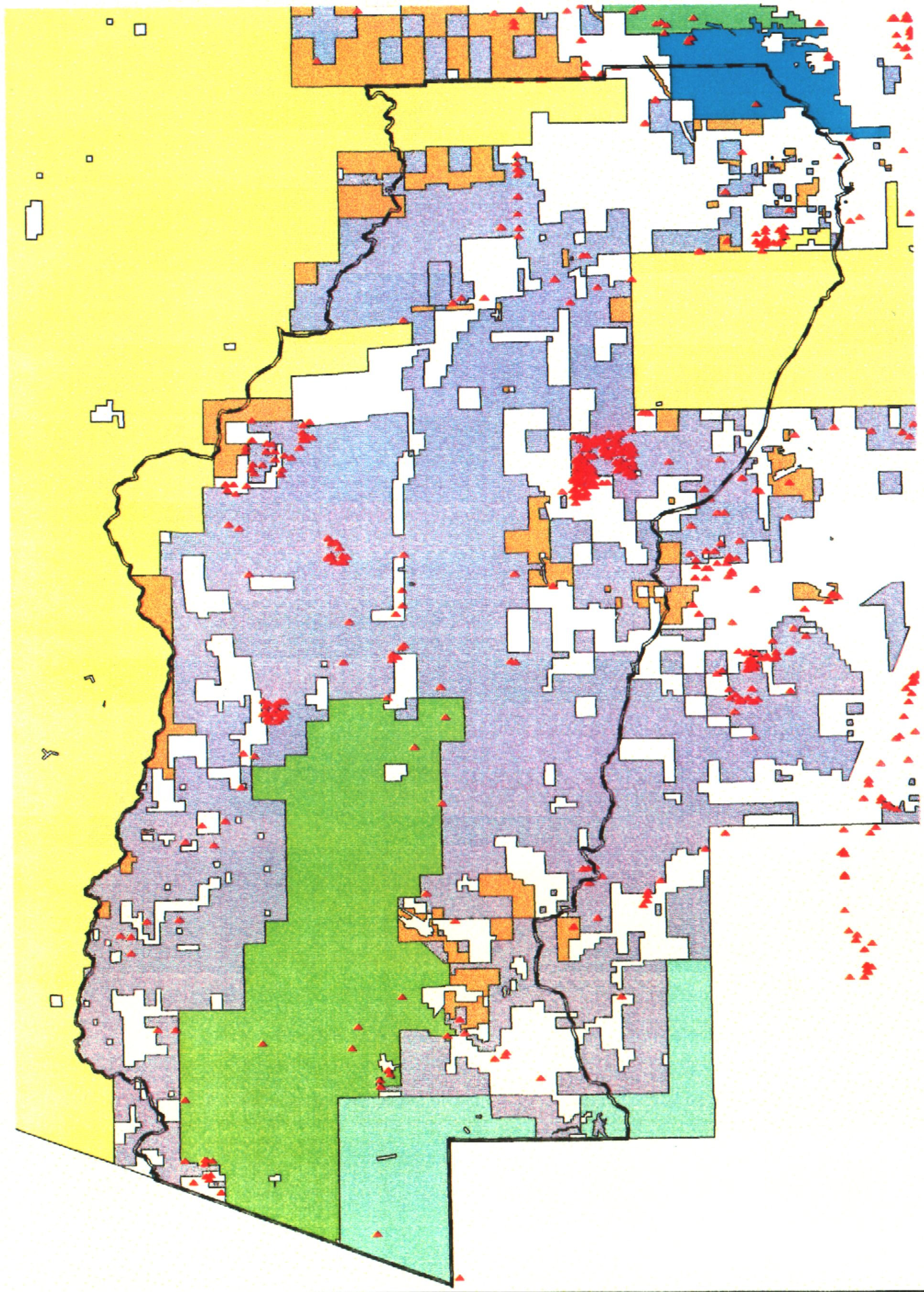
- The greatest area of threat is in the north valley where private development and the construction of public infrastructure is already occurring and will continue to occur as the Tucson Metropolitan area pushes to the south and west. The fact that private land can be subdivided and developed without platting under current state law, and that state trust land is vulnerable to sale for the "highest and best use," increases the potential for resource loss in the future. On the southern end of the Valley, development pressures are far less intense and thus less of a threat to cultural and historical resources

Because the distribution of the majority of cultural resources is unknown, assessing risk and making conservation recommendations is difficult. In effort to predict areas with high sensitivity for cultural and historical resources, proximity to water is used under the assumption that places closer to water will tend to have been used more heavily by past human populations than places more removed from water sources. The map entitled **"Cultural Resources High Sensitivity Areas"** identifies areas within the subarea that are predicted to be highly sensitive for cultural resources. These areas include springs in the subarea, almost all of which are located in the foothills of the Baboquivari, Sierrita, and San Luis Mountains. Areas around shallow ground water in the vicinity of Arivaca are predicted to be sensitive as well. There are limitations to this attempt to model sensitive areas, for instance, the map does not predict the Gunsight Mountain Archaeological District east of the Diamond Bell Ranch. More refined environmental data are needed to capture areas along secondary drainages. Nonetheless, given human needs for water and the pattern of distribution for archaeological sites in particular, the predicted high sensitivity areas should capture many cultural and historical resources within the Altar Valley subarea.

Summary

The most important observation that can be made about cultural and historic resources in the Altar Valley subarea is how little is known of the area. Only a little more than five percent of the area has been investigated meaning that the vast majority of the landscape and the cultural resources it contains is unknown. Comparison of the maps showing archaeological survey and site locations and land ownership demonstrates that where investigations have occurred in the past, archaeological sites are found, leading to a further conclusion that more inspection will result in more sites being identified. Despite the limited degree of archaeological survey coverage, what information has been collected demonstrates that over 11,000 years of human history is represented in the Alter Valley. This makes the Altar Valley one of the few basins in the region to contain a record of each period in the sequence of human development through time enhancing its potential as a place with high scientific and educational value.

Both Arivaca and Sasabe are historic communities that are products of Euro-American frontier settlement in 19th century with potential archaeological and architectural assets, as is the Cerro Colorado ghost town site. Lastly, Native American claims identify the Altar Valley as part of their traditional use areas. Baboquivari Peak, on the western edge of the subarea is a known and highly significant traditional cultural place and the possibility that other places with traditional cultural value exist in the subarea is high, especially those places associated with the archaeological record. In short, the subarea, while virtually unknown, has rich cultural and historical resources values that will only be increase as more data are collected. Since the majority of the Subarea is composed of state trust lands, and since these lands are potentially convertible into private lands for development, there is a further need to identify cultural and historical resources, evaluate their significance and where warranted, protect them for future generations.



Archaelogical Sites and Land Ownership

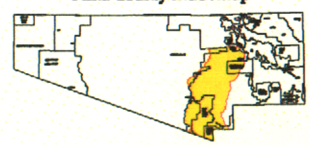
SDCP PLANNING UNIT 6a

Watershed Planning Boundary
Archaeology Sites
BLM
COUNTY PARKS
INDIAN LANDS
GOLDWATER GUNNERY RANGE
MILITARY RESERVATIONS
NATIONAL FOREST LANDS
NATIONAL PARKS AND MONUMENTS
NATIONAL WILDLIFE REFUGE
PRIVATE LANDS
STATE LANDS
STATE PARKS

STATISTICS

JURISDICTION	# OF SITES
BLM	6
COUNTY PARK	2
GOLDWATER GUNNERY RANGE	0
MILITARY RESERVATIONS	0
NATIONAL FOREST LANDS	1
NATIONAL PARKS AND MONUMENTS	0
NATIONAL WILDLIFE REFUGE	14
PRIVATE LANDS	99
STATE LANDS	216
STATE PARKS	0
COUNTY OWNED LAND	0
TOTAL	338

Pima County Index Map



Index Map Scale 1:1,500,000

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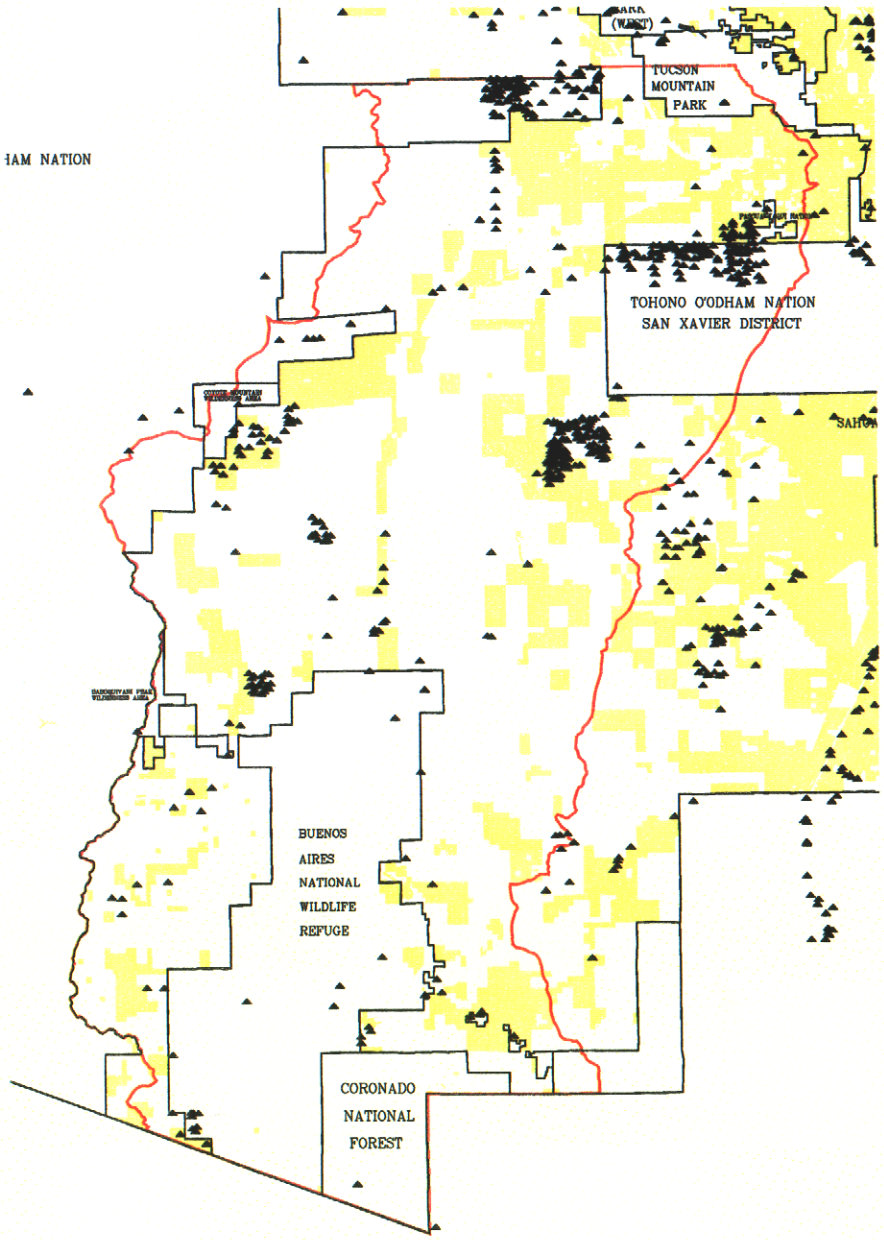
THE SEAL OF PIMA COUNTY ARIZONA

