

Resources of the Upper Santa Cruz Subarea **DRAFT**

Sonoran Desert Conservation Plan

May 2000

Pima County
Board of Supervisors

Mike Boyd, District 1
Dan Eckstrom, District 2
Sharon Bronson, Chair, District 3
Raymond J. Carroll, District 4
Raúl M. Grijalva, District 5

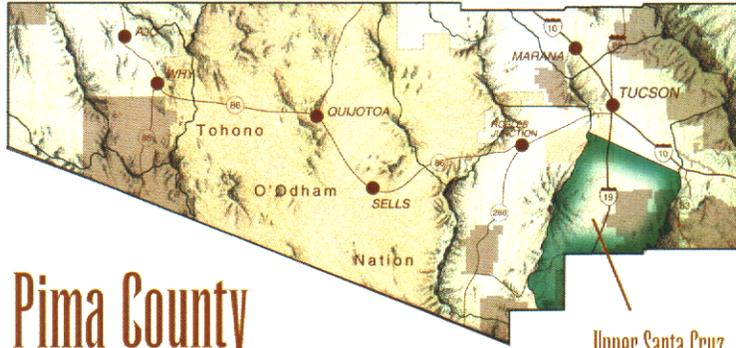
County Administrator
Chuck Huckelberry



Draft 1

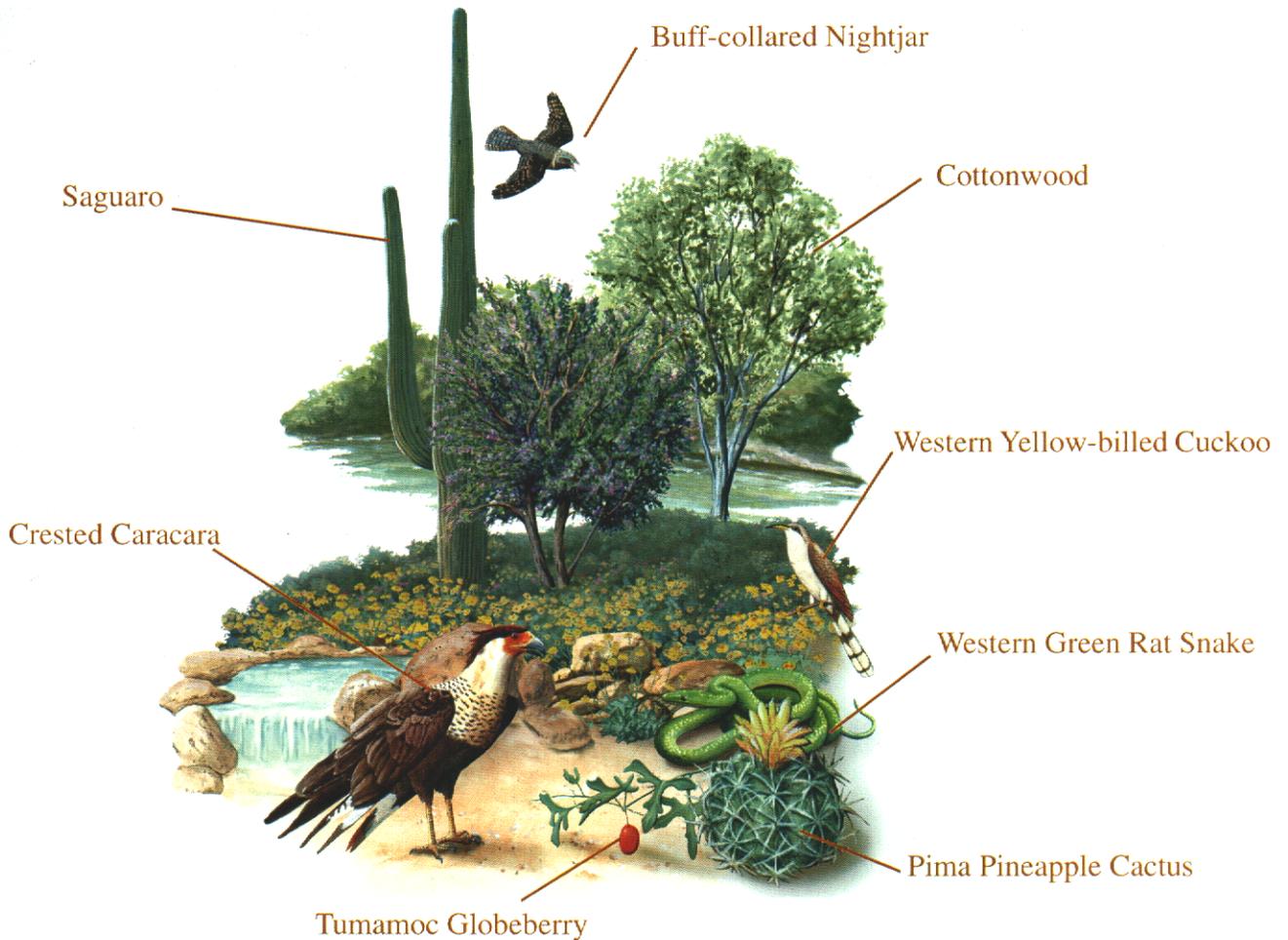
DRAFT

Sonoran Desert Conservation Plan



Pima County

Upper Santa Cruz Subarea



Saguaro

Buff-collared Nightjar

Cottonwood

Western Yellow-billed Cuckoo

Crested Caracara

Western Green Rat Snake

Pima Pineapple Cactus

Tumamoc Globeberry

**Current and former inhabitants of
the Upper Santa Cruz**



MEMORANDUM

Date: May 11, 2000

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

From: C.H. Huckelberry
County Administrator *[Signature]*

Re: *Resources of the Upper Santa Cruz Valley*

I. **Background**

This memorandum provides a brief summary of a compilation of resource investigations that have been submitted so far, to help develop the Sonoran Desert Conservation Plan within the watershed planning area of the Upper Santa Cruz Valley. The Steering Committee, interested members of the public, and stakeholding private citizens and governmental entities are invited to submit additional documents and comments. Presentations at the May 20, 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, Technical Teams, and the Board of Supervisors for consideration.

CONTENTS AND ATTACHMENTS

<u>Habitat and Corridors Elements</u>	2
A.1 <u>Biological Stress Assessment</u>	2
<u>Riparian Protection Element</u>	3
A.2 <u>Pima County's Watersheds and Watercourses</u>	4
<u>Ranch Conservation Element</u>	5
A.3 <u>Ranching in the Upper Santa Cruz Valley</u>	5
<u>Cultural Resources Element</u>	5
A.4 <u>Cultural and Historical Resources Inventory Report</u>	5
<u>Land Use and Fiscal Considerations</u>	5
A.5 <u>Land Use in Upper Santa Cruz Valley</u>	5

II. Habitat and Corridors Elements

Biological Stress Assessment and Review of Vulnerable Species

Attachment 1 is the Upper Santa Cruz Valley chapter from the *Biological Stress Assessment*, issued by Recon consulting as part of the biological evaluation in March of 2000. The *Biological Stress Assessment* examines past land and water uses, existing uses, and some major uses foreseeable over the next 30 years in an effort to determine the greatest potential threats to vulnerable species within each watershed planning unit. The Upper Santa Cruz subarea is discussed in pages 66 through 88 of the text. A summary of the stress analysis is available in Table 33, and reproduced in part below.

Areas and Habitats of Concern	Species, Federal Concern	Sources of Stress
Shallow groundwater Sopori Wash	Pineapple cactus	Population growth
Mixed riparian/xeroriparian areas	Gila topminnow	Concentrations of lot splitting
Palo verde mixed scrub, uplands	Mexican spotted owl	Groundwater pumping
Valley lands along Santa Cruz	Lesser long nosed bat	Conversion, ag land & ranches
Semi-desert grasslands	Yellow billed cuckoo	Existing and future mining
Groves providing cuckoo habitat	San Xavier Talussnail	Invasive species
Pineapple cactus habitat		

Potential threats and stressors to other vulnerable species in the Upper Santa Cruz subarea, including species of federal concern, are discussed in the report such as the:

- Apache northern goshawk;
- Saiya;
- Needle-spined pineapple cactus;
- Western red bat;
- Box Canyon Muhly;
- Weeping Muhly;
- Pale Townsend's big-eared bat;
- Chiricahua Leopard Frog;
- Lowland Leopard Frog;
- Arizona Shrew;
- Mexican Garter Snake; and
- Tumamoc globeberry.

III. Riparian Element

A report issued in April of 2000, entitled *Prioritization of Streams for Conservation in Pima County*, described a number of streams within watershed planning units and prioritized these streams according to their existing contribution to the overall conservation of biological diversity in Pima County. Streams that ranked in the top 20 by the following parameters are recommended for priority consideration in identifying areas for further analysis by the scientists assisting in the development of the Sonoran Desert Conservation Plan:

- perennial stream length and intermittent stream length
- area of hydro-mesoriparian vegetation and of xeroriparian Class A vegetation
- area of shallow groundwater
- presence of native fish.

A very small percent of the priority streams within the County are found within the Upper Santa Cruz subarea.

SDCP Planning Unit	Number of Priority Streams	Percentage of Total
1. Middle San Pedro	8	12
2. Cienega Rincon	17	26
3. Upper Santa Cruz	3	4
4. Middle Santa Cruz	9.5	15
5. Tortolita Fan	5.5	8
6A. Altar Valley	18	28
6B. Avra Valley	2	3
7. Tohono Nation	1	2
8. Western Pima Co.	1	2
Total	65	100

Pima County's Watersheds and Watercourses

Attachment 2 is a chapter of a watershed and watercourse study by authors including Barbara Tellman of the Arizona Water Resources Research Center. Human impacts on the Upper Santa Cruz watershed are described, 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.

The Upper Santa Cruz subarea is discussed in pages 91 through 102 of the text. The summaries of the (1) potential and existing impacts on the watercourses within the subarea, and (2) potential options for reducing stress on watercourses within the subarea, are reproduced below.

Potential and existing impacts on the watercourses in the Upper Santa Cruz subarea

REGION WITHIN THE SUBAREA	GRAZING	WILDCAT SUBDIVISION	PLANNED SUBDIVISION	COPPER MINE	SAND & GRAVEL MINE	PUMPING	AGRI CULTURE	REC
SANTA CRUZ RIVER VICINITY		yes	yes		yes	yes	yes	yes
PIEDMONTS	yes	yes	yes			yes		yes
MOUNTAINS	yes			yes				yes

Potential options for reducing stress on watercourses within the Upper Santa Cruz subarea

REGION WITHIN THE SUBAREA	LESS PUMPING (ALT WATER)	NON STRUC FLOODPLAIN MANAGE	LAND USE MANAGE MENT	FEDERAL LAND, PROTECTION	STATE TRUST LAND PROTECTED	OTHER PRESERVE INCREASE	BETTER GRAZING
SANTA CRUZ RIVER VICINITY	potential	potential	potential			potential	
PIEDMONTS	potential	potential	potential		potential		potential
MOUNTAINS							potential

Issues suggested for discussion as part of the Sonoran Desert Conservation Plan

- Should efforts be taken to preserve water supplies?
- Should alternate sources of water, such as CAP, be provided to landowners?
- How should the distributary flow issues be handled as the east terrace is developed?
- Should the trend toward wildcat development be discouraged for planned development?
- Should effluent be used in this area for riparian restoration? Turf? Groves?
- What should be done in response to pressure to improve Sahuarita Road? The road to Madera Canyon?

IV. Ranch Conservation Element

Ranching in the Upper Santa Cruz Valley

Attachment 3 includes a descriptive summary of Ranching in the Upper Santa Cruz Valley, drafted by Ms. Linda Mayro, the lead staff of the Ranch Conservation Team. Ranches in the area are described, along with grazing allotments, the carrying capacity per square mile by grazing allotment, the role of stock tanks and other ranch related resource topics.

V. Cultural Resources Element

Attachment 4 is a cultural and historic resources inventory report by Mr. David Cushman, the lead staff of the Cultural and Historic Resources Technical Team. Three kinds of resources are described: archaeological sites, historic resources, and traditional cultural resources, which are all defined and quantified within the report. This document includes maps that depict: the zone of archaeological sites in the Upper Santa Cruz Valley; general archeological site and survey locations; and archaeological sites in relation to land ownership.

VII. Land Use Considerations

Land Use in the Upper Santa Cruz Valley

Attachment 5 is the contribution of Mr. Ben Changkakoti of the Planning Division. This report offers information about current and planned land use, zoning, housing types, 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.

Within the Upper Santa Cruz watershed, the urbanizing community of Green Valley is developing in a manner very distinct from the development patterns in the other outlying watershed areas studied to date. Whereas the Upper San Pedro area, Altar Valley, Avra Valley and the Cienega-Rincon area are all accommodating population growth primarily or exclusively through unregulated development, Green Valley is piecing together a number of planned and platted communities. Previous studies have described the vast difference that exists in the fiscal return of land that is developed through the regulated process, as opposed to the unregulated process. At the community level, unregulated development has weakened the tax base contribution of vast tracts of land. Picture Rocks, for example, covers 44,775 acres, which is almost ten percent of the urbanizing areas of Pima County. However, residents of the Picture Rocks area paid just over \$1 million dollars in total property taxes, which is less than one percent of the taxes paid by all residents in the urbanizing areas of the County.

Comparisons of the full cash value of platted and unplatted land from an urbanizing community perspective are found in the chart below. The average full cash value of platted and unplatted land in the urbanizing areas is \$61,250: only six of sixteen communities exceed this average. The Green Valley community has a buffer of undeveloped land surrounding it. The fiscal strength of the community will depend in part on how that remaining open land accommodates population growth. Of note in the chart below is the fact that when land is platted in the Green Valley community, it achieves a full cash value per acre of over \$213,000, one of the highest market values in all of Pima County. This is probably because Green Valley residents live in mixed use and somewhat higher density neighborhoods, which in this instance confers a relative benefit to the tax base.

COMMUNITY LEVEL COMPARISON OF PLATTED AND UNPLATTED LAND (From highest to lowest full cash value)			TOTAL FCV/A
The Urbanizing Areas Land Units within Pima County (Percent platted)	Unplatted -- Full Cash Value Per Acre	Platted -- Full Cash Value Per Acre	Full Cash Value/ Acre - - UP & P
Casas Adobes (69% platted)	\$68,761	\$ 214,531	\$ 168,638
Foothills (81% platted)	\$66,184	\$ 190,407	\$ 166,758
South Tucson (87% platted)	\$ 63,917	\$ 131,378	\$ 122,349
Tucson (42% platted)	\$ 38,090	\$ 237,649	\$ 121,540
Oro Valley (50% platted)	\$ 27,364	\$ 188,642	\$ 108,312
Green Valley (34% platted)	\$ 4,390	\$ 213,191	\$ 74,570
Tanque Verde (44% platted)	\$ 25,389	\$ 93,910	\$ 55,520
South Valley (12% platted)	\$ 13,502	\$ 108,946	\$ 25,088
Tortolita (5% platted)	\$ 17,957	\$ 46,158	\$ 19,307
Catalina (4% platted)	\$12,852	\$ 68,859	\$ 15,346
Marana (7% platted)	\$ 4,351	\$ 156,785	\$ 14,896
Sahuarita (13% platted)	\$ 3,077	\$ 87,809	\$ 14,257
Ajo (4% platted)	\$ 1,698	\$ 81,138	\$ 5,056
Picture Rocks (3% platted)	\$ 4,110	\$ 20,017	\$ 4,664
Santa Rita (5% platted)	\$1,513	\$ 25,839	\$ 2,715
Arivaca (0% platted)	\$ 1,512	NA	\$ 1,512

VIII. Conclusion

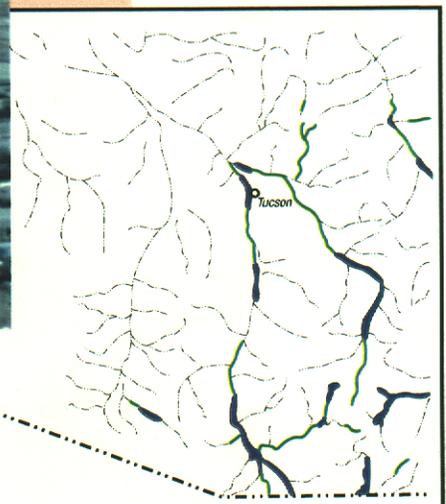
After subarea meetings are held, additional contributions and comments are received, discrepancies are eliminated in the data of individual reports and resource reports are perfected, a synthesizing subarea evaluation will be drafted that includes landowner goals and suggestions for conservation strategies. 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.

Biological Stress Assessment

An Overview Discussion of Issues and Concerns

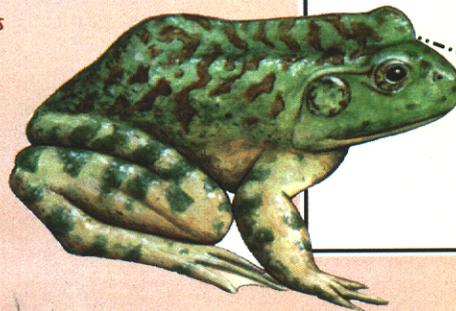
Sonoran Desert Conservation Plan

March 2000



Pima County Board of Supervisors
Mike Boyd, District 1
Dan Eckstrom, District 2
Sharon Bronson, Chair, District 3
Raymond J. Carroll, District 4
Raúl M. Grijalva, District 5

County Administrator
Chuck Huckelberry



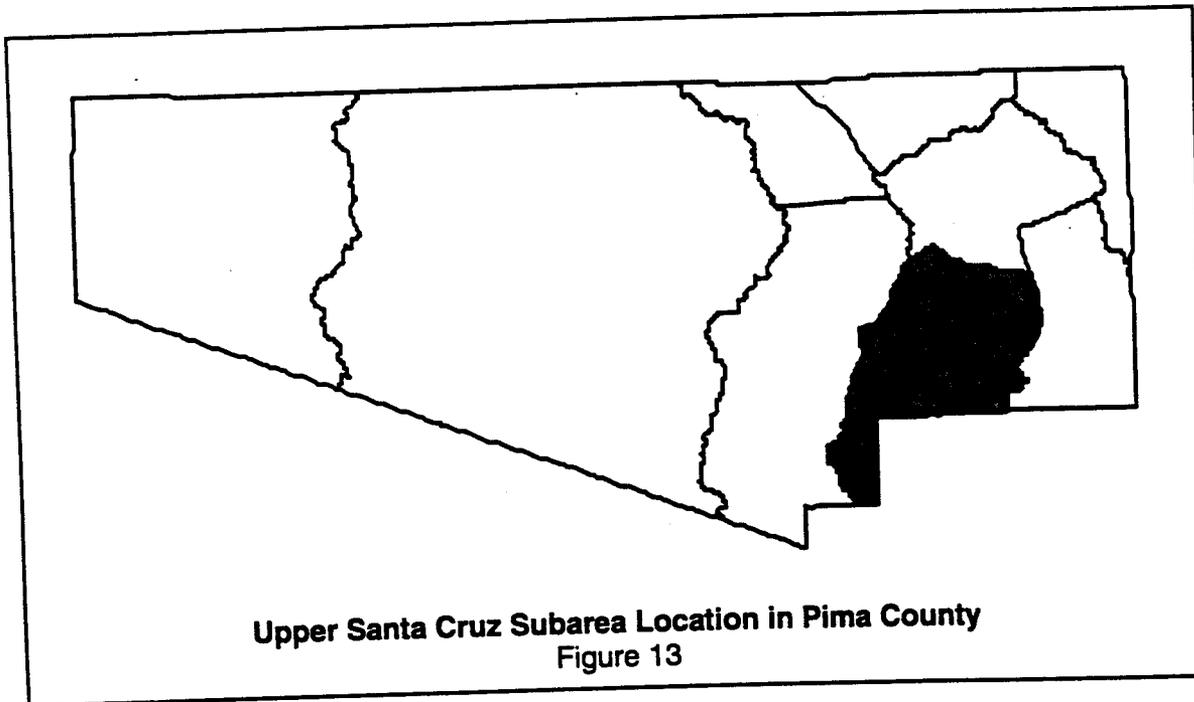
BEFORE 1890

EPHEMERAL FLOW
PERENNIAL FLOW
CIENEGA / RIVERINE MARSH



V. Upper Santa Cruz (Subarea 3)

This subarea extends north from the Pima County/Santa Cruz County line to Martinez Hill, near the northern boundary of the San Xavier District of the Tohono O'odham Nation (Figure 13). It consists of the valley formed by the Santa Cruz River, the Santa Rita mountains on the east, and the Sierrita Mountains on the west. The communities of Green Valley, Continental, and the Town of Sahuarita are within the subarea.

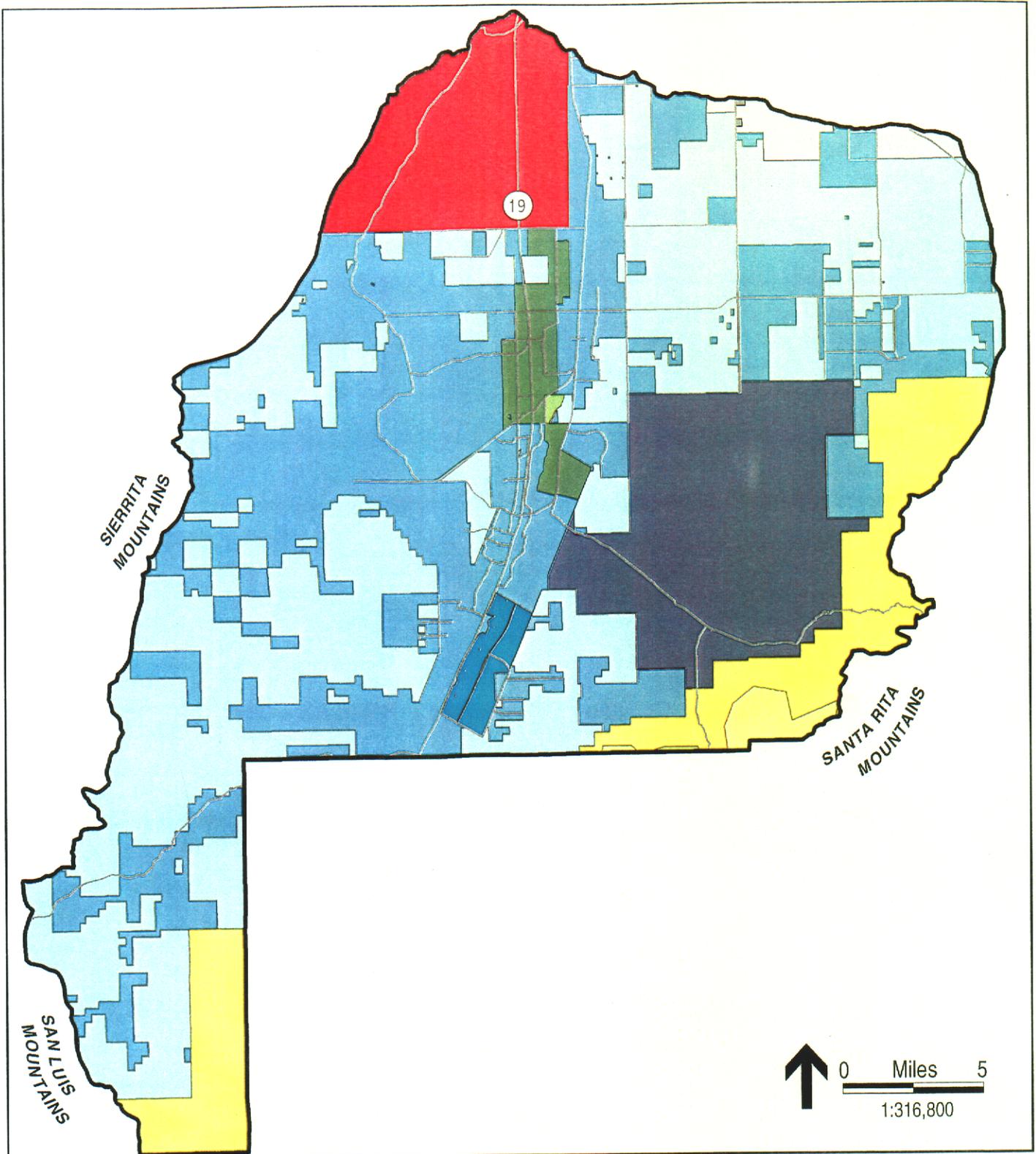


A. Potential Threats and Stressors

1. Land Use and Landscape Character

Historically, the area has been used for ranching, farming, and mining. Residential growth and commercial development in Green Valley and other communities during the last 50 years has changed the rural character to one more urbanized. The general distribution of land ownership and management status is depicted in Figure 14. This is mostly evident along the I-10 corridor. Cultivated fields have given way to pecan orchards, and some of the pecan orchards are now being developed for residential uses. This has displaced many of the mature pecan trees, which provide habitat for the yellow-billed cuckoo and numerous other birds (Kingsley 1989).

The County's Comprehensive Plan reflects this corridor of urbanization in the Upper Santa Cruz Valley Subregion Plan (Pima County 1997). The Plan shows medium and high intensity urban uses along both sides of I-19 up to the Town of Sahuarita boundaries. Lower intensity rural is shown as distance from I-19 increases. Significant blocks of land on the west side of I-19 are identified as "Resource Productive." These are where the large open pit mines and tailing ponds are located.