/pygmyowl2/sonora/cultural/asmjoined/plan6a/amls/park6a.aml Plotted 3/8/00

Archaeological Sites Within Private Land



SDCP PLANNING UNIT 6a

Watershed Planning Unit

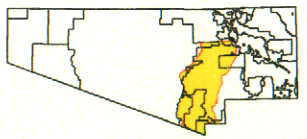
Private Land

Archaeology Sites

ARCHAEOLOGY SITES WITHIN PRIVATE LAND

TOTAL SITES: 679
SITES WITHIN PRIVATE LAND : 78
SITES OUTSIDE OF PRIVATE LAND: 601

Pima County Index Map



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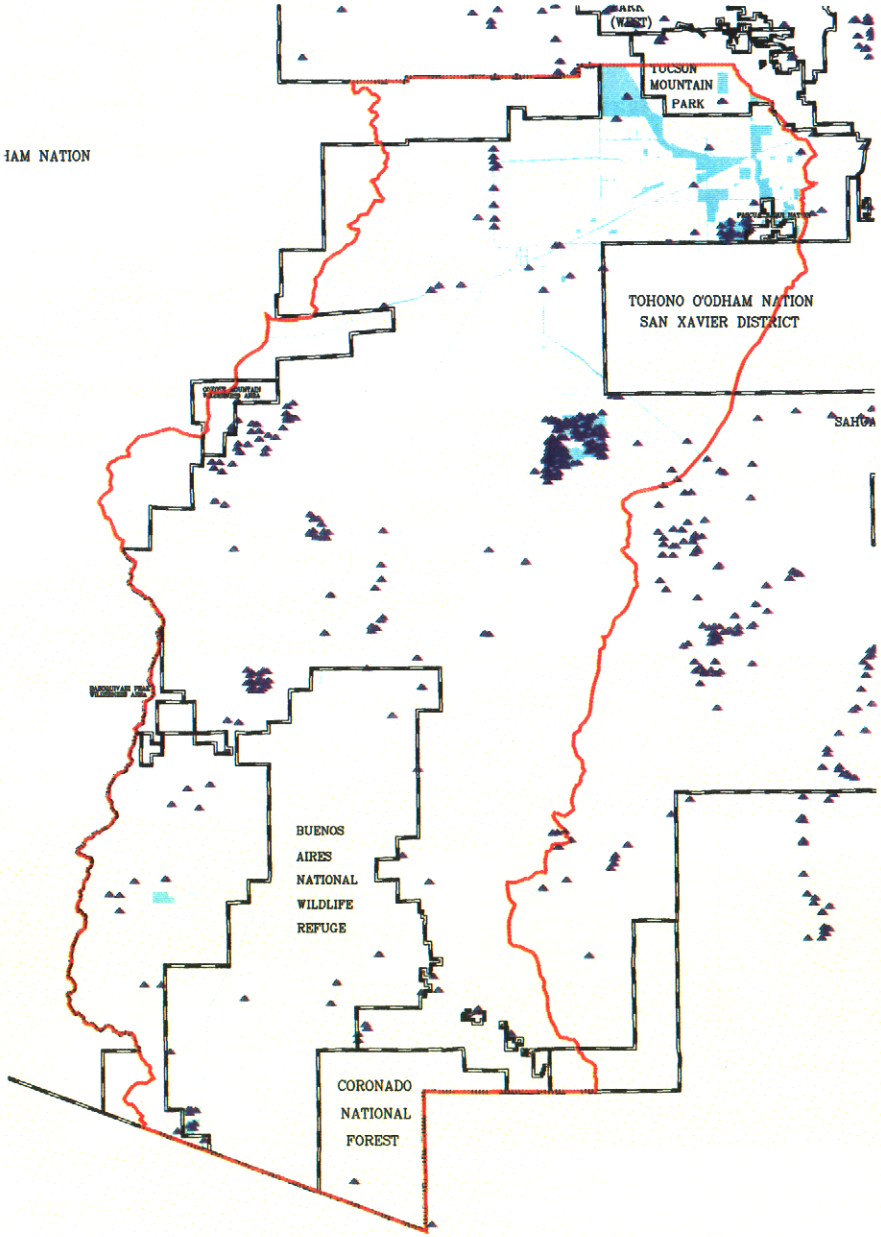
2/18/00

/pygmyowl2/sonora/cultural/asmjoined/plan6a/amls/arch_priv.aml

Archaeological Site/Survey Locations



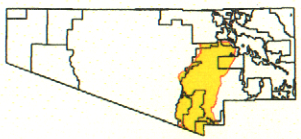
SDCP PLANNING UNIT 6a

Archaeology Surveys

Archaeology Sites

STATISTICS
****
TOTAL NUMBER OF SITES: 679
AREA FOR POLYGONAL SURVEYS: 35,577.36 AC
LENGTH FOR LINEAR SURVEYS : 639,640.09 FT
121.14 MI

Pima County Index Map



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3/7/00

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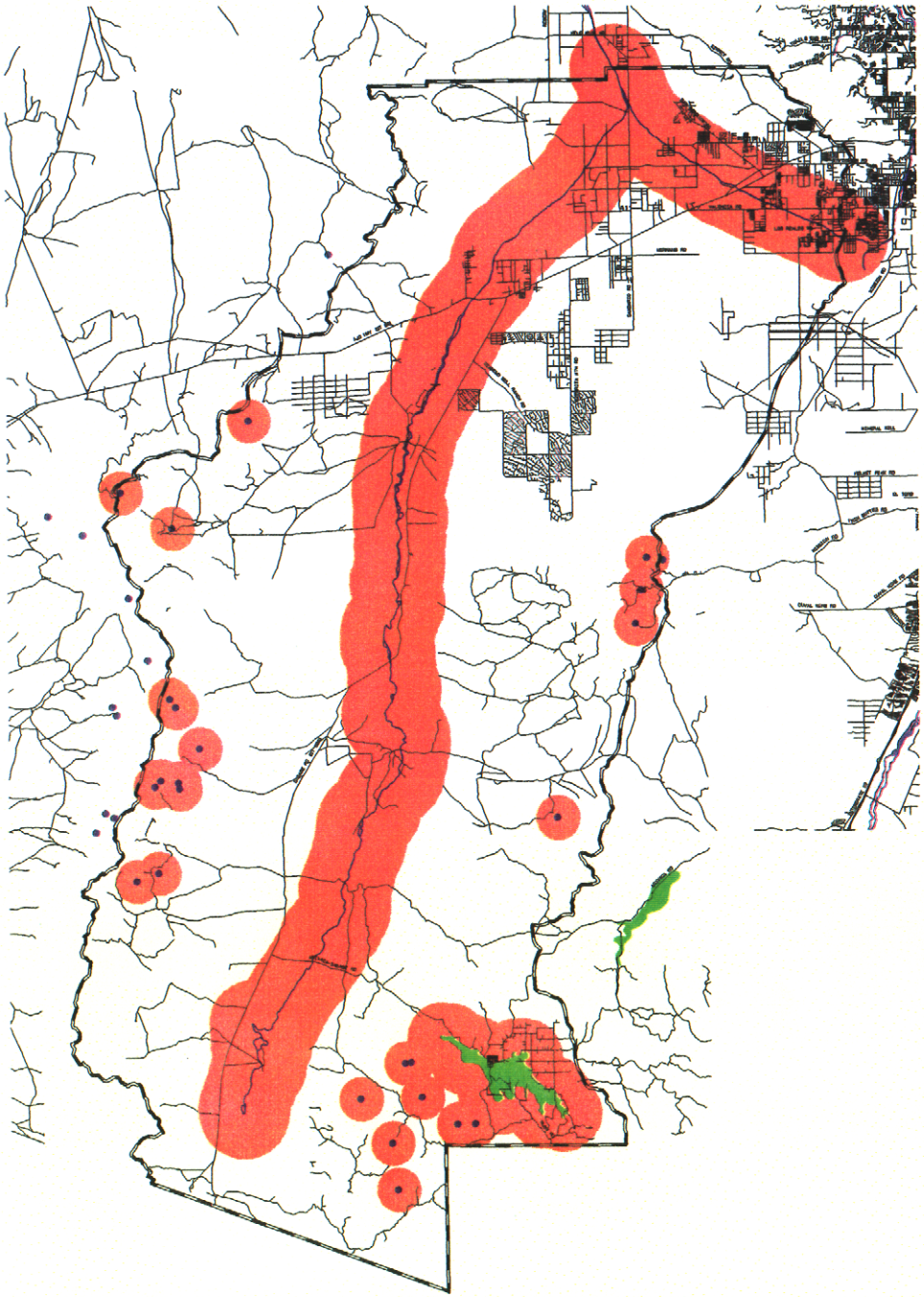


Cultural Resources
High Sensitivity Areas

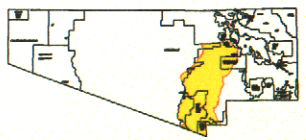
SDCP PLANNING UNIT 6A

- Shallow Ground Water
- 2 Mile Buffer - Major Washes
  1 Mile Buffer - Springs
  1 Mile Buffer - Shallow Ground Water
- Streets And Roads
- Major Washes
- Subarea Boundary
- Springs

STATISTICS FOR UNIT 6A

ACRES OF BUFFERED WASH, SPRING, AND SHALLOW FROUND WATER: 225,702 AC.

Pima County Index Map



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/pygmyowl2/sonora/cultural/ssajoined/plan6a/smls/wash6a.sml Plotted 3/8/00

Sonoran Desert Conservation Plan

Altar Valley Watershed Sub-area Report

Draft

Pima County

March 2000

TABLE OF CONTENTS

Draft

I. SUMMARY

The Altar Valley Watershed lies in the south-western part of eastern Pima County, west of I-19 and east of Tohono O'odham Nation. Land ownership is comprised primarily of State Trust Land.

The current land use for the sub-area is predominantly vacant land, mostly property that belongs to the State Land Trust. In the Altar Valley Sub-area, land development has occurred primarily on the upper third of the watershed in areas to the north, west and immediately south of the San Xavier District. The maximum density of residential uses occur in the form of medium and low intensity urban. Industrial land uses occur in the Ryan Airfield area, encompassing an area of approximately 12 square miles. Commercial land uses do not exceed one square mile in the entire watershed.

The planned land uses for the sub-area include Medium, High and Low Intensity Urban; Medium and Low Intensity Rural; Resource Productive; Resource Conservation; Resource Transition; and some Industrial and Commercial Activity Centers. Zoning, on vacant land, is predominantly RH Rural Homestead, GR-1 Rural Residential and CR-1 Single Residential.

The topography in the Altar Valley range in altitudes between 700 and 1,850 meters above MSL, with prominent mountain peaks and ridges on both the east and west sides of the valley. The Baboquivari Mountains in the west separate the watershed from the Tohono O'odham Nation. Other mountain ranges, such as the Roskruge, Coyote, Saucito and Pozo Verde lie to the west of the watershed, and the Tucson, Sierrita, Cerro Colorado, Las Guijas and San Luis lie to its east.

The perennial and intermittent streams in the sub-area are Arivaca Creek, Brown Canyon and Thomas Canyon. There are areas in the southern part of the watershed "suspected" of having shallow ground water. In the basin by Arivaca there are over 300 registered wells. The perennial flow of the Arivaca Creek shows that overdraft of the aquifer is not a major problem yet.

The Altar Valley watershed has low-densities of population and housing, due to its predominance of vacant land and natural preserves. The developed areas north and west of the San Xavier District have the primary infrastructure demands and needs. Ajo Highway, on an east-west axis off of I-19, is the most heavily traveled road in the northern part of the watershed. The central part has limited road access through Sierrita Mountain Road, off of Ajo Highway. State Highway 286 (Sasabe Road) traverses through the Buenos Aires National Wildlife Refuge. West Arivaca and South Ruby roads intersect in Arivaca, 12 miles north of the Mexican border. Other infrasturcture includes an existing wastewater treatment plant (WWTP) and several large trunk sewers. Water is provided by five different water companies. There are six school districts and three parks in the sub-area. Electricity, telephone and gas services are provided by Tucson Electric Company, US West and Southwest Gas Company, respectively. Individual propane tanks are also in use.

Currently, a total of 15 capital improvement projects are underway in the watershed. These are funded through various bonds with a total budget of over $18 Million dollars. Residential and commercial construction in the sub-area declined between 1998 and 1999, as revealed by the number of permits issued during those years.

II. SITE INVENTORY AND ANALYSIS

A. Location

The Altar Valley Watershed subarea lies in the south-western part of eastern Pima County, west of Interstate 19 and east of the Tohono O'odham Nation. It extends from the southeastern slopes of the Roskruge Mountains, south of Mile Wide road, due south to the U.S. border with Mexico. It is the largest of eight watersheds in eastern Pima County, measuring approximately 713,800 acres.[1]

B. Ownership

Land ownership is comprised primarily of State Trust Land. Others include the Tohono O'odhom Nation and part of the San Xavier district; lands of the Bureau of Land Management; Buenos Aires National Wildlife Refuge; Coronado National Forest; some small parcels of other Federal land; Tucson Mountain Park (partial); county land; and, private land.

C. Land Use and Zoning

1. Land Use

The current land use for the sub-area is predominantly vacant land, mostly property that belongs to the State Land Trust, public preserves and agricultural land. Vacant land, public preserves and agricultural land combined constitutes approximately 84 percent of the total land. Other uses include miscellaneous government, industrial, mobile home parks and subdivisions, small portions of single family residences and very little commercial (as shown in **Table 1**).

Land development in the valley has occurred primarily on the upper third of the watershed in areas to the north, west and immediately south of the San Xavier District. The maximum density of residential uses, in the form of medium and low intensity urban, occur north of Valencia Road and east of Ryan Airfield, in the Township-Range of T15S-R12E. This area has experienced a lot of wildcat lot-splitting as well. Other areas like Three Points, where land is zoned primarily GR-1, there is booming wildcat activity, barring a few exceptions of development on sub-divided land. The Diamond Bell development, located east of State Highway 286, began in the early 1970s. It offers many expensive, one-acre parcels of land zoned CR-1 that require site built homes. The few houses that have been built in this development use dirt roads for access to Diamond Bell Road.

Industrial land uses occur in the Ryan Airfield area. In 1957, a total of 12 square miles were set aside as industrial land, zoned CI-2 General Industrial, about two miles south of the Tucson Mountain Park. Ajo Highway and Valencia Road provide access to this site. Over the years, approximately 200 acres of this land zoned industrial have been converted to residential (TR Transitional) and another 75 acres to commercial. Commercial land use in the entire watershed accounts less than one square mile. These are concentrated in the Township-Range of T15S, R12E, south of the Tucson Mountain Park, with a few along Ajo Highway, west of the San Xavier District.

Table 1

EXISTING LAND USE: ALTAR VALLEY WATERSHED		
JURISDICTION	**LAND USE**	**ACRES**
PIMA COUNTY	RURAL	8,180.60
PIMA COUNTY	0.2 TO 0.4 RAC	3,489.78
PIMA COUNTY	0.4 TO 0.75 RAC	1,514.59
PIMA COUNTY	0.75 TO 1.25 RAC	2,514.66
PIMA COUNTY	1.25 TO 3.0 RAC	234.24
PIMA COUNTY	3.0 TO 6.0 RAC	337.08
PIMA COUNTY	6.0 TO 10.0 RAC	158.50
PIMA COUNTY	10.0 TO 15.0 RAC	105.34
PIMA COUNTY	15.0 TO 25.0 RAC	6.49
PIMA COUNTY	AGRICULTURAL	65,798.05
PIMA COUNTY	COMMERCIAL	737.26
PIMA COUNTY	DEDICATED OPEN SPACE	51.74
PIMA COUNTY	GOLF COURSE	49.13
PIMA COUNTY	INDUSTRIAL	261.96
PIMA COUNTY	INSTITUTIONAL	3,296.55
PIMA COUNTY	LODGING	260.76
PIMA COUNTY	MILITARY/POLICE	15.26
PIMA COUNTY	MISC GOVERNMENT	988.07
PIMA COUNTY	OFFICE	3.83
PIMA COUNTY	OTHER	179.16
PIMA COUNTY	PARK	6.56
PIMA COUNTY	PARTIAL	146.08
PIMA COUNTY	PUBLIC PRESERVE	161,811.38
PIMA COUNTY	UTIL/TELECOMM	28.65
PIMA COUNTY	VACANT	343,696.58
PIMA COUNTY	VACANT-JUR	78,793.09
PIMA COUNTY	VACANT-STATE	3,474.62
PIMA COUNTY	CHK	5,453.79
PIMA COUNTY TOTAL		**681,593.80**
PASCUA-YAQUI	TOTAL ACREAGE	1,244.28
SAN XAVIER	TOTAL ACREAGE	40,905.13
TOHONO O'ODHAM	TOTAL ACREAGE	45,460.91
GRAND TOTAL		**769,204.12**

2. Planned Land Use

The planned land uses for the sub-area include Medium/High Intensity Urban, Low Intensity Urban, Medium Intensity Rural, Low Intensity Rural, Resource Productive, Resource Conservation, Resource Transition, some amount of Industrial and Activity Centers. **Table 2** shows that Low Intensity Rural (LIR) accounts for most of the planned land.

There is ample vacant land in the watershed but the development of all the future residential, commercial, industrial and other uses will depend largely upon the availability of water, access to it and water laws.

Table 2

PLANNED LAND USE--ALTAR VALLEY WATERSHED		
JURISDICTION	**PLANNED LAND USE**	**ACRES**
PIMA COUNTY	CAC	194.67
PIMA COUNTY	I	2,150.80
PIMA COUNTY	LIR	55,352.21
PIMA COUNTY	LIU-0.3	256.22
PIMA COUNTY	LIU-0.5	119.45
PIMA COUNTY	LIU-1.2	2,166.20
PIMA COUNTY	LIU-3.0	1,142.58
PIMA COUNTY	MFC	5.03
PIMA COUNTY	MHIU	97.02
PIMA COUNTY	MIR	9,726.77
PIMA COUNTY	MIU	2,203.13
PIMA COUNTY	NAC	41.69
PIMA COUNTY	RC	25,811.11
PIMA COUNTY	REAC	83.73
PIMA COUNTY	RT	1,092.59
PIMA COUNTY	RUAC	62.67
PIMA COUNTY	RX	55.96
PIMA COUNTY	OUTSIDE PLAN AREA	313,337.40
TOTAL		**413,899.23**

3. Zoning

Zoning, on vacant land, is predominantly RH Rural Homestead, accounting for some 391,655 acres, with other large acreages including GR-1 Rural Residential, CR-1 Single Residential, CI-2 General Industrial. Other zoning districts, with smaller land areas, include SR Suburban Ranch, SP Specific Plan, CR-2 and CR-3 Single Residential, CMH-1 and CMH-2 Mobile

Home, CR-4 Mixed Dwelling Type, CR-5 Multiple Residence, TR Transitional, TH Trailer Homesite and IR Institutional Reserve (as shown in **Table 3**).

Currently, there are approximately 413,900 acres of vacant land which have zoning designations. Of this, 391,656 acres (93 percent) are zoned RH Rural Homestead i.e. land earmarked for low-density residential. Less than 230 acres (0.05 percent) are zoned commercial and 3,725 acres (0.9 percent) are zoned industrial. The remaining vacant land includes single family residential, mobile homes, multifamily and other zone districts. Combined, these remaining uses comprise of approximately five percent of the total land.

Table 3

ZONING ON VACANT LAND--ALTAR VALLEY WATERSHED		
JURISDICTION	**ZONING DISTRICT**	**ACRES**
PIMA COUNTY	CB-1	184.56
PIMA COUNTY	CB-2	42.87
PIMA COUNTY	CI-2	3,724.46
PIMA COUNTY	CMH-1	390.41
PIMA COUNTY	CMH-2	35.88
PIMA COUNTY	CR-1	5,715.05
PIMA COUNTY	CR-2	31.67
PIMA COUNTY	CR-3	338.37
PIMA COUNTY	CR-4	256.15
PIMA COUNTY	CR-4(G)	197.25
PIMA COUNTY	CR-5	66.36
PIMA COUNTY	GC	2.48
PIMA COUNTY	GR-1	7,179.68
PIMA COUNTY	IR	177.24
PIMA COUNTY	RH	391,655.78
PIMA COUNTY	SH	720.57
PIMA COUNTY	SP	1,430.87
PIMA COUNTY	SR	1,418.47
PIMA COUNTY	SR-2	4.97
PIMA COUNTY	TH	42.40
PIMA COUNTY	TR	283.74
TOTAL		**413,899.23**

There are several rezoning cases that are either being reviewed currently or have been left open from as far back as the early 1960s. Some of these have conditional zoning while others do not. **Table 4** lists the cases related to residential rezonings, showing that a total of 7,697 lots are proposed - subject to zoning changes - accounting for a total of 2,285 acres.

Table 4

CASE	CURRENT ZONE	TO	FROM	ACRES	PROPOSED # OF LOTS	CONDITIONAL	T-R-S	BASEMAP #
Co9-62-084	SR	SH	SR	349	422	NO	16-11-08	196
Co9-62-084	GR	SH	GR	426	515	NO	16-11-08	196
Co9-62-084	RH	SH	RH	4.66	5	YES	16-11-08	196
Co9-62-084	RH	SH	RH	4.77	5	YES	16-11-08	196
Co9-62-084	RH	SH	RH	2.02	2	YES	16-11-08	196
Co9-63-089	SR	CR-3	SR	40	217	NO	14-13-31	17
Co9-67-044	SR	CR-1	SR	5	6	NO	14-12-35	38
Co9-68-056	SR	CR-1	SR	10	12	NO	14-12-27	38
Co9-70-032	GR-1	CR-2	GR-1	35	95	NO	15-12-11	37
Co9-70-081	GR-1	TH	GR-1	177	428	NO	15-12-12	36,63
Co9-70-084	GR-1	TH	GR-1	40	96	NO	15-11-28	37, 64, 65, 66
Co9-71-023	GR	CMH-1	GR	300	1633	NO	15-12-09	38
Co9-71-078	SR	SH	SR	5	6	NO	14-12-34	38
Co9-81-152	RH	CR-5	RH	60	435	YES	15-12-16	64,65
Co9-81-152	RH	CR-4	RH	160	995	YES	15-12-16	64,65
Co9-81-152	RH	TR	RH	10	43	YES	15-12-16	64,65
Co9-81-152	RH	CB-1	RH	10	43	YES	15-12-16	64,65
Co9-82-098	TH	TH	GR-1	26.26	63	YES	14-12-30	67
Co9-87-041	CMH-2	CMH-2	GR-1	98.28	1223	YES	14-12-36	17,38
Co9-92-008	CR-1	CR-1	SR	4.09	5	YES	15-12-02	37
Co9-93-004	SH	SH	SR	5.28	6	YES	14-12-34	38
Co9-94-066	CMH-1	CMH-1	GR-1	4.15	22	YES	15-12-10	37
Co9-95-001	SR-2	SR-2	SR	5	3	YES	14-12-35	38
Co9-95-041	CMH-1	CMH-1	SR	129.09	702	YES	15-12-03	37
Co9-96-012	SH	SH	SR	4.53	5	YES	14-12-34	37,38
Co9-97-020	CR-1	CR-1	SR	22.9	27	YES	14-12-25	17,18,38,39
Co9-97-020	CR-4	CR-4	SR	108.90	677	YES	14-12-25	17,18,38,39
Co9-97-020	CR-4	CR-4 (GC)	SR	213.88	0	YES	14-12-25	17,18,38,39
Co9-97-020	TR	TR (GC)	SR	15.21	0	YES	15-12-01	17,18,38,39
Co9-97-026	CR-1	CR-1	SR	3.3	4	YES	15-12-12	36
Co9-97-044	SH	SH	GR-1	.91	1	YES	15-12-02	63
Co9-99-005	CR-1	SR	SR	4.77	1	NO		37
TOTAL				**2,285**	**7,697**			

4. Housing

Development has occurred in the northern third of the watershed. Residential development is comprised primarily of mobile homes and site built single family residences (**Table 5**). Mobile homes account for almost twice as many of the site built homes. Multifamily housing, townhouses and condominiums account for a very small 0.18 percent of the total housing.

Residential development in the area is mostly wild cat lot-splitting with mobile homes as well as site built homes. Wild cat developments are located south of Ajo Highway and the San Xavier District.

Table 5

NO.	EXISTING LAND USE (HOUSING)	ACREAGE
1.	Single Family	6,087.86
2.	Multifamily	25.27
3.	Mobile homes	11,474.69
4.	Townhouses and Condominiums	6.11
	Total	**17,593.93**

D. Topography

Altar Valley is the largest undeveloped area in eastern Pima County, and is comprised of the entire watershed in which it lies. The watershed sub-area topography has two distinct features - the valley and the mountain ranges that lie to its east and west. Public preserves within the watershed, such as Buenos Aires National Wildlife Refuge and parts of the Coronado National Forest, account for over 160,000 acres (approximately 23.5 percent) of the total land.

The valley varies in altitude ranging between 700 and 1,100 meters above the mean sea level (MSL). The mountain ranges with their distinct peaks and ridges, that are spread along the eastern and western edges of the valley, vary in altitude ranging from 1,300 to 1,880 meters above MSL.

The Altar Valley originates in the southeastern slopes of the Roskruge Mountains, in the general area where Ajo Highway is located. It stretches all the way south to the U.S. border with Mexico. A sizable portion of the valley lies within the Buenos Aires National Wildlife Refuge.

The mountain ranges of the Roskruge, Coyote, Saucito, Baboquivari and the Pozo Verde lie to the west of the valley; and, the ranges of the Tucson, Sierrita, Cerro Colorado, Las Guijas and San Luis lie to its east. **Table 6**, lists some of the prominent peaks of these mountain ranges that lie within the Altar Valley watershed.

There are several canyons and passes that act as a link between the various mountain ranges and the valley. Almost all the washes connect directly with the Altar Wash. There are others that connect

with the Arivaca, Puertocito and San Luis washes at the southern part of the valley. Altar Wash dissects the valley into two parts, along a north-south axis. The Arivaca, Puertocito and the San Luis washes connect with the Altar Wash, sloping north.