M:\jobs\3273\big\slapr\sthr\town.apr\lusc_mrgmgt_3/00

Land Ownership and Land Management in the Upper Santa Cruz Subarea

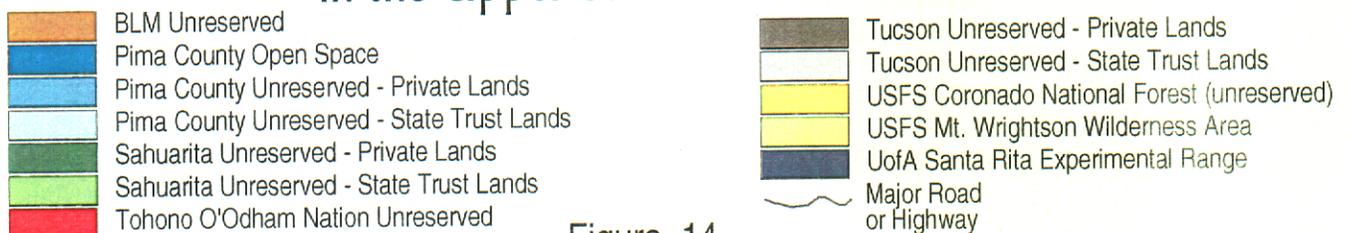


Figure 14

Residential growth by lot splitting has been prevalent in some areas, such as east of the San Xavier District and along Sahuarita Road, near Corona de Tucson, and in the Arivaca area (Pima County 1998). Otherwise the growth has been accommodated by regulated specific plans, subdivisions, and developments. Green Valley started out as a retirement community but is seeing a wider diversity as growth continues to increase in the area. Newer subdivisions and master-planned communities such as Madera Reserve, Madera Estates, and Quail Creek are located on the east side of I-19 and the Santa Cruz River. There is currently a proposal to build 5,000 retirement homes on 2,106 acres in Quail Creek, a Specific Plan area (*Arizona Daily Star* 2000). Quail Creek may become annexed into the Town of Sahuarita.

Within Sahuarita's boundaries are two master planned projects now in the process of being built that will take up the northern one-third of the town's 14 square miles. One is Rancho Sahuarita, a 2,800-acre community. The other is Madera Highlands, a 920-acre community. Both of these will have mixed uses and golf courses. The developers of Rancho Sahuarita will build a wastewater treatment plant and a lake as part of the project and turn them over to the town when completed. They will also give the town a water well and water rights for the purposes of supplying the lake. Eventually the lake will be fed by treated wastewater. The remaining pockets of private land within the town will likely be built out in the near future (Town of Sahuarita-Staley 2000). Over half of the Madera Highlands community is on land that was previously pecan groves. To the east of Sahuarita are many more acres of pecan groves. With mounting development pressure, there is the possibility that these groves could be converted to residential uses. They are owned by the Farmers Investment Company (FICO), a privately held company. These trees provide habitat for numerous species of birds.

Last year a major rezoning for the Canoa Ranch Specific Plan, in the southern part of the subarea, was denied. Subsequently, the Board of Supervisors revised the Comprehensive Plan to designate this area as "Resource Conservation." Although the project may be redesigned and resubmitted for consideration at some time in the future, any development proposal for over one residence per three acres would require an amendment to the Comprehensive Plan. The County is considering the purchase of the property, or a portion of the property, for the purposes of establishing a cultural and natural resources preserve. At this time, no actions have been taken towards that end.

The Tohono O'odham Nation has plans for building a large casino on 55 acres at the south end of the San Xavier District, at I-19 and Pima Mine Road. The facility will include retail shops, a concert venue, restaurants, and a bingo hall in addition to the casino and is expected to generate 500 new jobs. Future plans may include a hotel on an adjacent 80 acres. The presence of the casino will increase the potential for the interchange location to become a major commercial center.

At the current and projected rate of growth in this area and further south in Rio Rico, it is possible that the entire I-19 corridor between Tucson and the County line will become urbanized within the future. Although the land along the corridor that is within the San Xavier District now exists as mostly undeveloped open space, that is subject to change as is evidenced by the planned new casino. Stressors to biological resources resulting from the urbanization of the corridor have included and will continue to include habitat loss and degradation, habitat fragmentation, conversion of vegetative cover, decline in groundwater levels, and competition by invasive species. As new impervious surfaces

are constructed drainages are frequently altered or channelized, resulting in the removal of wash-associated xeroriparian vegetation, and the wildlife it supports is displaced. This has been the case in much of Green Valley. Development has led to the channelization of most of the washes which drain the Sierrita Mountains and foothills. Other significant drainage improvements, expansion of culverts, construction of earthen and concrete dikes, bank stabilization, rip-rapping, and erosion control projects are either underway or planned in the Green Valley to protect homes from flooding and erosion. (See report under separate cover, "Watershed and Watercourse Considerations.") The Santa Cruz River has experienced dramatic changes over the last 100 years. Human uses in the floodplain, urbanization, diversion, channelization, and livestock over-grazing have all contributed. Once broad and shallow, the channel has widened and is estimated to have deepened 20-30 feet in places. This eliminated significant amounts of vegetation once associated with the river channel and banks. Continued channel cutting and erosion would be made worse by increased urbanization adjacent to the river channel, which could eventually require continuous bank protection.

Although much of the valley along the Santa Cruz River is taken up with a growing urbanized corridor, ranching continues to be an important part of the economy and landscape management in the areas closer to the mountains. There are many acres of private ranch land and many acres of State Land and forest land with grazing allotments. (The BLM has a relatively small amount of land in the subarea.) The Santa Rita Experimental Range is a 53,159-acre area abutting the northwest flank of the Santa Rita Mountains. The land is owned by the state and administered by the University of Arizona, College of Agriculture for the purpose of studying range ecology and management techniques. The range is grazed under careful management. The vegetation has changed since the 1900s. Where shrub-free grassland once dominated half of the range, velvet mesquite is now a dominant overstory species. Other species such as burroweed, cholla, and prickly pear are now prevalent. Lehmann lovegrass, a non-native invasive grass, now dominates nearly 40 percent of the range (USDI-Medina 1996).

The pressure on ranchers to sell off all or portions of their private holdings is as much a concern in this subarea as it is in other subareas. The conversion of ranches to subdivisions and/or lot-split areas poses concern for biological resources. Habitat loss, alteration, and fragmentation can result, along with increased groundwater pumping. Further, the opportunity to manage the land's biological resources on a landscape level is lost.

Mining has had a significant impact on the landscape within this subarea. ASARCO's open pit copper mines at the Mission Complex consisting of six mines situated on 20,000 acres (ASARCO 2000). Cyprus Climax has three open pit mines at its Sierrita facility. These mines are all on the west side of I-19. Although copper mining had been projected to diminish, new extractive techniques have extended the viability of the mines. Even if closed out, the long-term impacts of the mines and tailings ponds on the landscape and watershed will remain. The tailing ponds trap much of the runoff from the west, keeping it from ever entering the Santa Cruz River. The USGS is currently studying water quality issues associated with mining operations in this subarea.

The mineral resources of the Santa Rita Mountains have been explored and mined for many years. There are several areas of medium to high potential for mineral resources

in these mountains, the largest of these is the Helvetia-Rosemont mining district (USDI-USGS 1996). A proposal by ASARCO to develop a mine on the east side of the Santa Ritas, in the Rosemont area, was put on hold in 1998. Interest in the ore body at Rosemont remains, and mining could be an issue at any time in the future (*Arizona Daily Star* 1998). There is currently one active aggregate limestone operation in the Helvetia Mining District where there are enormous reserves of recrystallized limestone. An aggregate product and landscaping rock is produced here. According to a report produced for the Coronado National Forest, the potential for development of collection and quarry sites for riprap and aggregate is high, particularly in areas easily reached from developed areas adjacent to the forest boundary (USDI-USGS 1996).

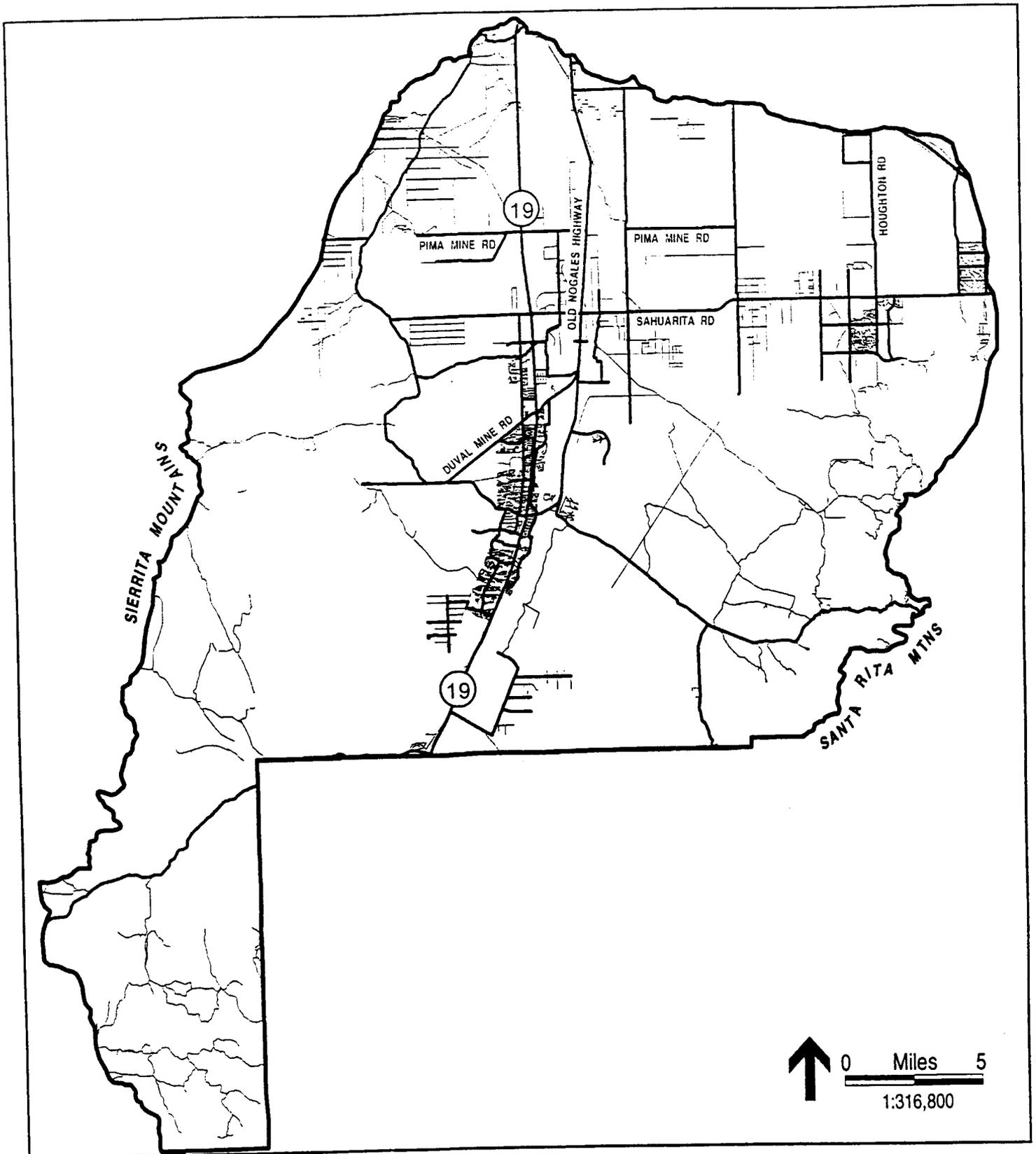
Effects on biological resources from mining can include large-scale degradation of intact areas, habitat loss and fragmentation, potential for downstream watershed contamination, and intensive groundwater pumping to support mine operations. Habitats affected could represent the full range from heavily forested areas at higher elevations, riparian canyons, oak woodlands, and grasslands.

2. Transportation

The existing network of highways and roads fragments much of the remaining natural landscape in the Upper Santa Cruz Subarea (Figure 15). I-19 is the primary north-south roadway, generally bisecting the subarea. It generally parallels the Santa Cruz River. The Old Nogales Highway extends south and connects with Duval Mine Road. The Southern Pacific Railroad follows the east side of Old Nogales Highway and the Santa Cruz River down to Nogales. These elements, in combination with the frontage roads, other smaller roadways, and the commercial and residential development along the corridor from a major barrier to east-west movement of wildlife across the valley.

The Long Range Transportation Plan (Pima County 1986) shows Sahuarita Road (I-19 to SR-83), Kolb Road (Sahuarita Road to I-10), and Houghton Road (Sahuarita Road to I-10) as Key Features within the subarea. This designates a controlled access roadway with a 300-foot-wide right-of-way. Sahuarita Road would be realigned in the vicinity of SR-83 and I-10 and would accommodate significant truck traffic by reducing travel time by bypassing the Tucson area. The Tucson Airport Authority, City of Tucson, Town of Sahuarita, Pima County, and ADOT are all interested in the improvement of Sahuarita Road as a commercial traffic bypass. For the Tucson Airport Authority (TAA), the roadway would provide better access to their freight center on the east side of the airport. Sahuarita Road has been placed on the state highway system as a joint-funded State Route. Additional planning studies focusing on the roadway will be undertaken this year (Pima County-Goff 2000). Kolb and Houghton Roads are planned to ultimately become the principal north-south roadways connecting to I-10 (Pima County 1986).

Although these roadway improvements are not on the PAG Metropolitan Transportation Plan, they are still on record as part of Pima County's long-term plans and there is interest in moving them forward. If built as controlled access roadways, they would displace significant amounts of vegetation and habitat and serve as barriers to wildlife movement. This area, along with the southeastern portion of the Tucson basin in general, has seen increased growth, both regulated and unregulated. It has recently begun to have more appeal to developers because it does not have the constraint of the CFPO Critical Habitat designation that the Tortolita Subarea has. A floodplain study for



M:\p00s\3273big\staprs\thrtrans.apr\usc_streets 3/00

Road Network in the Upper Santa Cruz Subarea

-  Highway or Major Road
-  Local Road

FIGURE 15

this area north of the Santa Rita Experimental Range described the area as consisting of a tributary network of poorly defined watercourses within an alluvial fan (DeGroot and Fuller 1988). If development continues to increase in this area and the poorly defined washes are channelized, downstream flooding and upstream erosion and channel cutting will likely result, as they have in other areas under these circumstances. Direct modification of the watercourse, downcutting, and loss of xeroriparian and upland vegetation can essentially transform an area of rich biodiversity into one low biological resource value. This is a serious concern for this area and elsewhere in other subareas (e.g., Tortolita Fan area). This potential for erosion and watershed degradation will compound the impacts of habitat loss and fragmentation that is associated with development and urbanization of a rural area that is expected to experience rapid growth in the future.

3. Water Use

Private water companies serve the communities of Green Valley, Continental, and Sahuarita. Additionally, there are numerous private wells. The mines and the pecan growers (FICO) have private wells. There is a proposal by the Upper Santa Cruz Water Users Group (USCWUG) to extend the Central Arizona Project (CAP) line south from Pima Farms Road to water users in the Green Valley Sahuarita area, including the mines and the pecan groves. At this time the biggest constraint is the lack of water delivery infrastructure. ASARCO and FICO are considering participating in the Groundwater Savings Facility Program by using CAP water in lieu of groundwater if the technical and economic issues can be resolved (Arizona Department of Water Resources [ADWR] 1998).

Recharge basins for CAP water are located at Pima Mine Road, and plans for instream recharge from there north to Valencia Road are being developed. The full-scale capacity of the project is expected to reach 30,000 acre-feet per year. The San Xavier Arroyos project uses CAP water by recharging into arroyos west of I-19 and the main channel of the Santa Cruz River (ADWR 1998). This project has potential for recreating and enhancing riparian and xeroriparian habitats. The Bureau of Reclamation (BOR) and the Nation constructed an erosion control project on the west bank of the Santa Cruz River near the bridge at the Mission. It includes an area for riparian habitat restoration using CAP water. The Nation is also considering using CAP water to reconstruct the mesquite bosque that once grew south of San Xavier Mission.

Directly affecting the potential future use of CAP water, the USFWS issued a jeopardy decision in their recent draft Biological Opinion of the impacts of Santa Cruz River Basin recharge projects on the endangered Gila topminnow. The BOR and the USFWS are continuing to work through the Section 7 Consultation process. As part of their Biological Assessment the BOR will be constructing two fish barriers along the Santa Cruz River near Pima Mine Road and will implement other measures to offset potential impacts to the endangered fish which exists upstream between Tubac and Nogales (USDI-BOR 2000). These fish barriers would have no effect on any CAP water entering the watershed upstream of Pima Mine Road.

It is unclear to what extent the ongoing Section 7 consultation will impact CAP delivery and recharge projects within the Upper Santa Cruz Subarea and elsewhere throughout the Santa Cruz basin.

Shallow groundwater exists in the area along the Sopori Wash, which extends west from the Santa Cruz River near the Arivaca Junction (PAG 2000). Most of the land on both sides of the wash is privately owned, surrounded by State Land. The pattern of land development here is by lot splitting, and there are numerous private wells. If residential density and ground water pumping continues to increase in this area the water table may decline and vegetation that the shallow ground water supports could be lost over time. The Sopori Wash is the largest tributary to the Santa Cruz within this subarea and has significant biological resource values due to the dense vegetation and proximity to the undeveloped open space areas of the Coronado National Forest and State Lands.

The depth to groundwater has declined between 50 and 100 feet since 1940 throughout much of the Green Valley area and other portions of the subarea in the valley area. Immediately north of the subarea the groundwater has declined 100-150 feet. This forms a cone of depression that has been linked to the decline and demise of a large mesquite bosque and cottonwood gallery south of the San Xavier Mission. Springs that once flowed near San Xavier no longer flow because of this decline in the water table. The decline has been attributed to groundwater pumping for the mines, agriculture, and urban use. One of the City of Tucson's most productive well fields is near here.

This example of the direct effect of groundwater overdraft on biological resources and habitats of concern presents possibilities of similar scenarios taking place in the future further upstream along the Santa Cruz River. As groundwater pumping continues to increase and the groundwater table continues to decline, riparian and xeroriparian vegetation communities associated with the river and its tributaries are put at greater and greater risk of dying out (Figure 16 and Table 12).

4. Recreation

Coronado National Forest provides the largest area for recreation within the Upper Santa Cruz Subarea. Madera Canyon has developed facilities such as the Bog Springs campground, picnic areas, parking, and trails. There are also private homes within the canyon and a private concession, the Santa Rita Lodge. Most of the developed facilities are within Santa Cruz County. Much of the recreation use of the Canyon is geared to bird watching, other wildlife viewing, and hiking, but a full range of uses are allowed within Forest lands. Numerous bird species, including the elegant trogon and many hummingbird species, bats, deer, black bear, and other wildlife species inhabit this canyon which has ephemeral stream flows. Bird species diversity is especially high here because the Santa Rita Mountains are the northern limit of the range of many of the bird species. Florida Canyon Wash is also a well known birding and wildlife viewing area due to its well-developed xeroriparian vegetation.

Biological stressors associated with recreational uses in the Santa Ritas are primarily tied to human use and overuse. Increasing growth in Green Valley and Sahuarita, and further south in Santa Cruz County, results in increased use of Forest lands for recreation. The limited facilities at Madera Canyon are well-used and primitive camping and use of other areas of the Forest is increasing. The Greaterville Road provides east-west access to I-19 and SR-83. The more traveled this road becomes for recreational uses, the greater chance there is for roadkill, habitat degradation, introduction and spread of exotic species, and wildfires.



M:\jobs\3273b\gis\apr\sthr\water.apr\usc water 3/00

Surface Groundwater and Streams in the Upper Santa Cruz Subarea

- Suspected Shallow Groundwater Areas
(based on well data and aerial imagery)
- Possible Shallow Groundwater Area
(based on vegetation assemblages)
- Well with Depth to Water less than 50 feet
(ADWR Well 55-Registry and GWSI databases)
- Intermittent Reach
- Major Street or Highway

Figure 16

TABLE 12
STREAM CHARACTERISTICS IN THE UPPER SANTA CRUZ SUBAREA

Stream Name	Miles of		Acres of Hydro- mesoriparian Habitat	Acres of Class A		Acres of Shallow Groundwater	Pygmy- Owl Habitat	Fish Species	Leopard Frogs
	Perennial Flow	Intermittent Flow		Riparian Habitat	Groundwater				
Franco Wash	0	0	0	67	N/A	No	0	N/A	
Madera Canyon	0	1.5	N/A	105	N/A	No	N/A	N/A	
Florida Canyon	0	3.4	N/A	N/A	N/A	No	N/A	N/A	

N/A = not applicable.

B. Biological Resources

1. Vegetation and Land Cover

Habitat within the Upper Santa Cruz Subarea consists primarily of mixed grass scrub giving way to palo verde-mixed cacti towards the north (Figure 17). Much of the central portion of the subarea is urbanized and has drainages running through that support mixed scrub and cordgrass habitats. To the west, south, and east limited areas of encinal oak forest habitat grow at higher elevations. Limited agricultural land occupies the south-central portion of the subarea.

2. Critical Habitat

No areas of Critical Habitat have been designated within the Upper Santa Cruz Subarea.

3. Species at Risk

A total of 18 Status 1 and Status 2 Vulnerable Species occur within the Upper Santa Cruz Subarea (Table 13).

C. Existing and Proposed Preserve Areas

1. Canoa Ranch

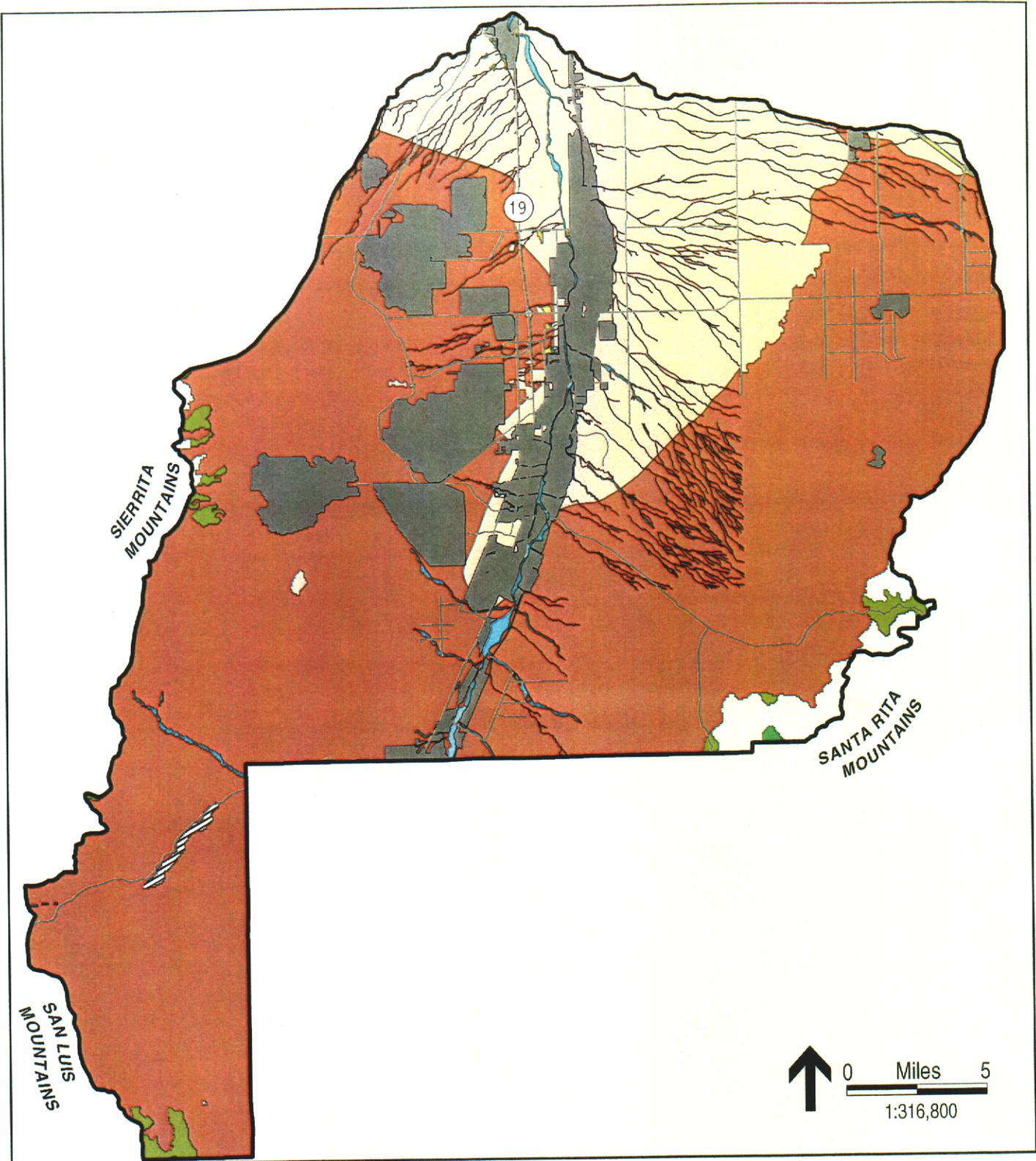
The County's Open Space Acquisition Master Plan identifies this for acquisition (Pima County 2000). The 1997 Open Space Bond Program provided two million dollars to acquire approximately 500 acres of the original Spanish Land Grant of 1821. This amount is less than the current estimated acquisition costs. The area identified for acquisition is located at the south end of the Canoa Ranch, on both sides of the Santa Cruz River and I-19. It would include the confluence of the Madera Canyon Wash and other tributary washes, and a small pond associated with the historic ranch house. If this area is not purchased and managed as preserved open space, the land will likely be developed at intensities found elsewhere along the I-19 corridor. Stressors to biological resources would then include those associated with urbanization such as habitat loss and degradation, habitat fragmentation, groundwater pumping and decline in groundwater levels, and competition by invasive species. The likelihood of removal of xeroriparian vegetation for wash channelization and bank protection would increase.