Table 6

MOUNTAINS	PEAKS	ALTITUDE (METERS)*	LOCATION
SIERRITA	Gunsight	1,427	T16S, R11E
	Keystone	1,880	T18S, R11E
	Placer	1,786	T18S, R11E
	Red Boy	1,840	T18S, R11E
	Samaniego	1,829	T17S, R11E
	Soto	1,376	T17S, R11E
	Stevens	1,342	T18S, R10E
CERRO COLORADO		1,621	T19-20S, R10-11E
LAS GUIJAS		1,400	T20-21S, R9-10E
SAN LUIS		1,460	T21-22S, R9E
JALISCO		1,320	T21-22S, R11E
COYOTE		1,760	T16S, R8E
SAUCITO		1,520	T17S, R8E
BABO-	Baboquivari	2,357	T19S, R7E
QUIVARI	Mildred	1,697	T20S, R7E
	Osobavi	1,680	T20S, R7E
	Three Peaks	1,440	T20S, R7E
	Aguirre	1,550	T21S, R7E
	Caponero	1,489	T22S, R7E
	Presumido	1,400	T22S, R7E
POZO VERDE		1,433	T22S, R7E

Source: USGS 30 x 60 minute quadrangle (1:100,000 - metric scale), 1994.
* Highest point of any given peak (within watershed)

Table 7, lists the canyons and passes which connect the peaks and ridges of the mountain ranges to the valley. On an average, these canyons and passes range in altitude between 1,000 and 1,500 meters. Aguirre Pass, south of the Roskruge Mountains, at an altitude of about 800 meters is the exception.

Table 7

CANYON	AVG. ALTITUDE	LOCATION	PROXIMITY
Tascuela	1,100 - 1,500	T18S, R10-11E	NE of Black Hills
Wilbur	1,100 - 1,300	T21S, R9E	N of San Luis Mountains
Aguirre Pass	800	T15S, R9-10E	S of Pescadero Mountain
Mendoza	1,000 - 1,500	T16S, R8E	Coyote Mountains
Sabino	1,100 - 1,400	T18S, R8E	N of Baboquivari Peak
Brown	1,100 - 1,400	T19S, R8E	E of Baboquivari Peak
Thomas	1,200 - 1,500	T19S, R7-8E	SE of Baboquivari Peak
Jupiter	1,300	T19S, R7E	NE of Osobavi Peak
Chutum Vaya Pass	1,300 - 1,400	T20S, R7E	S of Osobavi Peak
Dead Man Pass	1,300	T20S, R7E	N of Aguirre Peak
Coyote	1,000 - 1,300	T21S, R7E	S of Aguirre Peak
Coyote Pass	1,300	T21S, R7E	S of Aguirre Peak
Presumido Pass	1,200	T21S, R7E	E of Presumido Peak
Presumido	1,000 - 1,300	T21S, R7E	W of Pozo Verde Mntns.

E. Hydrology

In Pima County, the water problems evident today stem from historic issues of: serious overdraft of an aquifer due to continued groundwater mining; the failure to understand the interconnection between surface and ground water; and "the continued strategies within the community to defer reconciliation of water use with water availability."[2] These in turn have given rise to "the loss of 85 to 95% of quality riparian habitat during the last century,..."[3] It is evident that "the jurisdictions throughout the region face the realistic prospect that a level of restoration will be a condition of the Section 10 permit issued under the Endangered Species Act."[4]

The perennial and intermittent streams in the Altar Valley watershed are Arivaca Creek, Brown Canyon and Thomas Canyon.[5]

There are areas in the southern part of the watershed "suspected" of having shallow ground water. These are close to the intersection of Arivaca Lake Road and Ruby Road, north of the Coronado National Forest and east of the Buenos Aires National Wildlife Refuge. There are about six sites with "possible" shallow groundwater tables within this geographic area.[6]

The watershed has several wells with depth to water measuring less than 50 feet (ADWR Well 55-Registry and GWSI databases, as mentioned in the above-referenced report).[7] In the basin by Arivaca, "there are over 300 registered wells....."[8] The perennial flow of the Arivaca Creek shows that overdraft of the aquifer is not a major problem yet. Based on information gathered in 1995, the depth to water in the watershed ranges from 200' to 700'.[9]

Over 90 percent of the land is either vacant or falls within public preserves. The low levels of development, in the lower two-thirds of the watershed, have made minimum demands on water.

F. Soils

On the northern fringe of the watershed, the decline of Brawley Wash - as recorded in an undated soil survey - states that there was "an area of 3,000 acres of upland soils on the Garcia Strip which were buried by recent deposits of silt one to two and half feet thick." For more information, please contact Department of Environmental Quality (DEQ)

G. Environmental Characteristics

1. Vegetation

At the end of the nineteenth century, the broad floodplain of the Brawley Wash had good vegetation cover of Johnson grass. Cottonwood and mesquite have been identified along the Arivaca Creek, and sycamore and mesquite along the Brown Canyon Creek.[10]

Table 8

	VEGETATION	BABOQUIVARI	BUENOS AIRES	COYOTE	CORONADO
1.	Madrean (Encinal)	270	343	1,312	Insufficient Data
2.	Madrean (Oak-Pine)	1,050	96	569	
3.	Mogollon (Manzanita)			38	
4.	Mogollon (Sclerophyll)		20		
5.	Scrub Grassland (Mixed)	759	111,929	888	
6.	Sonoran Decid. Swamp		6,681		
7.	Sonoran Desertscrub (Creosote)			2,120	
8.	Sonoran Desertscrub (Paloverde)			178	
9.	Sonoran Interior Marshland		156		
10.	Sonoran Rip. (Cottonwood-		28		
11.	Unclassified		136		
12.	Water		114		

The watershed is documented to have the following flora based on the Gap Analysis Program (GAP). The Gap Analysis Program is "a national endeavor to catalog the range of vertebrates or their habitat (based on vegetation) in every state and compare them to land ownership."[11] The vegetation types include Chihuahuan Desertscrub (Creosotebush - Tarbush), Chihuahuan Desertscrub (Mixed Scrub), Sonoran Desert Scrub (Paloverde - Mixed Cacti), Sonoran Desert Scrub (Creosotebush - Bursage), Sonoran Deciduous Swamp and Riparian Scrub (Mixed Scrub), Sonoran Interior Marshland (Cattail), Sonoran Riparian and Oasis Forest (Cottonwood - Willow), Madrean Evergreen Forest (Encinal), Madrean Evergreen Forest (Oak - Pine), Mogollon Chaparral Scrubland (Mixed Evergreen Sclerophyll) and Mogollon Chaparral Scrubland (Manzanita).[12] Some vegetation types are unclassified in the GAP/EROS maps. **Table 8** reflects GAP data.[13]

2. Wildlife

Please refer to the report on Biological Resource Base and *Water Resources and the Sonoran Desert Conservation Plan*, July 1999.

H. Viewsheds

The Altar Valley, with its natural preserves, ranches and vast expanses of land in its pristine state, allows for spectacular views all around. The Baboquivari Mountains to the west, the Rincon Mountains to the east, the Tucson and Catalina Mountains to the north, and several other mountains and hills in the area continuously shifts one's focus across a panoramic canvas.

Plate I (above): Altar Valley - Las Guijas and Cerro Colorado Mountains (looking east from the intersection of Highway 286 and Arivaca Road)

Plate II (above): Altar Valley - Sierrita Mountains (looking northeast from the intersection of Highway 286 and Arivaca Road)

Draft

Plate III (below): Baboquivari Peak (looking northwest from four miles northwest of downtown Arivaca)

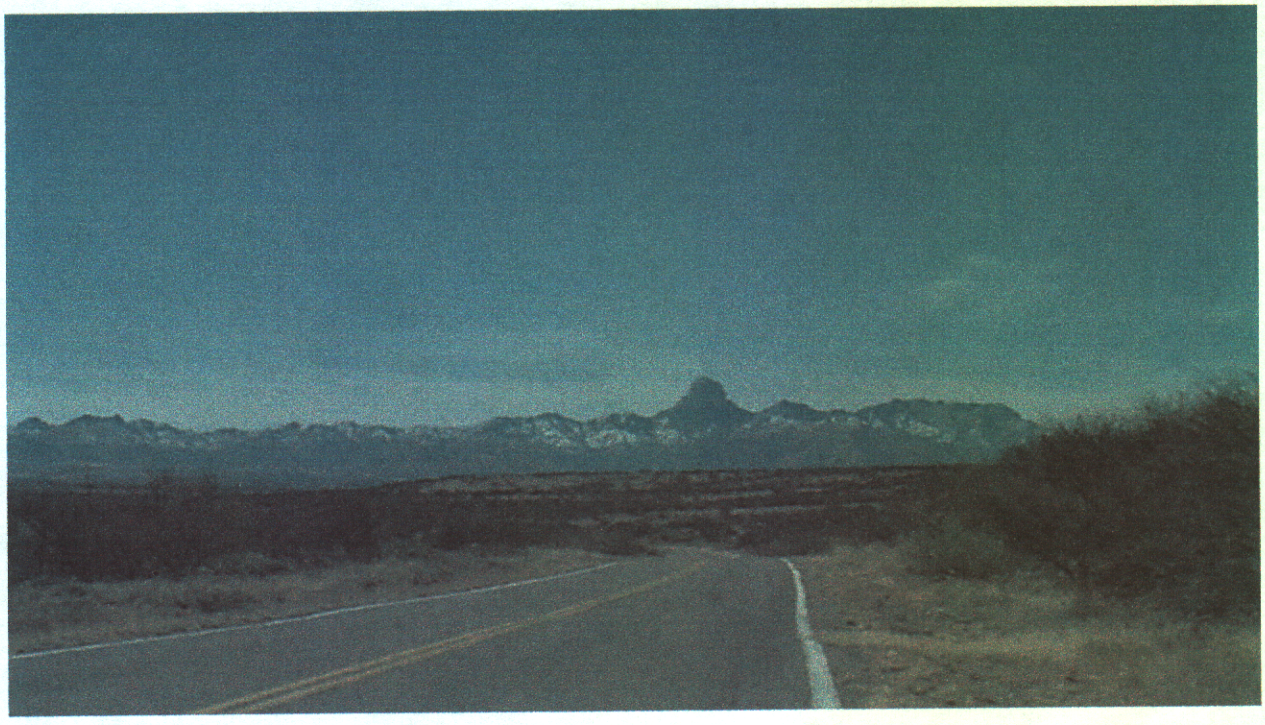

Plate IV (above): Looking northeast at Sierrita Mountains and Buenos Aires National Wildlife Refuge (from ten miles north of the intersection of Highway 286 and Arivaca Road)

Plate V (below): Altar Valley and Avra Valley beyond (looking northeast from 15 miles north of the intersection of Highway 286 and Arivaca Road)

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Plate VI (above): Cerro Colorado Mountains (looking north from Arivaca Road, 15 miles west of I-19)

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Plate VII (below): San Luis Mountains and beyond (looking southwest from Arivaca Road, four miles north of downtown Arivaca)

Plate VIII (above): Cerro Colorado Mountains (looking north from Arivaca Road, four miles north of downtown Arivaca)

Plate IX (below): Las Guijas Mountains and Baboquivari Mountains beyond (looking northwest from Arivaca Road, four miles north of downtown Arivaca)