2. Sierrita Ranch Conservation Area

Incorporating State Land, BLM land, and private land, this conservation area would serve to protect much of the Sierrita Mountains while allowing ranches to continue their operations, including grazing cattle. Without some level of protection the mountains and foothill areas would be subject to increasing development pressures, as evidenced by the subdivisions and lot-splitting that have taken place immediately to the northwest.

D. Summary of Potential Stressors to Biological Resources

Primary stressors to biological resources within the Upper Santa Cruz Subarea include habitat loss, alteration, and degradation; habitat fragmentation; human use and overuse;



M:\jobs\3273\bigislpr\thr\veg.apr\uscveg_series_300

Vegetation and Land Cover in the Upper Santa Cruz Subarea

Vegetation Communities (BLP Classification)

	122.61 Douglas-Fir-Mixed-Conifer
	122.62 Pine
	123.31 Encinal (Oak)
	133.32 Manzanita
	133.36 Mixed-Evergreen Sclerophyll

	143.15 Mixed Grass-Scrub
	154.11 Creosote-Bursage
	154.12 Paloverde-Mixed Cacti
	223.22 Mixed Broadleaf
	234.71 Mixed Scrub

	243.53 Cordgrass
Other Land Cover Types	
	999.1 Agriculture
	999.2 Urban
	Major Road or Highway

Figure 17

TABLE 13
STATUS 1 AND 2 VULNERABLE SPECIES OCCURRING IN THE UPPER SANTA CRUZ SUBAREA

Scientific Name/Common Name	Pima County Status	State Rank	Listing Status	Potential Threats and Stressors	HDMS Records	Notes
<i>Accipiter gentilis apache</i> Apache northern goshawk	2	S3	F- petitioned, FSS WSC	Habitat destruction by logging and forest clearing. Possibly consequences of fire suppression leading to major timber fires. Organized recreational and sports use. Global climate change. Disturbance by recreationists, cattle grazing, mining, road building and other forest disturbances are site specific threats alleged by Center for Biodiversity.	Mt. Hopkins quad. Santa Cruz Co. 1990 USFS Mt. Wrightson quad, 1991, 1994, 1997 USFS	May occur at high elevation areas within this subarea. Petitioned for listing as endangered, 90-day finding determined that listing was not warranted 6/29/98. Suit filed 2/25/99 to list as endangered.
<i>Amoreuxia gonzalezii</i> Saiya	1	S1	FSC FSS SR	Very narrow distribution and small number of individuals. Grazing (plant is palatable to cattle). Degradation of habitat due to livestock grazing. Competition by introduced invasive plants. Javelina consume roots.	Empire Ranch quad 1976. USFS Mt. Hopkins quad, Santa Cruz Co. northeast of Agua Caliente Caves, 1991 USFS	Limestone endemic.

TABLE 13
STATUS 1 AND 2 VULNERABLE SPECIES OCCURRING IN THE UPPER SANTA CRUZ SUBAREA
(continued)

Scientific Name/Common Name	Pima County Status	State Rank	Listing Status	Potential Threats and Stressors	HDMS Records	Notes
<i>Coccyzus americanus occidentalis</i> Western yellow-billed cuckoo	2	S3	F- petitioned FSS WSC	Habitat destruction and alteration, historic and present. Groundwater pumping, channelization, urbanization, historic livestock grazing? Farming and agricultural uses? Wood cutting. Reduction of acreage in pecan farming.	Helvetia quad, Florida Canyon, 1925 USFS Empire Ranch W of Cienega Creek 1998 BLM Saucito Mtn. quad, Santa Cruz Co. Soporí Wash 1980 Private Mt. Hopkins quad, Santa Cruz Co., Chino Canyon, 1981 USFS Mt. Wrightson quad 1923, 1927 USFS Arivaca quad. Wilbur Wash 1994 private Arivaca Creek 1994 FWS	Positive 90-day finding on petition, 2/17/00
<i>Coryphantha scheeri</i> var. <i>robustispina</i> Pima pineapple cactus	1	S2	FE HS	Narrow distribution, much of which is on private and Indian lands and much of which has been developed. Development, off-road vehicle traffic.	60 records for Pima Co. 41 for this subarea. San Xavier Mission, 1, 1993 private; Tucson SW, 2, 1992 private; Tucson SE, 2, 1998, 1999 private and State; Vail: 6: 2 private, 3 BOR, 1 State Twin Buttes, 2, 1981, 1982 private; Sahuarita, 3, 1989, 1998 State; Corona de Tucson, 2, 1989, 1999 State; Mount Fagan: 7: 4	May not be a valid variety using today's standards. There are many more unreported locations in this subarea.

TABLE 13
STATUS 1 AND 2 VULNERABLE SPECIES OCCURRING IN THE UPPER SANTA CRUZ SUBAREA
(continued)

Scientific Name/Common Name	Pima County Status	State Rank	Listing Status	Potential Threats and Stressors	HDMS Records	Notes
<i>Echinomastus erectocentrus</i> var. <i>erectocentrus</i> Needle-spined pineapple cactus	2	S3	SC S SR	Very narrow distribution. Land development and off-road vehicles might impact this species.	Vail quad, 1966, 1981 Private Mount Fagan quad, Davidson Canyon, 1990 State	BOR, 3 State; Esperanza Mill, Sierrita Mountains, 2, 1987, 1988 private; Green Valley, 6, State, BLM, USFS, Helvetia: 2, USFS; Amado 4, 1982-1996 State; Mt. Hopkins Santa Cruz Co. 1994 private
<i>Lasiurus blossevillii</i> (= <i>borealis</i>) Western red bat	2	S2	FSS WSC	Habitat loss as a result of ground-water pumping, channelization, wood cutting, leading to loss of riparian areas. Farming and agricultural uses, specifically secondary poisoning and reduction of food supply resulting from insecticide use.	Green Valley quad, Santa Rita Experimental Range, 1991 State. Empire Ranch quad, Empire Gulch, 1989 BLM.	This probably is more common on Empire Ranch than the records indicate. Also reported confirmed from Colossal Cave Mountain Park, roosting in trees on Posta Quemada Ranch.
<i>Leptonycteris curasoae yerbabuena</i> Lesser long-nosed bat	2	S2	FE WSC	Alleged to be related to reduction of numbers of maternity colonies and decline in size of remaining maternity colonies in Arizona and Sonora due to exclusion and disturbance. Addi-	Vail quad. Rincon Mountains 1988, 1988 Private Helvetia quad 2 mi E of Helvetia 1976 USFS	There was formerly a maternity roost in Colossal Cave. With much effort, bats were excluded and driven away. They may return if the cave is managed

TABLE 13
STATUS 1 AND 2 VULNERABLE SPECIES OCCURRING IN THE UPPER SANTA CRUZ SUBAREA
(continued)

Scientific Name/Common Name	Pima County Status	State Rank	Listing Status	Potential Threats and Stressors	HDMS Records	Notes
<i>Muhlenbergia dubioides</i> Box canyon muhly	1	S1	FSS	Ironically, thought to be negatively affected by large reductions in acreage of native agaves over large areas of northern Mexico due to excessive harvesting for local manufacture of mescal and tequila. Excessive browsing by livestock on newly emergent flower stalks of Agaves has also been suggested as possibly decreasing foraging opportunities and thus contributing to declines among these bats.	Empire Ranch quad, Empire Ranch 1989 BLM Mt. Hopkins quad, Santa Cruz Co. Madera Canyon Lodge 1988 Private Mt. Wrightson quad, Sawmill Canyon (Santa Cruz Co.) 1988 USFS	properly for them. The Colossal Cave Mountain Park website lists this species as present, not in the cave but roosting in cliffs.
<i>Muhlenbergia xerophila</i> Weeping muhly	1	S1	FSS	Very narrow distribution.	Helvetia 1986 USFS	
<i>Plecotus townsendii pallascens</i> Pale Townsend's big-eared bat	2	S3S4	FSC	Disturbance of roosts by recreationists and renewed mining.	Helvetia 1990, 1940 USFS Vail quad, Rincon Valley, 1986 Private. Samaniego Peak quad, Sierrita Mtns, Tascuela Canyon 1996 BLM. Cerro Colorado quad, Las Guijas Mtns. 1996 BLM Mt. Hopkins quad, Santa Cruz Co. Devils Cash Box 1993 State	This species is probably more common in Pima Co. than records indicate. Reported from Colossal Cave, which it uses as a maternity roost.

TABLE 13
STATUS 1 AND 2 VULNERABLE SPECIES OCCURRING IN THE UPPER SANTA CRUZ SUBAREA
(continued)

Scientific Name/Common Name	Pima County Status	State Rank	Listing Status	Potential Threats and Stressors	HDMS Records	Notes
<i>Poeciliopsis occidentalis</i> <i>Gila topminnow</i>	1	S2	FE FSS WSC	Non-native species, competition and predation. Habitat loss by ground-water pumping and channelization. Flooding. Drought. Dredging. Poor water quality. Livestock grazing (trampling by cattle, watershed changes).	Mt. Wrightson quad, Santa Cruz Co. Cave Creek 1986 USFS Arivaca quad, Fraguita Wash 1991 USFS, Fraguita Spring 1986 USFS Arivaca quad. Altar Valley, Arivaca Creek drainage, 1989, private	
<i>Rana chichahuensis</i> Chiricahua leopard frog	1	S3	FC FSS WSC	Disease. Introduced predators/competitors. Loss of habitat, groundwater pumping, water diversions. Center for Biological Diversity alleges threats are: "continued degradation and destruction of Southwest riparian areas by livestock grazing, ground-water pumping, water diversion, and dams. They are also threatened by exotic species, such as the bull frog and the large-mouth bass, which compete with and prey on the frog."	Helvelia quad, Santa Rita Mts. West Sawmill Canyon 1995 USFS; Box Canyon 1979 USFS. Mt. Wrightson quad, in Santa Cruz Co. several records. In Pima Co., Fish Canyon 1995 USFS Arivaca quad, Arivaca Creek, 1992 private. Murphy Peak quad, Turmacacori Mtns. 2 sites. 1989 USFS	CBD sued to list as endangered 8/27/99

TABLE 13
 STATUS 1 AND 2 VULNERABLE SPECIES OCCURRING IN THE UPPER SANTA CRUZ SUBAREA
 (continued)

Scientific Name/Common Name	Pima County Status	State Rank	Listing Status	Potential Threats and Stressors	HDMS Records	Notes
<i>Sonorella eremita</i> San Xavier talussnail	1	S1	-	Protected by Conservation Agreement. Limited distribution. Agreement challenged by CBD, who threatened a lawsuit. Alleged threats are: vandalism, collection, herbicide poisoning, habitat disturbance, siltation from runoff.	Twin Buttes quad., near San Xavier, NW shoulder of white hill, 1990 private.	lawsuit apparently not filed
<i>Rana yavapaiensis</i> Lowland leopard frog	2	S4	SC FSS WSC	Groundwater pumping, disease, water pollution, invasive non-native species, ozone loss, unknown causes of population declines.	Helvetia quad, Box Canyon 1979 USFS Empire Ranch quad, Empire Spring 1990 BLM Mt. Wrightson Quad, several records in Santa Cruz Co. 1979-1989 USFS Arivaca quad, Arivaca Creek 1981 private.	
<i>Sorex arizonae</i> Arizona shrew	2	S2S3	FSC FSS WSC	Limited distribution, poorly known. Fires and floods. Recreational development and camping.	Mt. Wrightson quad, Santa Cruz Co. Stone Cabin Canyon 1923 USFS	Appropriate habitat has not been surveyed using the best available techniques. This species may or may not be present in montane areas in Pima Co.