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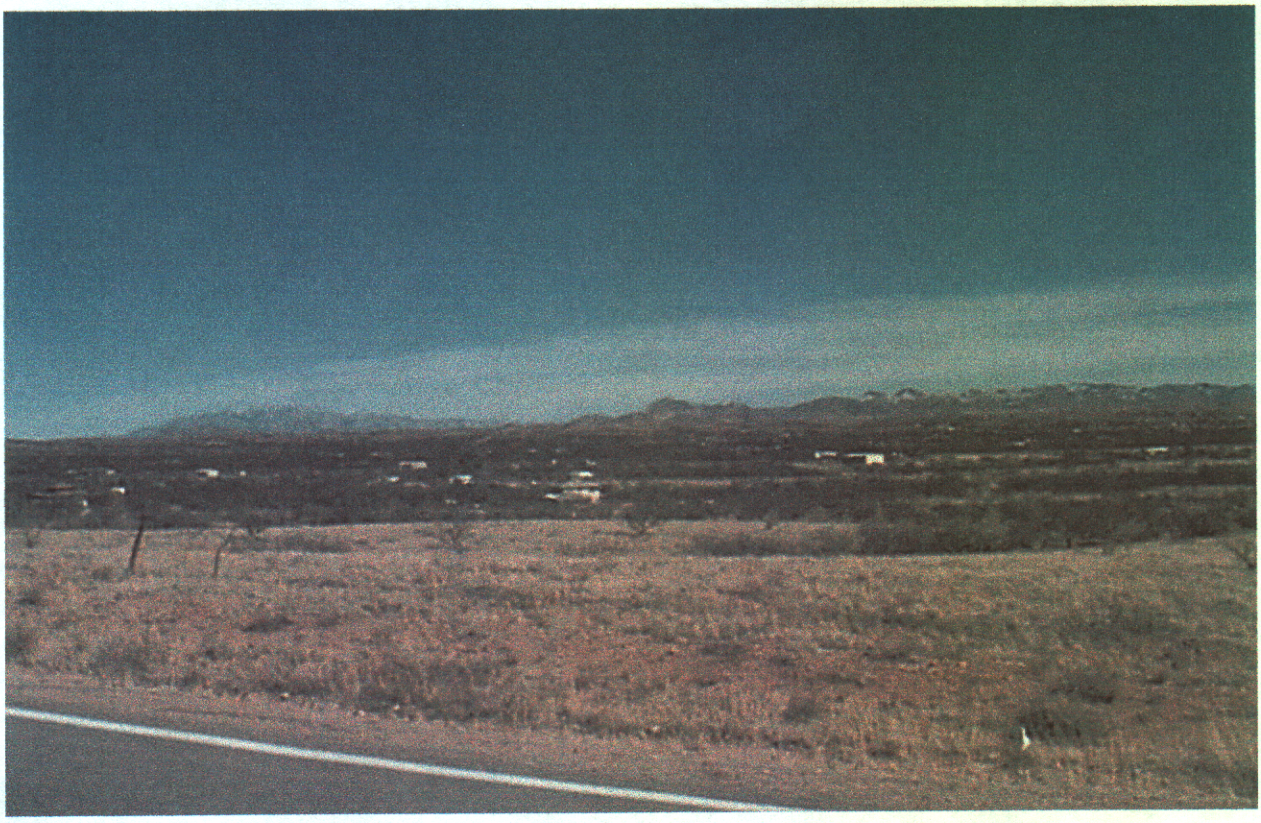

Plate X (above): Arivaca (looking from Arivaca Road, two miles north of downtown Arivaca)

Plate XI (below): Residential development (six miles south of the intersection of Highways 86 and 286)

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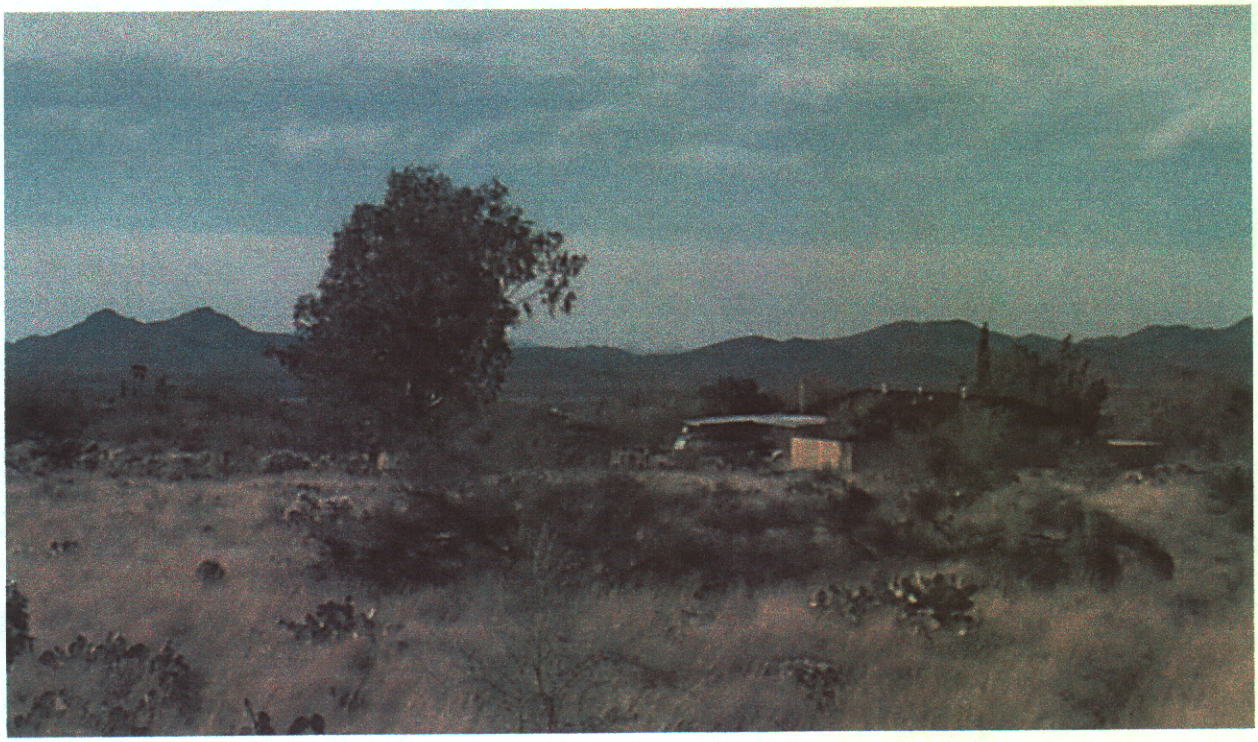

Plate XII (above): Residential development (three miles southeast of intersection of Highways 86 and 286)

Plave XIII (below): Residential development off of Ajo Highway (86), looking southeast

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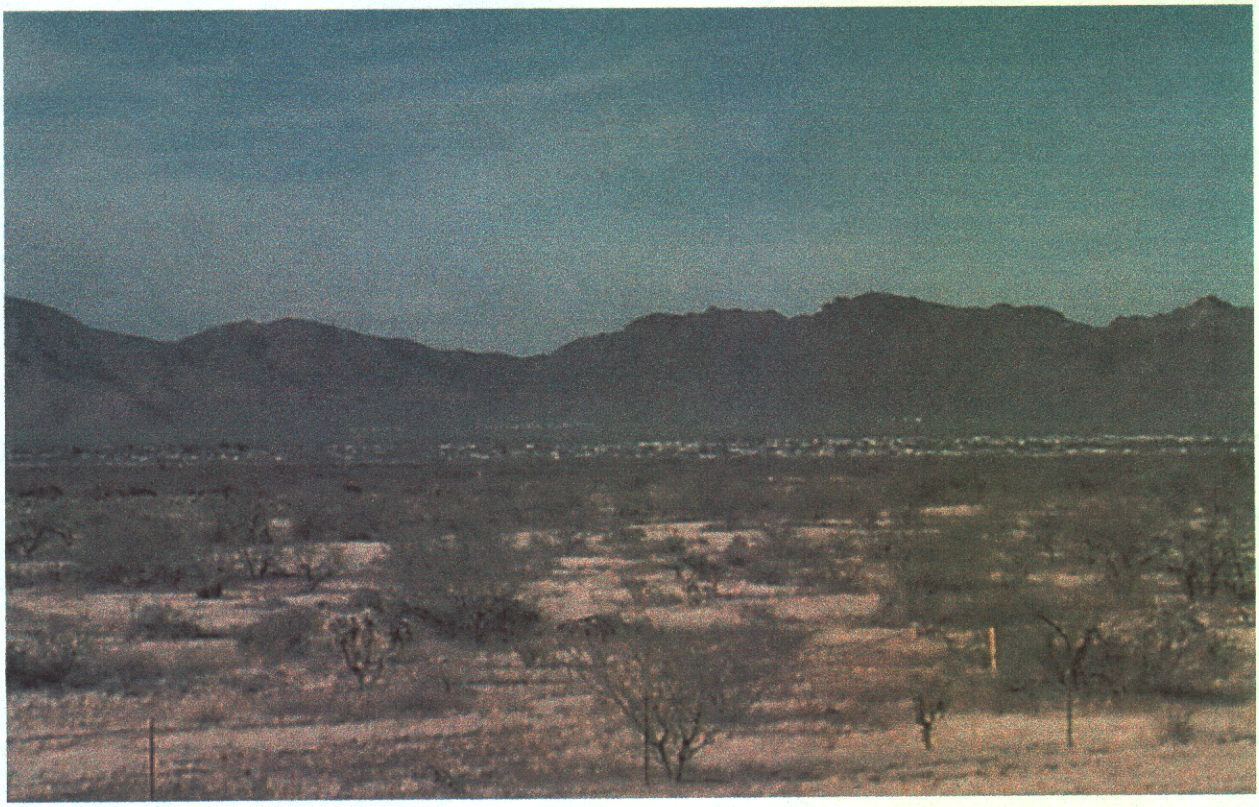

Plate XIV (above): Residential development, southwest of Tucson Mountains

Plate XV (below): Residential and commercial development south of Golden Gate Mountain (Tucson Mountains)

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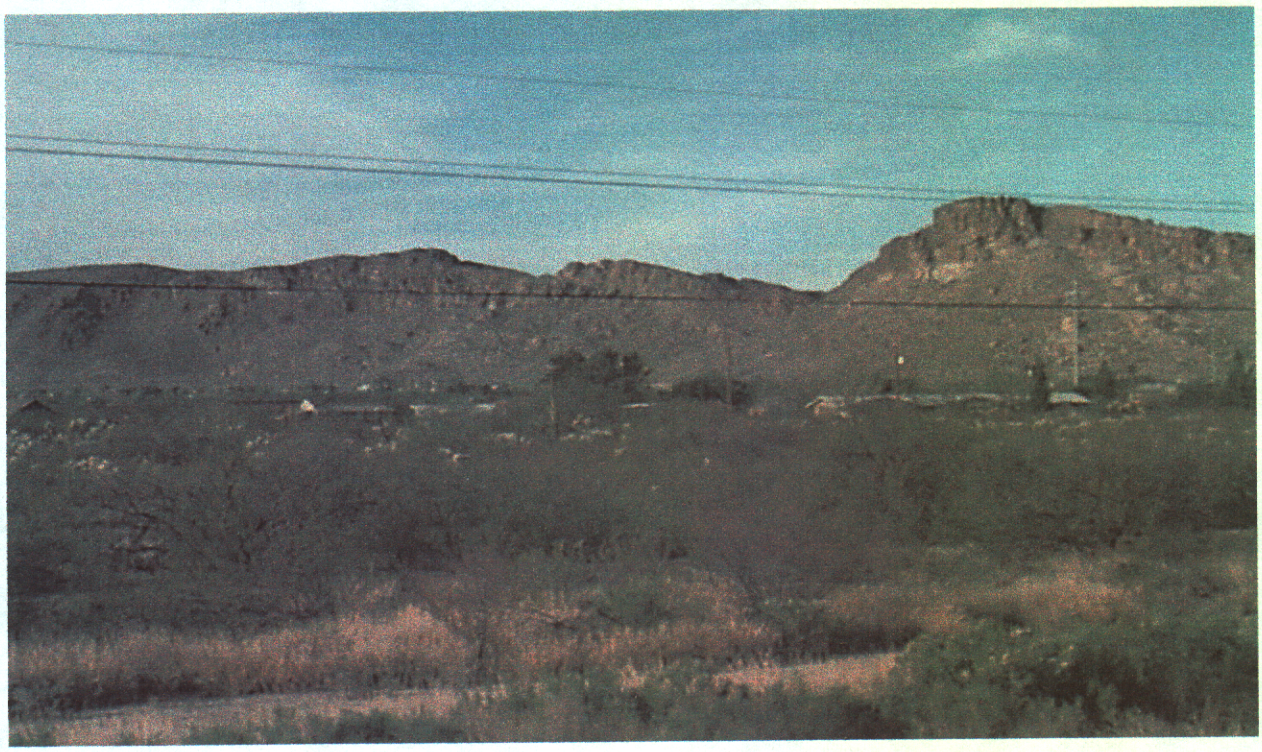

I. Infrastructure

The Altar Valley watershed has low-densities of population and housing, due to its predominance of vacant land and natural preserves. The developed areas north and west of the San Xavier District and, to some extent, Arivaca to the south, all have some levels of infrastructure demands and needs.

1. Roads and Access

Ajo Highway (State Hwy 86), on an east-west axis off of Interstate 19, is the most heavily traveled road in the northern part of the watershed. As with all state highways, including the Sasabe Hwy, Ajo Hwy is a designated "major street" and "scenic route" according to the Pima County Major Streets and Scenic Routes Plan - meaning that there are special zoning regulations for abutting properties. Irvington, Drexel, Valencia, and Los Reales Roads, north of San Xavier District all feed into Mission Road and Interstate 19, due east. Other major roads, designated "major streets" and "scenic routes" in this area, are San Joaquin, Kinney and Sandario Roads; and, portions of San Joaquin, Irvington, and Valencia Roads.

The central part of the watershed, west of Green Valley, is sparsely populated and has limited road access. Sierrita Mountain Road, off of Ajo Highway and Mission Road, west of Interstate 19 provide most of the access along the eastern part of the watershed. It is a designated "major street" and has a proposed right-of-way of 150 feet.

State Highway 286 (Sasabe Road) off of Ajo Highway is on the western part of the watershed. Highway 286 traverses through the Buenos Aires National Wildlife Refuge due south to the Mexican border. West Arivaca and South Ruby roads intersect in an area called Arivaca, approximately two miles east of the Buenos Aires National Wildlife Refuge and two miles north of the Coronado National Forest.

2. Water

Most of the watershed is within the Arizona State Department of Water Resources' Tucson Active Management Area. The area is served by private wells and several water companies. The water companies and their general service areas are:

Diablo Water Co. - vicinity of Vahalla Road and Valencia Road
Mirabella Water Company - T16S, R10E, Section 24
Thim Water Co. - Three Points area
Tucson Water Co. - extending southwest from metro Tucson to the general areas of Bopp Road and Jerome Avenue and to Camino Verde and Valencia Road
Worden Water Company - T15S R10E Section 29

3. Sanitary sewer

The public sanitary sewerage conveyance and treatment facilities in Pima County are owned and operated by the Wastewater Management Department (WWM). WWM is an enterprise fund and is not supported by the tax base.

Some developments have the need for sewers. The developer bears all responsibility to build such sewers to serve a development, and pays for the construction of all sewers, whether they are public or private, on-site or off-site. If the sewers are public, the developer builds and transfers ownership to WWM, subject to acceptance by WWM.

The cost to WWM for the operation, maintenance and replacement of conveyance lines is paid for by the monthly User Fees. These fees also pay for the treatment costs. The cost to WWM for treatment facility expansion and large line (trunk or interceptor) construction or augmentation are paid for by the one-time Sewer Connection Fees.

The Altar Valley watershed sub-area includes an existing wastewater treatment plant (WWTP) and several large trunk sewers, as well as a number of existing developments. The wastewater treatment plant is located in Section 36, T14S, R11E. There is no sewer service west of the existing WWTP.

At the present time there are no plans to extend service to the west of the wastewater treatment plant is located in Section 36, T14S, R11E. There are also no plans for any proposed new large trunk extensions in the sub-area. There have been some submittals and pre-submittals for potential development. Some of these developments are:

Star Valley Village area (T15S, R12E, Section 16+)
University of Arizona property (T14S, R12E, Section 26+)
Camino Verde Estates (T15S, R12E, Section 3)
Tucson Mountain Ranch (T15S, R12E, Section 9)

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4. Natural Gas

The area is served by Southwest Gas Company and individual propane tanks.

5. Telephone and Electricity

U.S. West provides telephone services for the area and Tucson Electric Power provides electrical service. Tucson Electric Power's service area extends southwest along the Ajo Highway to T15S R11E.

6. Schools

The school districts within this watershed include the following:

Indian Oasis Baboquivari School District covers the San Xavier District of Tohono O'Odham Nation except for the area covered by the Sunnyside School District. The school district has a primary, middle, and high school in Sells, an intermediate school in Topawa, and a pre-school handicapped Head Start in Sells.

Altar Valley School District covers most of the rural southwestern portion of the watershed and has a middle and elementary schools in Three Points.

San Fernando Elementary School District covers the area near the Buenos Aires National Wildlife Refuge and has an elementary school in Sasabe; otherwise, students use the Altar Valley School District and other districts.

A portion of the Sahuarita Unified School District serves the area of Mission Road within the watershed and has two elementary schools, a high school, and a middle school in Sahuarita.

A portion of the Sunnyside School District covers the northern boundary of the San Xavier District, and has several elementary and middle schools, and a high school.

A portion of the Tucson Unified School District also overlaps this watershed and has several elementary and middle schools located within the watershed boundaries.

Additionally, according to the Arizona Department of Education, there is a charter school near the Pascua Yaqui community.

7. Parks

The Pima County parks in this watershed are Vesey Park near Irvington Road and Butts Road, Lawrence Park near Valencia Road and Mark Road, Three Points Veterans Memorial Park off of Sasabe Road, and a portion of the Tucson Mountain Park. There is also a park within the Pascua Yaqui Pueblo managed by the community.

J. Open Space

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The primary open spaces in the watershed are the reserves. Studies were done where "reserve boundaries were verified by land managers, ..."[14] The reserves identified within the watershed are, Buenos Aires National Wildlife Refuge, Coronado National Forest, Baboquivari Wilderness Area (Tohono O'odham Nation) and Coyote Mountain Wilderness Area (Tohono O'odham Nation).[15]

Table 9

NO	RESERVE	ACRES (APPROX).	LOCATION
1.	Buenos Aires National Wildlife Refuge	121,300	T19-22S, R8-9E
2.	Coronado National Forest	42,300	T-21-22S, R9-11E
3.	Baboquivari Wilderness Area	2,080	T19S, R8E
4.	Coyote Mountain Wilderness Area	5,100	T16S, R8E
5.	Tucson Mountain Park (partial)	7,000	T14S, R12E
	Total	177,780	

The combined total of these reserves account for approximately 25 percent of the total land area in the watershed sub-area, which are protected at Status 1a of the Gap Analysis Program."[16]

K. Archaeological and Cultural Resources

Please refer to *Pima County's Cultural and Historic Resources* Report.

L. Real Estate Market Conditions

It is noted that "the Pima County property tax base has declined substantially during the last quarter century when viewed on a per capita basis. The general fiscal trends show a decline in the revenue base."[17] The amount of unregulated development in the watershed exceeds regulated development. The statistics also show that in Pima County "only 26 percent of the land has been developed."[18]

M. Capital Improvement Project (by Departments)

There are a total of 15 capital improvement projects currently underway in the watershed. These are funded through various bond allocations (described below), with a total budget of $18,214,617.

Fund Sources and Total Budgets

Parks and Recreation	
Arivaca Community Center Expansion (General Obligation Bond No. P-49)	$200,000
Sopori Community Center (General Obligation Bond No. P-50) –UNFUNDED	$0
Lawrence Community Center (General Obligation Bond No. P-51)	$680,000
Lawrence District Park (General Fund)	$549,765*
Kay Stupi-Sopori Pool (General Fund)	$1,368,604
Three Points Veterans Memorial Park Improvements (Gen. Obligation Bond No. P-20)	$600,000
Lawrence District Park Lighting Improvements (General Obligation Bond No. P-23)	$776,000
Ryan Air Field Park Land Acquisition (General Obligation Bond No. P-28)	$100,000
Branding Iron Park (General Obligation Bond No. P-44)	$132,974
Budget Total:	**$4,407,343**
Facilities Management	
Sheriff's New Substations (General Obligation Bond No. S-3)	**$1,000,000**
Transportation	
Valencia Road: Mark Road to Camino de la Tierra (HURF DOT-17, Impact fees)	$6,799,000
Kinney Road: Ajo Way to Bopp Road (HURF DOT-50, Impact fees)	$3,750,000
Budget Total:	**$10,549,000**
Wastewater Management	
Arivaca Junction WW Treatment Facility Relief Sewer (Sewer Bond No. SS-11)	**$1,621,274**
Cultural Resources (County Administrator's Office)	
Robles Ranch Rehabilitation (General Obligation Bond No. CH-27)	**$637,000**
Grand Total:	**$18,214,617**

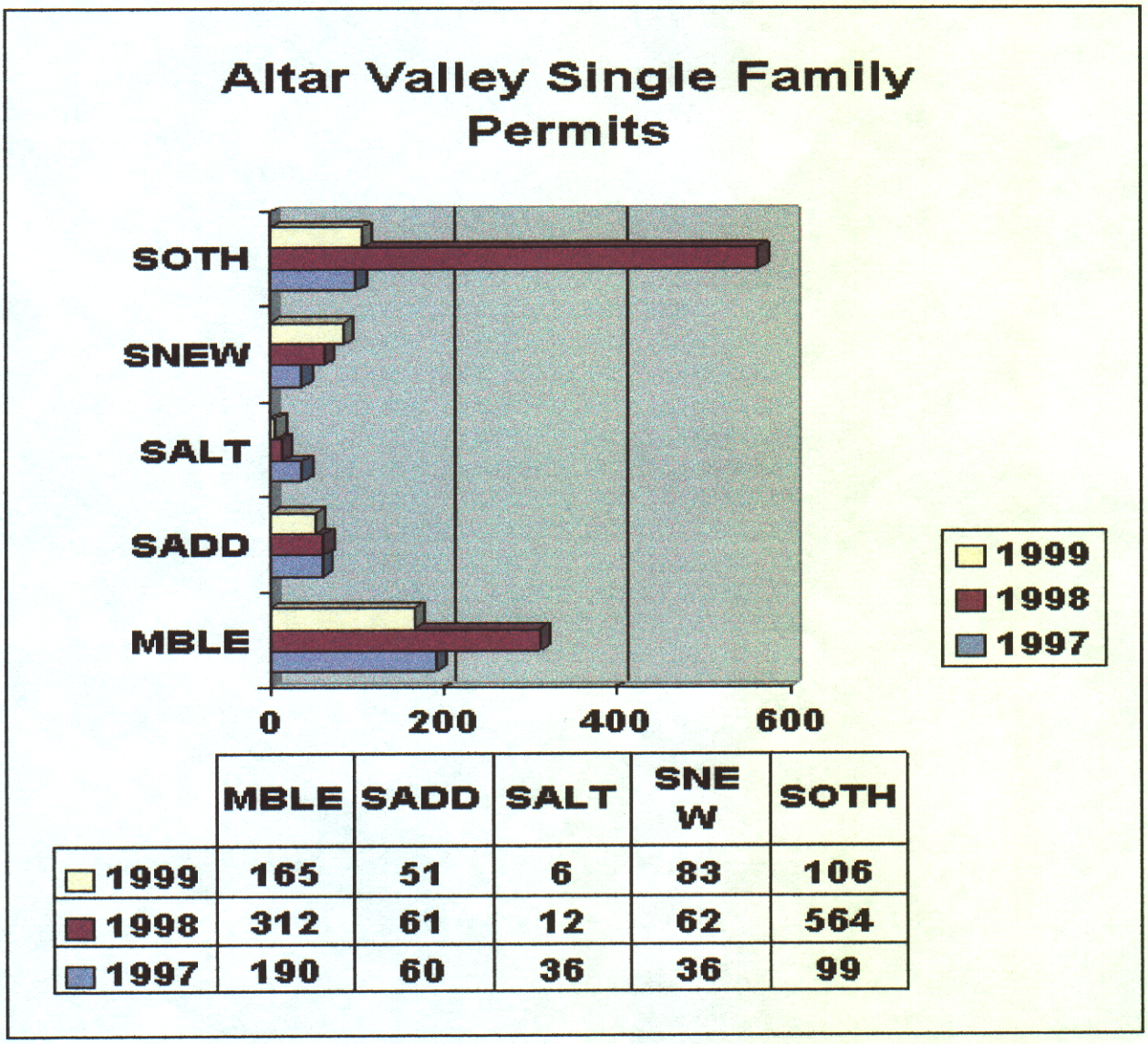
*Lawrence District Park is a completed project.

Most of the projects pertain to parks and recreation, which account for approximately 24 percent of the combined funding. The two transportation projects account for approximately 58 percent of the total allocated bond funding. With the exception of the waste water and transportation projects, the rest are all funded through either General Obligation Bonds or General Funds.

N. Permits

Permits issued for residential and commercial activities, between 1997 and 1999, are shown in **Graph 1** and **Graph 2** respectively.