TABLE 13
STATUS 1 AND 2 VULNERABLE SPECIES OCCURRING IN THE UPPER SANTA CRUZ SUBAREA
(continued)

Scientific Name/Common Name	Pima County Status	State Rank	Listing Status	Potential Threats and Stressors	HDMS Records	Notes
<i>Strix occidentalis lucida</i> Mexican Spotted Owl	2	S3S4	FT WSC FSS	Habitat destruction by logging. Possibly consequences of fire suppression leading to major timber fires. Organized recreational and sports use and recreational development. Global climate change.	Mt. Hopkins quad, several records in Santa Cruz Co. 1994 USFS Mt. Wrightson quad, several locations all in Santa Cruz Co. 1994 USFS	May occur at high elevation areas, barely within this subarea. Critical Habitat for this species had been designated in 1995, but rescinded in 1998. It may have just barely touched portions of this subarea, but was mostly (if not entirely) within subarea 4. On 3/14/00 a federal judge ordered FWS to determine critical habitat by 1/15/01.
<i>Thamnophis eques megalops</i> Mexican garter snake	2	S2S3	FSC FSS WSC	Predation by bullfrogs. Aquatic and riparian habitat degradation and destruction.	Arivaca quad, Arivaca Creek, 1981 private	This species was formerly listed as endangered, but was delisted because it was found to be more common than thought at the time of listing.
<i>Tumamoca macedougalli</i> Tumamoc globeberry	2	S3	FSS SR	Threats include urbanization, farming, overgrazing, recreation, habitat conversion, javelina (eating tubers), off-road vehicle use, pesticides.	San Xavier Mission quad, 2 sites, 1988 private Sahuarita quad, Sahuarita vicinity 1988 State Green Valley quad, Sahuarita vicinity 1988 USFS	

NOTE: Records are from Heritage Data Management System (HDMS), Arizona Game and Fish Department. Quads: San Xavier Mission, Tucson SW, Tucson SE, Vail, Samaniego Peak, Twin Buttes, Sahuarita, Corona de Tucson, Mount Fagan, Batamote Hills, Esperanza Mill, Green Valley, Helvetia, Empire Ranch, Cerro Colorado, Saucito Mtn, Amado, Mt. Hopkins, Mt. Wrightson, Arivaca, Murphy Peak

a decline in ground water levels; and competition by invasive species. Very little of the Upper Santa Cruz Subarea is currently under management for conservation of biological resources (Figure 18). The majority of the subarea is land status 4a and 3b, with substantial areas urban and other intensive uses.

Habitats most at risk include the mixed riparian and xeroriparian woodlands associated with the Santa Cruz River and its tributaries, palo verde mixed scrub associations in uplands, and areas of semi-desert grasslands. Habitats supporting the Pima pineapple cactus and the western yellow-billed cuckoo are at risk from urbanization.

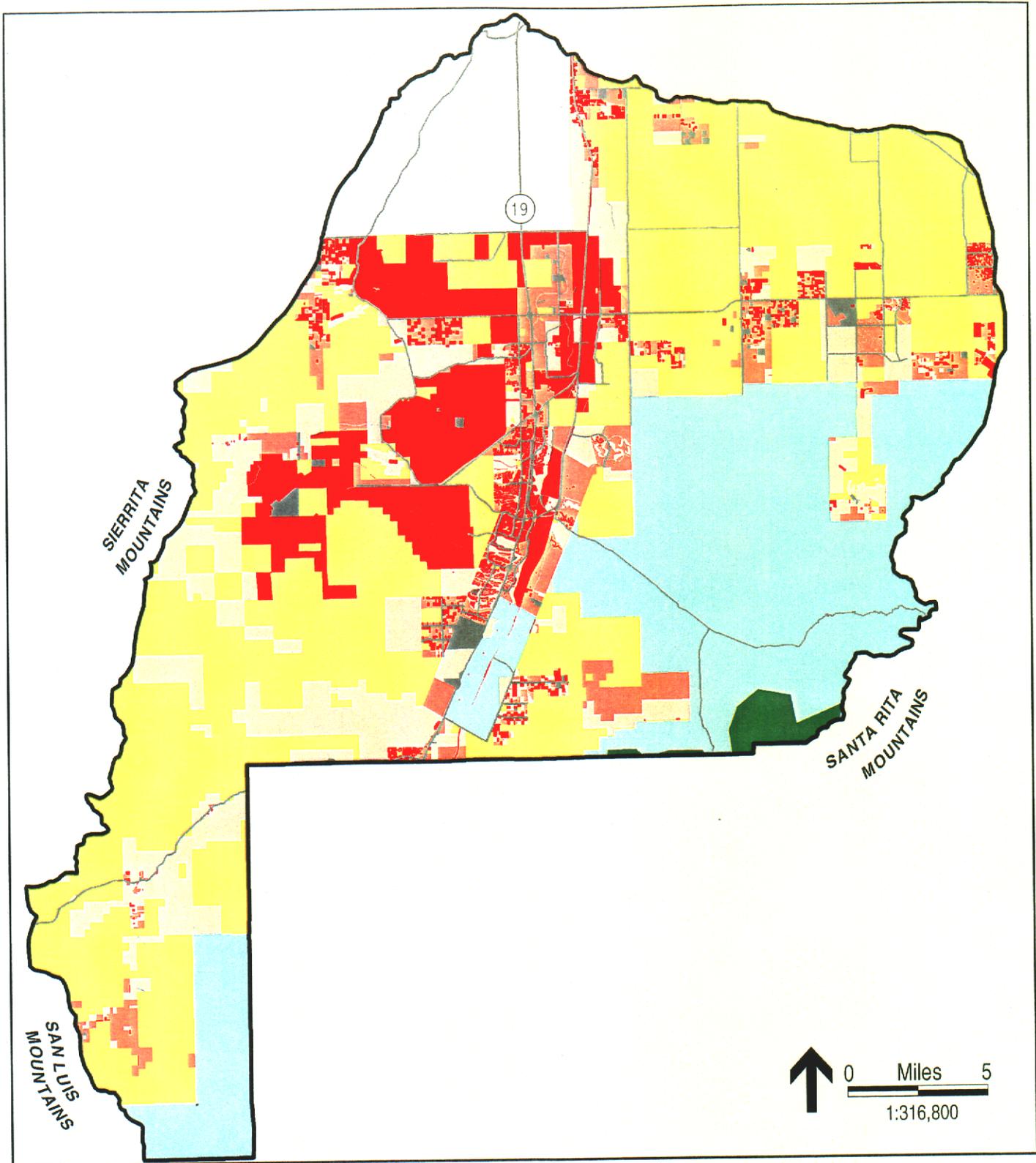
Activities contributing to biological stress are shown on Table 14. These include ground water pumping for mines, agriculture, and urban uses; mining; historic overgrazing; loss of native vegetation to agriculture; conversion of agricultural lands to urbanized uses; rapid urbanization of the I-19 corridor; and lot splitting in rural areas along the Sahuarita Road corridor and in the Arivaca area.

The conversion of some of the pecan groves to residential subdivisions raises concerns because of the presence of numerous bird species, including the yellow-billed cuckoo. The USFWS is currently reviewing a petition to list this bird as endangered (USDI-USFWS 2000). Some of the groves have already been sold for development. Increasing development pressures in the future could trigger further conversion.

The continued urbanization of the I-19 corridor is of concern in part because of its proximity to the Santa Cruz River. A combination of factors has dramatically altered the river channel and floodplain and it has experienced significant widening and deepening, coupled with the loss of channel and bank vegetation. Channelization and bank protection of tributary washes throughout the Green Valley area continues to result in the loss of wash-associated xeroriparian vegetation.

Although the proposed Canoa Ranch Specific Plan was denied, the owners may submit a revised plan for consideration. The area has now been designated as "Resource Conservation" by the Comprehensive Land Use Plan, but unless it is acquired for preservation it will continue to be susceptible to development.

Growth in rural areas by lot splitting has become prevalent along Sahuarita Road and along the Arivaca Road. Arivaca Road closely parallels the Sopori Wash and areas of shallow groundwater. If residential growth and groundwater pumping continues to increase in this area the water table may decline and vegetation that the shallow groundwater supports could be lost. The watershed along the Sahuarita Road consists of numerous poorly defined washes. If development continues to increase in this area and the poorly defined washes are channelized, downstream flooding and upstream erosion and channel cutting will likely result, as they have in other areas under these circumstances. The resulting loss of xeroriparian and upland vegetation can essentially transform an area of rich biodiversity into one low biological resource value. This is a serious concern for this area and elsewhere in other subareas (e.g., Tortolita Fan area). This potential for erosion and watershed degradation will compound the impacts of habitat loss and fragmentation that is associated with development and urbanization of a rural area that is expected to experience rapid growth in the future.



M:\jobs\3273\big\slapsr\thrtcons.apr\usc cons 3/00

Level of Threat Represented by Conservation Status in the Upper Santa Cruz Subarea

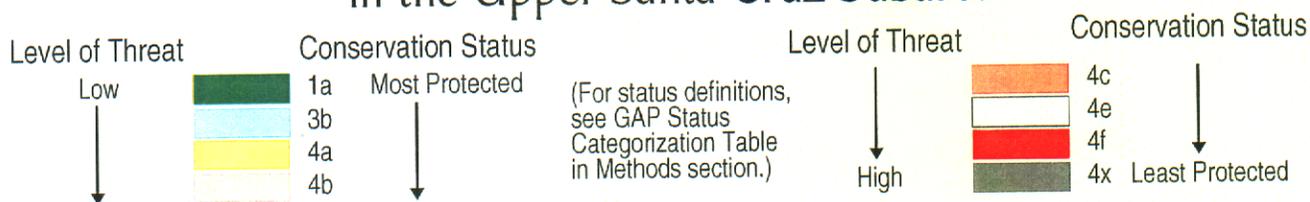


Figure 18

TABLE 14
LAND USE ACTIVITIES WITHIN LAND OWNERSHIP/MANAGEMENT CATEGORIES
OF THE UPPER SANTA CRUZ SUBAREA

Ownership or Management Category	Land Uses and Activities											
	Conversion of Vegetative Cover	Conversion of Ranches	Conversion of Agricultural Lands	Competition/Predation by Invasive Species	Lot-Splitting & Urbanization	Groundwater Pumping	Water Diversion & Impoundments	Recreational Uses	Mining	Roadways	Livestock Grazing	Removal of Plants
Coronado National Forest- unreserved (38,370 acres)	x	-	-	x	-	x	x	x	x	x	x	x
Mt. Wrightson – Wilderness (3,677 acres)	-	-	-	x	-	-	*	x	⊕	x	x	⊕
Pima County Open Space (4,563 acres)	-	-	-	x	-	x	x	x	x	x	x	x
Sahuarita Unreserved – State Lands (303 acres)												
Sucosn Unreserved – State Trust Lands (5,251 acres)												
Pima County Unreserved –State Land (156,494 acres)	x	x	x	x	*	x	x	x	x	x	x	x
Sahuarita Unreserved – Private Lands (8,904 acres)												
Tucson Unreserved – Private Lands (105 acres)												
Pima County Unreserved –Private Lands (148,274 acres)	x	x	x	x	x	x	x	x	x	x	x	x
Tohono O'Odham Nation Unreserved (31,689 acres)												
U of A Santa Rita Exper. Range (51,978 acres)												

x = occurs
 - = does not occur
 * = potential to occur
 ⊕ = historic but not present occurrence

The pressure on ranchers to sell all or portions of their private holdings is as much a concern in this subarea as it is in other subareas. The conversion of ranches to subdivisions and/or lot-split areas poses concern for biological resources. Habitat loss, alteration, and fragmentation can result, along with increased groundwater pumping. Further, the opportunity to manage the land's biological resources on a landscape level is lost.

The casino planned for the intersection of I-19 and Pima Farms Road has the potential to turn this interchange into a major commercial center. This would be increased greatly if this interchange is used for the future connection of the Sahuarita Road corridor (a possible alternative).

The presence of several areas of medium to high potential for mineral resources in the Santa Rita Mountains establishes the potential for continued and possibly expanded mining activities, particularly at the northern end and in the Greaterville area. Effects on biological resources from mining could include large-scale degradation of intact areas, habitat, and fragmentation; potential for downstream watershed contamination; and intensive groundwater pumping to support mine operations. Habitats affected could represent the full range from heavily forested areas at higher elevations, riparian canyons, oak woodlands, and grasslands.

Groundwater pumping to support the mines, agriculture, and urban uses have contributed greatly to the decline in groundwater levels. The proposal to extend the CAP line further south to serve these water users would significantly reduce dependence on groundwater pumping and provide new opportunities for recharge and riparian restoration projects. The draft jeopardy opinion by the USFWS regarding the effect of CAP water on the Gila topminnow within the Santa Cruz River basin raises serious concerns about the viability of CAP use here as well as in other subareas. It may be an even bigger concern in this area simply because of proximity to the upstream effluent-dominated reach of the Santa Cruz that does support the topminnow.

The development of a lake in Sahuarita poses additional concern for groundwater overdraft. Although it is planned to eventually be fed by effluent, until that time it will be filled with groundwater, further adding to the overdraft of the area.

Without some level of protection, such as the Sierrita Ranch Conservation Area could provide, the areas around the Sierrita Mountains will be subject to increasing development pressures, as evidenced by the subdivisions and lot-splitting that have taken place immediately to the northwest. This would be facilitated if State Lands and/or BLM lands are released for private development. Similar concerns exist for the Santa Rita Experimental Range. Although it is administered by the University of Arizona for research and utilized for grazing, it is State Land and as such brings with it a level of uncertainty as to its future. Research and present uses continue at the discretion of the State Legislature. Competition by invasive species, particularly non-native grasses, is a problem for the Experimental Range and ranchers in this subarea.