Graph 1



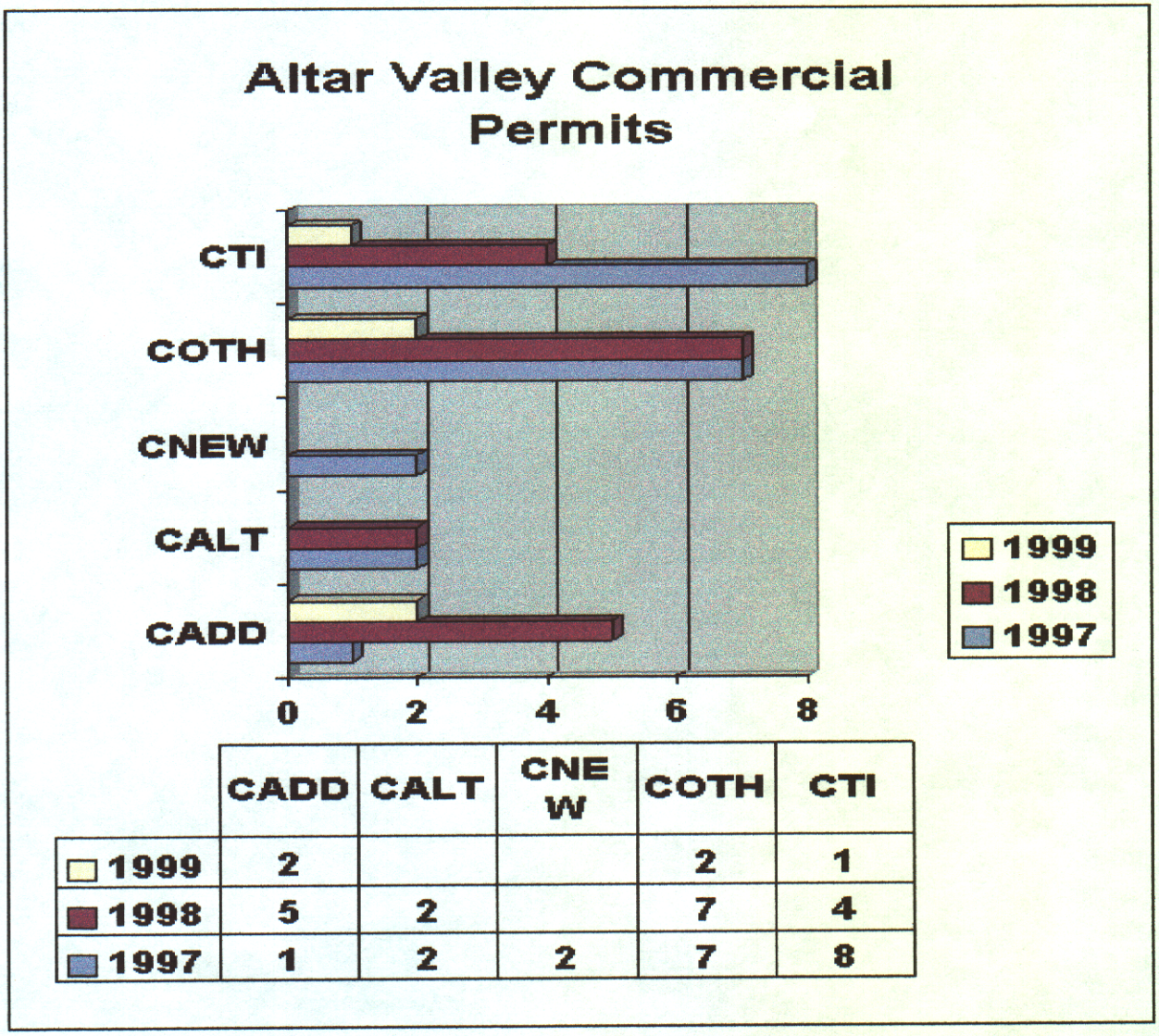
	MBLE	SADD	SALT	SNEW	SOTH
1999	165	51	6	83	106
1998	312	61	12	62	564
1997	190	60	36	36	99

SOTH = SINGLE FAMILY (OTHER); SNEW = NEW SINGLE FAMILY; SALT = SINGLE FAMILY ALTERATIONS; SADD = SINGLE FAMILY ADDITIONS; MBLE = MOBILE HOMES

Graph 1 shows that, between 1997 and 1999, the total permitting activities were an all-time high in 1998, with a total of 1,011 permits. The same is evidenced with the number of mobile home permits; however, mobile home permits declined by almost 50 percent from 1998 to 1999, which may indicate a slight decline in wildcat lot-splitting activities in the area. New home permits increased by 33 percent between 1998 and 1999. Of late, building activity in the Diamond Bell area has picked up a little and the increase in single family home permits may be indicative of it.

Graph 2 reveals the same trend as that of **Graph 1** in terms of the decline in activities from 1998 to 1999. The total number of permits decreased from 18 in 1998 to five in 1999, and there were no new commercial development permits issued in 1998 and 1999.

Graph 2



	CADD	CALT	CNEW	COTH	CTI
1999	2			2	1
1998	5	2		7	4
1997	1	2	2	7	8

CADD = COMMERCIAL ADDITIONS; CALT = COMMERCIAL ALTERATIONS; CNEW = NEW COMMERCIAL; COTH = COMMERCIAL (OTHER); CTI = COMMERCIAL TENANT IMPROVEMENT

APPENDICES

Maps:

1. Map of Existing Land Use
2. Map of Existing Zoning on Vacant Land

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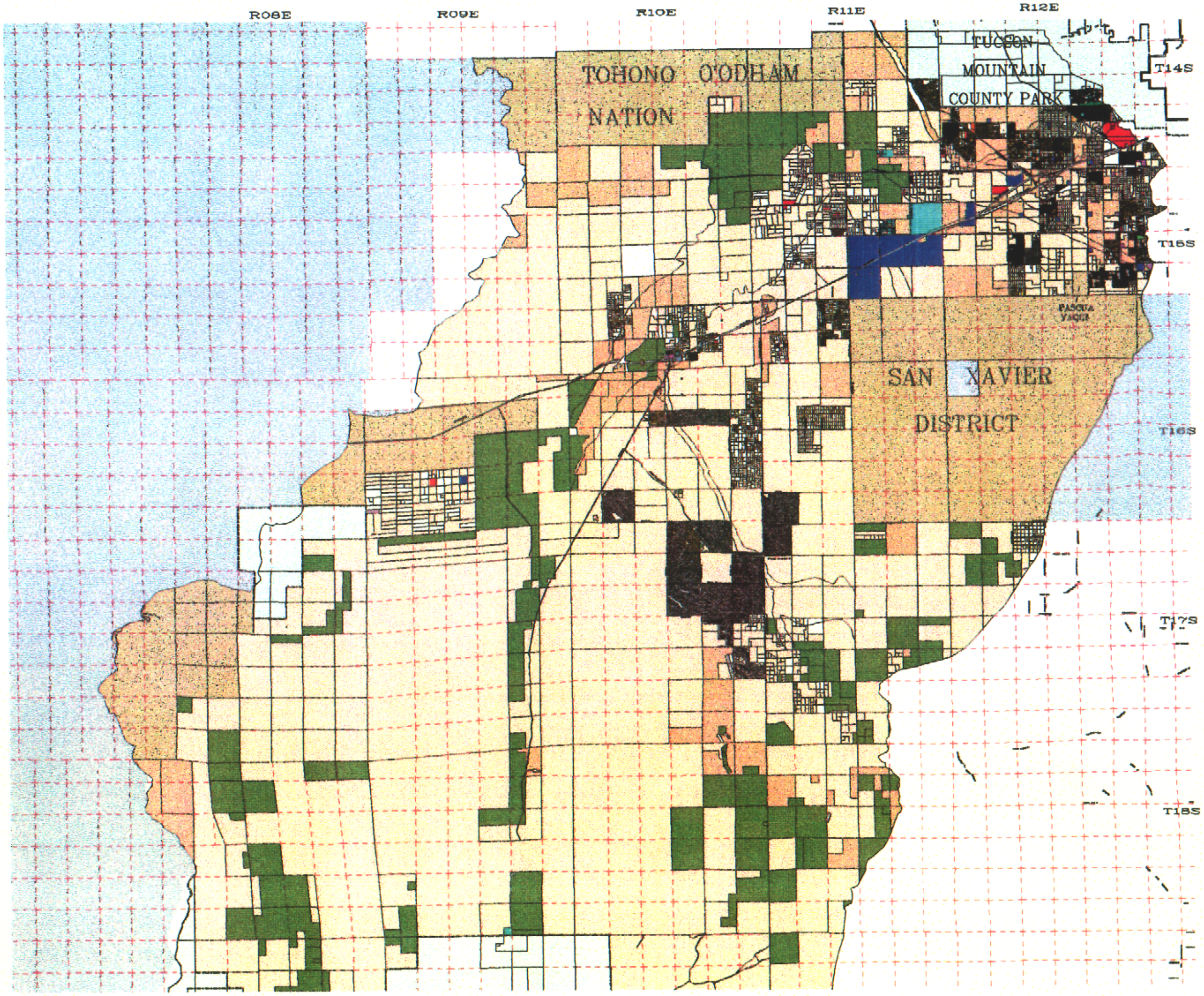

EXISTING LAND USE

Altar Valley Watershed
North Half

06-MAR-2000

Legend

Existing Land Use

- VACANT
- RURAL
- 0.2 TO 0.4 RAC
- 0.4 TO 0.75 RAC
- 0.75 TO 1.25 RAC
- 1.25 RAC TO 3.0 RAC
- 3.0 TO 6.0 RAC
- 6.0 TO 10.0 RAC
- 10.0 TO 15.0 RAC
- 15.0 TO 25.0 RAC
- GREATER THAN 25 RAC
- LODGING
- RESORT
- OFFICE
- COMMERCIAL
- PRIVATE STREETS
- INDUSTRIAL
- INSTITUTIONAL
- MISC. GOVERNMENT
- TRANSPORT FACIL
- UTILITIES/ TELECOMMUNICATIONS
- PARK
- GOLF COURSE
- AGRICULTURE
- DEDICATED OPEN SPACE
- OTHER
- MILITARY/ST. POLICE
- VACANT-STATE
- VACANT-JURISDICTION
- PARTIALLY DEVELOPED
- NO DATA

Basemap Features

- Public Preserves
- Tribal Lands
- Public Preserve Boundary
- City and Town Limits
- Sections

This map is regional in nature. Data comes from many sources, including the Pima County Development Services Dept. Dept. of Transportation and the Pima County Assessor's Office.

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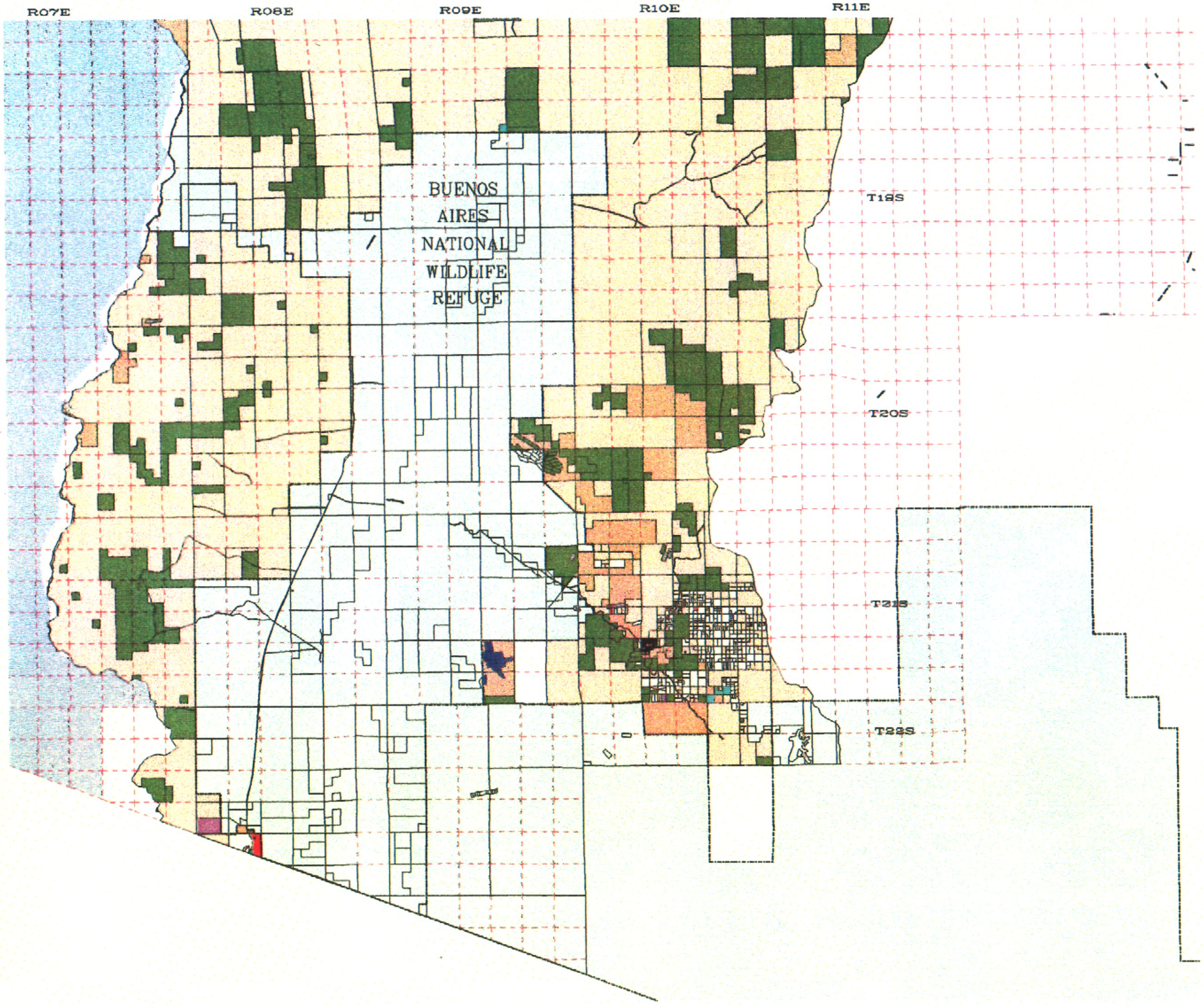

EXISTING LAND USE

Altar Valley Watershed South Half

06-MAR-2000

Legend

Existing Land Use

- VACANT
- RURAL
- 0.2 TO 0.4 RAC
- 0.4 TO 0.75 RAC
- 0.75 TO 1.25 RAC
- 1.25 RAC TO 3.0 RAC
- 3.0 TO 6.0 RAC
- 6.0 TO 10.0 RAC
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- 15.0 TO 25.0 RAC
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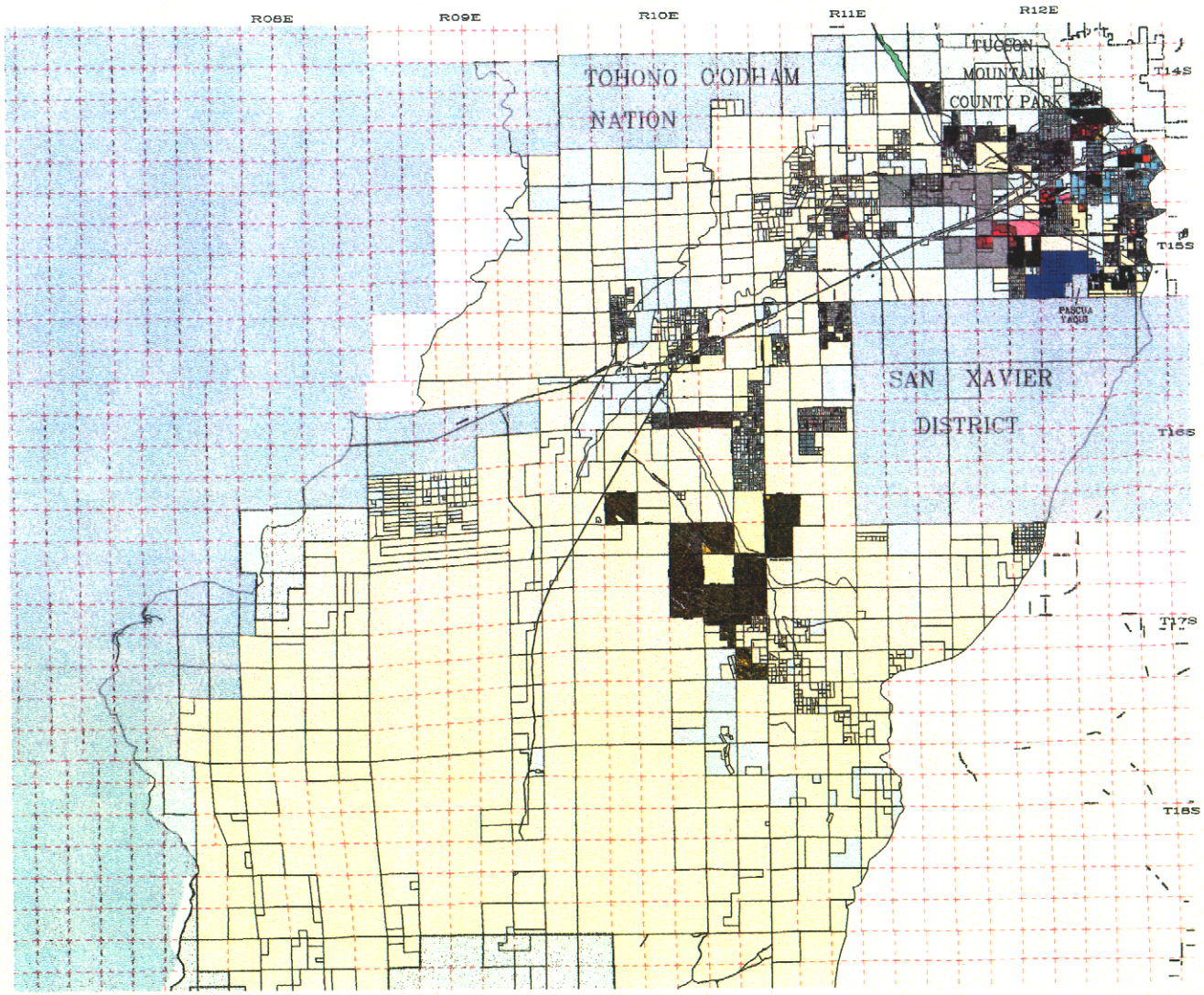
EXISTING ZONING
ON VACANT LAND
Unincorporated Pima County
Altar Valley Watershed-North Half
06-MAR-2000



Legend

Zoning Districts

- IR Institutional Reserve
- RH Rural Homestead
- GR-1 Rural Residential
- SR Suburban Ranch
- SR-2 Suburban Ranch Estate
- SH Suburban Homestead
- CR-1 Single Residence
- CR-2 Single Residence
- CR-3 Single Residence
- CR-4 Mixed Dwelling Type
- CR-5 Multiple Residence
- TR Transitional
- CMH-1 Mobile Home 1
- Cond'l Zoning Boundary
- CMH-2 Mobile Home-2
- TH Trailer Homesite
- MU Multiple Use
- MR Major Resort
- RVC Rural Village Center
- CB-1 Local Business
- CB-2 General Business
- CPI Campus Park Industrial
- CI-1 Light Industrial/Warehouse
- CI-2 General Industrial
- CI-3 Heavy Industrial
- SP Specific Plan
- GC Golf Course

CB-1

Basemap Features

- Built or Committed Land
- Cities and Towns
- Sections
- Public Preserve Boundary
- Public Preserves
- Tribal Lands

Note: Vacant land shown by zoning district color

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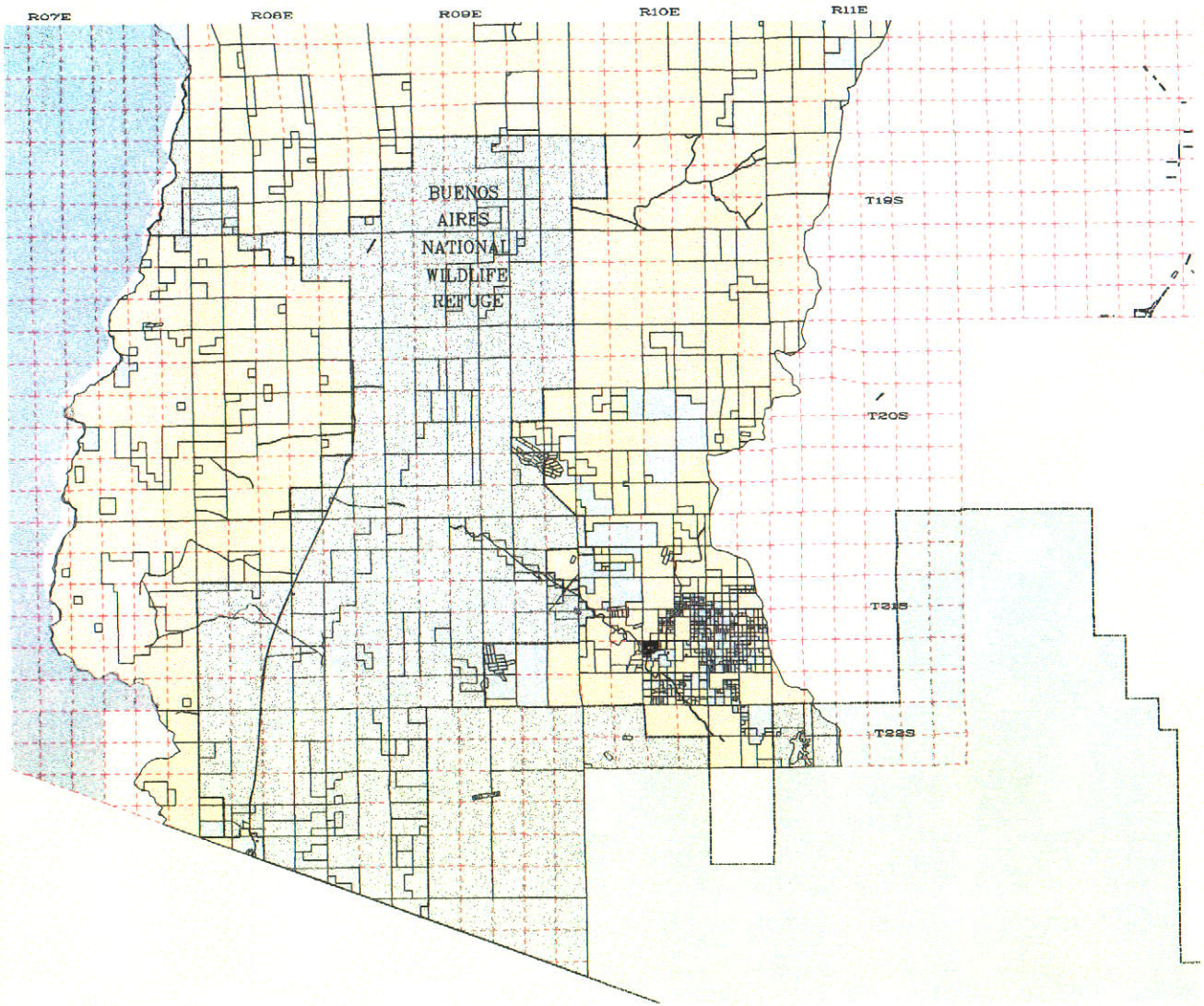
EXISTING ZONING
ON VACANT LAND
Unincorporated Pima County
Altar Valley Watershed-South Half
06-MAR-2000



Legend

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MAP

REFERENCES

Pima County/Pima Association of Governments. *GIS Coverages of Perennial and Intermittent Streams, and Areas of Shallow Groundwater, Sonoran Desert Conservation Plan.*

Pima County. *Land Stewardship in Pima County, Sonoran Desert Conservation Plan.*

Pima County. *Sonoran Desert Conservation Plan, Focus on Riparian Areas.*

Pima County. *Water Resources and the Sonoran Desert Conservation Plan.*

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END NOTES

1. Pima County, *Land Stewardship in Pima County, Sonoran Desert Conservation Plan*, February 2000, Table 6, p. 14.

2. Pima County, *Water Resources and the Sonoran Desert Conservation Plan*, July 1999, p. ii.

3. Ibid, p. 3.

4. Ibid.

5. Pima Association of Governments for Pima County, *GIS Coverages of Perennial and Intermittent Streams, and Areas of Shallow Groundwater, Sonoran Desert Conservation Plan*, January 2000, Figure 1, p. 13, 14 & 15.

6. Ibid, Figure 4, p. 25.

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8. Pima County, *Water Resources and the Sonoran Desert Conservation Plan*, July 1999, p. 38

9. Ibid, Figure 1, p. 11.

10. Pima Association of Governments for Pima County, *GIS Coverages of Perennial and Intermittent Streams, and Areas of Shallow Groundwater, Sonoran Desert Conservation Plan*, January 2000, Appendix F.

11. Pima County, *Land Stewardship in Pima County, Sonoran Desert Conservation Plan*, February 2000, p. 1.

12. Ibid, Figure 2, p. 8.

13. Ibid, Table 7, p. 16.

14. Ibid, p. 4.

15. Ibid, Figure 1, p. 5.

16. Ibid, p. 1.

17. Pima County, "Impact of Unregulated Development on the Pima County Tax Base, Service Demand and Future Infrastructure Liability, *Fiscal Impact of Land Use*, February 2000.

18. Ibid.