An Overview of Pima County's Watersheds and Watercourses

**Pima County
Sonoran Desert Conservation Plan Report**

April 2000

**Barbara Tellman, Water Resources Research Center, University of Arizona
Clint Glass, CMG Drainage Engineering
John Wallace, J.E. Fuller, Consultants**

Chapter 6

Subarea 3 - Upper Santa Cruz

WATERSHED/WATERCOURSE CHARACTERISTICS

THE WATERSHED

The subarea extends roughly from the northern San Xavier Indian Reservation boundary at Los Reales Road on the north to the Pima-Santa Cruz County line on the south and from the crest of the Sierrita Mountains on the west to the crest of the Santa Rita Mountains on the east. Elevations along the Santa Cruz River in the subarea range from approximately 2500 feet where the river passes Martinez Hill, to approximately 3000 feet where the river crosses out of Santa Cruz County. Elevations within the watershed range up to almost 6000 feet at Samaniego Peak in the Sierrita Range and 9400 feet at the peak of Mt. Wrightson in the Santa Rita Mountains. The subarea is shown on Fig. 6-1. The watershed is depicted on Fig. 6-2.

The Santa Cruz River Section

The Santa Cruz River originates on the east side of the Santa Rita Mountains, goes south into Mexico and then loops back to the United States east of Nogales. It gains additional flows from Sonoita Creek and several smaller watercourses. Mountain snows provide a significant amount of water to the watershed. The river is an effluent-dominated stream downstream of the Nogales International Wastewater Treatment Plant, but that flow dries up before it enters Pima County.

The Pima County portion of the watershed consists of two broad terraces between the river and the bordering mountain ranges to the east and west. Both terraces are drained by watercourses which vary in definition from well-defined foothills type watercourses to poorly defined sand bed channels which sometimes transition to a distributary flow pattern.

The Santa Cruz River is a wide sandy channel through most of this reach. The river once flowed perennially in some spots, most notably through the San Xavier Indian Reservation. The river and floodplain have seen dramatic changes over time. During the 19th and 20th centuries the river experienced widening and deepening as a result of numerous factors including human activity in the floodplain. During the period 1936-1986, the reach of the river through the San Xavier Reservation experienced 20 to 30 feet of vertical entrenchment and the mean width of the channel more than doubled. (Parker, 1995). Between the San Xavier reservation and Green Valley the river experienced about 20 feet of incision which cut off several other flow paths of the river. Channelization along this reach also shortened the overall river length by about one mile (Parker, 1995). Between Green Valley and the Santa Cruz County line the river was fairly stable until the floods of 1977 and 1983 when this segment underwent major channel widening as a result of the floods. Between 1976 and 1986 alone this segment experienced about 1,200 feet of widening (Parker, 1995). Opinions vary as to the cause of the channel

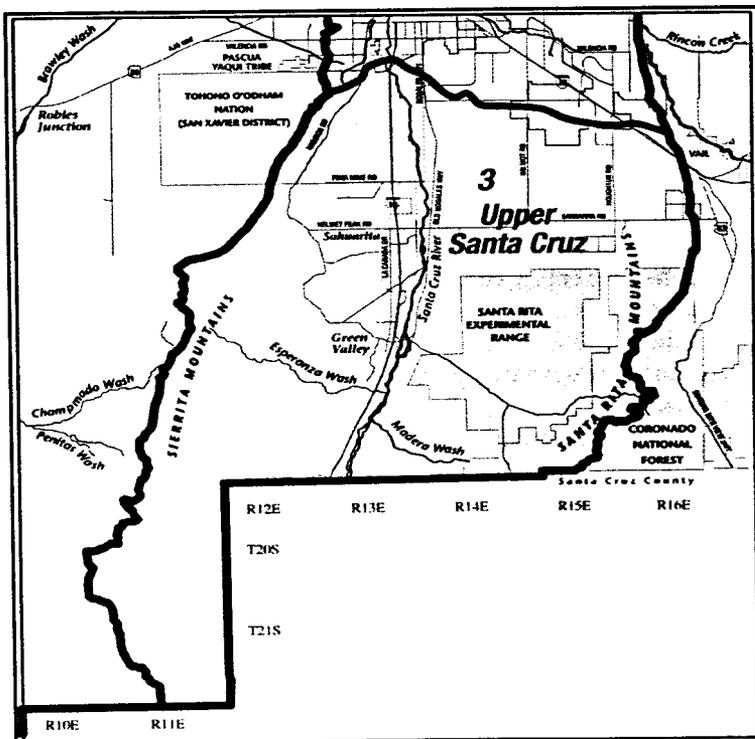


Fig. 6-1. The Upper Santa Cruz Subarea.

cutting and entrenchment along the Upper Santa Cruz river during the 19th and 20th century with some attributing it to a dry climatic period, over-grazing of cattle, improperly designed diversion canals, geologic events or a combination of these three.

The west terrace, between the Santa Cruz River and the Sierrita Mountains, is also characterized by steeply sloping alluvial surfaces extending down from the mountains to the river. Numerous small drainages carry runoff from the mountains to the Santa Cruz River. This terrace is the site of numerous copper mining operations and the community of Green Valley. The large mines in this area effectively preclude runoff from a considerable portion of the mountain front from draining down into the river. The community of Green Valley is traversed by numerous improved drainageways that convey runoff from the remaining mountain front and terrace areas down to the river. These drainageways vary in size and shape but are generally lined with rock or cement on either the sides and sometimes the bottoms. They are generally well defined and trapezoidal in cross-section. As with the east terrace, drainages here are relatively steep (1 percent slope or greater).

The East Piedmont

The east piedmont, between the Santa Cruz River and the Santa Rita Mountains, is characterized by broad expanses of grasslands intermixed with desert brush and rangeland. This terrace generally drains the north and west faces of the Santa Rita range. A substantial portion of this piedmont is state land, including the Santa Rita Experimental Range (SRER) which is owned by the state and administered by the University of Arizona College of Agriculture. The SRER consists of 83 square miles characterized by small areas of steep, stony foothills and a few isolated buttes but the greater part consists of long, gently sloping alluvial fans (Medina, 1996). Upper fans slope rather steeply and are cut by canyons and arroyos. At lower elevations, the slope diminishes to about 100 feet/mile and drainages become relatively shallow. Some parts of the lower range are characterized by terraces, breaks, or low escarpments and numerous gullies. Elevations range from 2,900 feet in the northwestern corner to about 5,200 feet in the southeastern part. Average annual rainfall within the SRER increases with elevation, from 10 inches at 2,900 feet to almost 20 inches at 4,300 feet (Medina, 1996). Research indicates that the grasslands on this terrace have experienced a decline since the middle of the 20th century (Medina, 1996). Recently, some major development has occurred along the southern portions of this terrace where it meets the geologic floodplain of the Santa Cruz River.

MAJOR WASHES

The only major wash within this subarea is the Santa Cruz River which flows south into Arizona from Mexico. The drainage area for the Santa Cruz River at Continental Road is 1682 square miles. The 100-year discharge for the Santa Cruz River along this reach is 45,000 cfs.

The Santa Cruz River channel is entrenched several feet below the adjoining geologic floodplain grades. The depth of incisement varies from about 15 feet in the vicinity of Pima Mine Road to about 6 feet near the south boundary of Pima County. The degradation (incisement) has decreased the amount of overbank storage provided by the upper Santa Cruz River. However, the floodplain continues to extend across the valley floor during high-magnitude floods. This overbank flooding which occurs at widths generally ranging between 0.5 and 1.7 miles continues to provide some peak flow reduction benefits to downstream channel reaches.

Bank erosion is evident along most reaches of the upper Santa Cruz River. This bank erosion is associated with the higher velocities of flow which occur as a result of historical channel bed degradation. The banks along most reaches are comprised of fine grain silts and clays which erode easily during floods. Bank protection has been installed along the west bank adjoining the Santa Rita Springs development and along the east bank extending approximately 1.0 miles downstream of the Continental Road bridge. A short segment of bank protection has been installed by Pima County along the reach adjoining the Wastewater Treatment Plant.

TRIBUTARY WASHES

The character of tributary washes varies from one location to another. There is a broad area of distributary flooding which covers many of the washes emanating from the Santa Rita Mountains east of the Santa Cruz River. This tributary flooding also occurs intermittently where tributary washes approach the Santa Cruz River along the west floodplain fringe.

Sopori Wash is the largest tributary wash within this subarea. This wash enters the Santa Cruz River along the west side of the basin at the Pima County/Santa Cruz County line. Upper reaches of Sopori Wash are located within

Pima County at a point approximately seven to ten miles west of the confluence with the Santa Cruz River. The upper reaches of Sopori Wash provide a significant amount of overbank storage capacity through the broad valley passing through Township 20 South, Range 11 East.

HUMAN IMPACTS ON THE WATERCOURSES

FLOOD MANAGEMENT PLANS AND ACTIVITIES

Because of the potential for flooding of the Santa Cruz River, Pima County maintains a warning system of precipitation and flow sensors at Nogales, Arivaca Junction and Green Valley.

The east terrace has been the subject of a technical investigation for floodplain management purposes. The "Hydrologic Investigation for the Lee Moore Wash Watershed" quantified hydrologic conditions and recommended floodplain management policies for the roughly 213 square mile watershed of the Lee Moore Wash which lies to the north of the Santa Rita Experimental Range. This area consists primarily of a tributary network of poorly defined watercourses within an inactive alluvial fan. The findings of the 1988 investigation indicate that lack of proper management of development in the area could result in an up to 300% increase in flood peak discharges on the Lee Moore Wash if channelization of the poorly defined washes were allowed to occur. The increase in flood peak discharges would largely be the result of loss of flood storage in the floodplains adjacent to the under capacity washes and the associated acceleration of collective downstream flow concentration. Somewhat prophetically, the report recommends adoption of policies prior to an increase in development of the area which has been occurring in recent years along Sahuarita and Houghton Roads. This concern was expressed in 1988 as plans for extension of Sahuarita Road through the area were underway. Only two years later, in 1990, the recently completed Sahuarita Road was badly damaged by flooding during a July 1990 storm, highlighting the flooding potential of the area.

During the early and mid 1990's some grading and berming of material was done along the river between Pima Mine Road and Continental Road to protect pecan groves along the river. In addition, some channelization was done upstream of the San Xavier Indian Reservation which caused entrenchment of the channel and cut off of other flow paths.

Development in Green Valley has led to construction of flood control structures on most of the washes which drain the Sierrita Mountains and foothills. These washes exist now as excavated and in many cases, rock or cement lined canals. In some cases however, the washes have been left relatively undisturbed with houses set back from the wash instead.

Pima County has \$1,000,000 in bond funds authorized in the 1997 election to do drainage improvements at Camino Portillo in Green Valley. The culverts will be expanded and a 160' long earthen dike protected by concrete installed on the north bank of the wash. In the downstream section the channel will be excavated and new bank stabilization constructed along the entire 2,300' reach.

Another bond project at Continental Ranch in the Green Valley area involve bank stabilization and berm construction with rip-rap and gabions to protect homes in the subdivision from flooding and erosion damage.

Pima County also has plans to improve drainage crossings in Sahuarita with construction of culverts and other drainageway structural measures. The conveyance capacity will be increased, reducing flooding.

The Bureau of Reclamation and the Tohono O'odham Nation constructed an erosion control project near the west bank of the river north of the Mission Road bridge. The purpose is to protect the bank from further erosion and provide an area for riparian habitat regeneration using a flow of CAP water.

The northern and south central parts of Green Valley have been declared critical basins because the existing culverts are inadequate and because several neighborhoods experience flooding or severe erosion. The southern and north central parts have been declared balanced basins because they have adequate capacity to convey runoff but the culverts under I-19 are inadequate and limit the capacity of the system. The northern part of the east terrace is designated as a balanced basin and discussed further in the Middle Santa Cruz chapter. (See Chapter 3 for information on critical and balanced basins).

TRANSPORTATION

Interstate 19 traverses the area, roughly following the Santa Cruz River and connecting Nogales with Tucson. The Arivaca Road (paved 2-lane) connects I-19 with Arivaca and the Altar Valley. Sahuarita Road (paved 2-lane) connects I-19 with the southeast side of Tucson and I-10 at Houghton Road. Some truckers use the road to bypass the metropolitan area. A railroad track roughly parallels I-19 from Nogales to Tucson. The Tucson International Airport is at the northern end of the subarea.

WATER AND WASTEWATER-RELATED LAND USES

Water Supply

Depth to water ranges from about 70 feet just north of the Santa Cruz County line to more than 500 feet at the northern flank of the Santa Rita Mountains, with some near-surface flow at the higher elevations. The area has experienced a major drop in the water table because of groundwater pumping for the mines, for agriculture, and for urban uses. Springs that once flowed near San Xavier no longer flow because of this drop in the water table.

The Green Valley-Sahuarita-Continental area is served by seven private water companies. In addition, the mines and the pecan growers have their own wells, as do individuals in the area. There are CAP allocations in the area, but not yet the delivery system to use it. ASARCO may participate in the Groundwater Savings Facility Program (in lieu-recharge) by using CAP water in lieu of pumping groundwater if technical and economic issues can be resolved. (See Chapter 3 for information on this program).

The City of Tucson has one of its most productive wellfields in the metropolitan region on the northern boundary of the subarea, adjacent to the Tohono O'odham Nation. In this area the water table declined more than 100' between 1940 and 1995 and there is a cone of depression at the northern boundary of the subarea. The Water Development Corporation documented the connection between the decline of the water table and the demise of a giant mesquite bosque and cottonwood forest south of San Xavier, which died in the 1940s and 1950s when the water receded beyond the root zone of the trees. The Tohono O'odham are considering using part of their CAP allocation to add flows to tributary washes to rehabilitate the habitat. (See below)

Wastewater

Pima County operates a wastewater treatment facility in Green Valley, using aerated lagoons. Sahuarita is in the process of becoming designated as the management agency for most of the town. Many individuals in the rural parts of the area are on septic systems. There is little reuse of wastewater in the region, but the recent agreement between the City and County (See Chapter 3), should open up new opportunities for use of wastewater.

Recharge

Parts of this subarea are used and more are proposed for use for CAP recharge projects. At Pima Mine Road recharge basins already exist and projects are in the planning stage for instream recharge from that area to Valencia Road. The Pima Mine Road Recharge Project (PMR) was developed by CAP jointly with the City of Tucson Water Department as a State Demonstration Recharge Project for the underground storage of Colorado River water. A 2-mile long, 36-inch diameter pipeline will convey water by gravity from CAP's aqueduct to the recharge basins. The project occupies 14 acres, with basins excavated twelve feet below the surface. Up to 10,000 acre-feet of CAP water can be recharged during the pilot phase. CAP pipeline reaches this area from the Altar Valley through the San Xavier District and could possibly be extended to Green Valley and the copper mine.

Another recharge proposal involves in-channel recharge through the San Xavier District. This proposal would require agreement between the Tohono O'odham and the City of Tucson. Approval of this project would also require approval of the U.S. Fish and Wildlife Service in light of possible impacts that organisms introduced by CAP water might have on threatened and endangered species.

EXISTING PUBLIC LAND USES

The upper watershed is in the Coronado National Forest which includes the popular Madera Canyon Recreation Area, with its trails, picnic areas and campground. Private residences in the Canyon have been phased out. Grazing is allowed in parts of the National Forest.

The 530,811 acre Santa Rita Experimental Range is between the Madera Canyon area and Green Valley. This land is owned by the State of Arizona and managed by the University of Arizona for long-term grassland studies. This area is not open for grazing or recreational use.

HISTORIC LAND USES

Parts of this area are the most historic in the region. People have used the area for at least 2,000 years. The course of the river south of this subarea was a shallow, marshy creek with perennial water. At the present county line the geology changes from high bedrock to the south and deep alluvium to the north. The river was historically normally dry between the county line and the springs in the Martinez Hill region, although the water table was very close to the surface. The springs provided a dependable supply of water for Indians and attracted Spanish missionaries to the area where they established the San Xavier Mission and grew crops. The Tohono O'odham farmed the region around the mission for many years, but sinkholes have developed in the former agricultural land making this land unusable.

Spanish miners worked in the Santa Rita Mountains as did Anglo miners starting in the mid-nineteenth century and there are still remains of historic mines in the area. The river became a major transportation corridor for gold seekers going to California and many other travelers.

The Continental-Green Valley area has been used for farming for almost one hundred years. Pecan groves have replaced crops such as corn and cotton grown on family farms.

EXISTING PRIVATE LAND USES

The Santa Cruz River Region

The only incorporated town in the subarea is Sahuarita. Sahuarita's current population is less than 3,000, but is projected to increase to about 9,000 by 2015. Continental is a small agricultural community. Green Valley which has a much larger population has repeatedly rejected attempts at incorporation. The Tucson City limits reach the northern edge of the subarea.

The primary agriculture in the area is in the FICO pecan groves along the river in the Green Valley/Continental area. Although some new groves have been recently planted, some of the older groves have been converted to residential use.

The San Xavier portion of the subarea is largely used for ranching, some residential use, and tourism at the Mission. The ASARCO copper mine extends onto the San Xavier District. Although most of the land along I-19 has been left undeveloped down to Sahuarita, the tribe is currently constructing a new casino and connecting road on the east side of I-19 at the southern boundary of the tribal property.

Large open pit copper mines are very significant features in this area, extending from within the San Xavier district where land is leased for mining, all the way to Green Valley and for many miles west. The mining which has occurred on the foothills terrace between Green Valley and the Sierrita Mountains and up into the San Xavier District of the Tohono O'odham Nation has resulted in the trapping of most of the mountain runoff in the tailings ponds associated with the mines. For the most part the effect of these mines on drainage through Green Valley has been to reduce flooding. However, mining operations are exempt from coverage under most floodplain management regulations in Arizona. Hence, the effectiveness and safety of the tailings mines as flood control structures is undocumented.

The mining operations may have water quality impacts. Water is used in the process of removing copper and other minerals from the ore and the resulting contaminated water is reused to some extent, but then disposed of in tailings ponds where the water evaporates and reject materials remain. Tailings ponds loom behind Green Valley and to the north. The USGS is currently conducting a study of the potential impacts to water quality of mining operations in the Upper Santa Cruz watershed (see <http://minerals.cr.usgs.gov/santacruz/index.htm> for more information on this project).

The East Terrace

The east terrace on the north side of the Santa Rita Mountains slopes gently toward the flat valley. A granite mine on this side provides construction materials for a growing Tucson metropolitan area. In some areas wildcat development has occurred and there are a few small neighborhood developments near the eastern boundary of the subarea, most notably Corona de Tucson. Many acres of land are advertised for sale, both as large acreages and as developed lots within planned subdivisions. Sycamore Ridge, for example, to the west of Corona de Tucson, has lots for sale of minimum 4 acres with utilities. South of I-10 in the Wilmot area is a State Prison, and the Pima County Fairgrounds.

PROJECTED LAND USES

The Pima County Comprehensive Plan allows for commercial and residential zoning on the west side of the River from the county line through Sahuarita and for mixed uses north of the mountains to I-10. Green Valley is expected to continue to grow at a rate of 2-3 percent annually. The incorporated town of Sahuarita is currently considering additional high density land use rezonings, commercial uses, golf courses and a community lake which will use groundwater. Because the lake is designated as a town lake, rather than a private lake, it is exempt from state laws governing use of groundwater on new lakes.

An attempt to rezone the Canoa Ranch on the southern boundary of the subarea failed and the area is under consideration for a historical and natural preserve, although additional rezoning applications may be submitted. The Santa Cruz County portion of the river is also experiencing population growth pressures and a continuous population corridor from Nogales to Marana is possible in the future.

Several attempts have been made to rezone the Canoa Ranch, near the Santa Cruz County line, for relatively high density development and resort facilities. The Board of Supervisors denied a major rezoning request, but new requests are rumored. Current county policy is to attempt to protect as much of this area as possible as open space. Private citizen groups are actively working to raise the necessary funds to preserve the historic and natural features of the area as a park, living history museum, or other format.

Additional residential or commercial uses in this area would have impacts on water supplies if groundwater pumping is the water source and on drainages and flooding potential as new impervious surfaces are constructed, drainages altered, and flood control structures built. This will especially be a problem if construction occurs on the broad floodplain. Expansion of Sahuarita Road or any other new road needed for an expanding population would impact drainages in the many ways described in Chapter III.

There may be demands to widen Sahuarita Road as more and more truckers use the road as a bypass between I-10 and I-19 and as more housing development occurs. This would probably involve changing the dip crossings to all-weather crossings. This in turn would probably lead to additional residential and commercial use of that area.

Copper mining in this area was projected to have diminished by now, but new processing techniques have extended the life of the mine. This copper will eventually be mined out and active operations will cease, but the long term land use and watershed impacts of the open pit mine and the tailings ponds will remain.

The granite mine at the north end of the Santa Ritas has a much longer projected lifetime, keeping pace with the demand for construction materials. Because of the provisions of the 1872 Mining Laws, it is possible that the Santa Rita Mountains may be the location of new mining operations, although the only recent proposal has been on the east side of the range, outside this subarea.

Agriculture (traditional crops as well as crops such as alfalfa) will return to San Xavier when the CAP pipeline reaches the area in 2001. The Tohono O'odham also have plans to restore parts of the Santa Cruz River as well as a number of washes, using their allocation of CAP water. They are also considering using CAP water to reconstruct the mesquite bosque that was once south of the mission, possibly solving the sinkhole problem in the process.

ISSUES FOR DISCUSSION

POPULATION GROWTH ALONG THE RIVER

With the projected population growth in Green Valley and Sahuarita additional pressures will be put on the water supplies of the area as well as the drainage features. How should these pressures be handled? Should growth be limited to reasonably available groundwater supplies or should CAP water be brought farther south for use on turf and/or treated for municipal use?

POPULATION GROWTH ON THE NORTH SIDE OF THE SANTA RITAS

How should the distributary flow issues be handled as the east terrace is developed? Should the trend be towards planned subdivisions, wildcat development, or towards minimal further development?

CANOA RANCH

What should be done at Canoa Ranch? Should it be zoned for higher density residential development or should it be preserved as open space? Is a park or museum a good use for that land? If developed what measures should be implemented to preserve overbank capacity.

WATER SUPPLIES

If the CAP pipeline is extended to Green Valley, enough water would be available for more population growth without using additional groundwater. Is this a desirable goal? Additional land will be used for recharge projects if the current projects prove to be successful. Is this a desirable land use for the area?

EFFLUENT USE

Should better use be made of wastewater produced in this area? What kinds of uses are preferable: constructed wetlands, riparian restoration, and/or application to golf courses or the pecan groves with corresponding reduction of groundwater use? How should any such projects be implemented?

WIDENING OF SAHUARITA ROAD

Should Sahuarita Road be widened and made into an all-weather road?

CONVERSION OF SANTA RITA EXPERIMENTAL RANGE

Although there are currently no plans for the University to abandon the Range, this is possible in the future. As this is State Trust Land, it would be available for sale at some time in the future. What should be the long-term plan for this land? Should it remain as open space?

EXPANSION OF TOURISM AT MADERA CANYON

Increasing tourism will place pressures to provide more services in Madera Canyon and to improve the road into the canyon. What measures should be taken to assure that the adverse impacts are minimal?

Region Within the Subarea	Grazing	Wildcat Subdivision	Planned Subdivision	Copper Mine	Sand & Gravel Mine	Pumping	Agriculture	Recreation
Santa Cruz River vicinity		X	X+		X	X+-	X-	X+
Piedmonts	X	X+	X+			X+		X+
Mountains	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

Fig. 6-3. Generalized Matrix of Potential and Existing Impacts on Watercourses in the Upper Santa Cruz 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
Santa Cruz River vicinity	X	X	X			X	
Piedmonts	X	X	X		X		X
Mountains							X

Key: X = Is possible and could have significant impact if it occurred.

Fig. 6-4. Generalized Matrix of Potential Options for Reducing Stress on Watercourses in the Upper Santa Cruz Subarea



Ranching in the Upper Santa Cruz Valley: Descriptive Summary

Introduction:

The Upper Santa Cruz Valley was historically one of the most significant ranching valleys in eastern Pima County. At the heart of the valley is the Santa Cruz River, once a reliable if not perennial source of water along certain reaches. The river and its floodplain was a focus of prehistoric Native American settlement and agriculture, the historic corridor of Spanish Colonial exploration and mission settlement, and the location of Spanish and Mexican period land grants, which established some of the first ranches in southern Arizona. El Camino Real was also the principal route of travel, and linked Colonial New Spain with Tucson, the military and mission settlement at the northern frontier of the Spanish colonial empire.

Today, the Upper Santa Cruz Valley remains an important route of travel, linking Mexico with the United States along Interstate-19. Much of this valley remains largely rural, and is characterized by significant unfragmented expanses of natural open space, comprised principally of ranchlands and a limited amount of public preserves. However, because of Interstate-19 and the developing private lands along the Santa Cruz River floodplain, the river corridor along this historic route of travel is rapidly urbanizing, especially in the areas of Green Valley and Sahuarita. With the exception of that portion of the river that flows through the San Xavier District of the Tohono O'odham Nation and the possibility of an open space preserve in the Canoa Ranch and Amado areas, the conversion of rural, agricultural private lands along the Interstate-19 transportation corridor to development and commercial use is likely to continue, resulting in "strip urbanization" within the Upper Santa Cruz Valley.

At the present time, the future of the Canoa Ranch comprised of 6400 acres along the Santa Cruz River is not resolved. Proposed for development and the expansion of the Green Valley retirement community by Fairfield Homes, debate continues about how to preserve its natural and cultural values. Once one of the most significant working ranches in southern Arizona, this ongoing debate over the conservation of Canoa Ranch reflects the greater community's concerns about how to control urban sprawl, maintain open space, conserve water, allow public recreation, and protect cultural and natural resources, while acknowledging that growth in the region is ongoing.

As a consequence of the largely undeveloped nature of the valley and the development trends along the Interstate-19 corridor, ranching continues in the Upper Santa Cruz Valley, but is discontinuous from east to west and is spatially separated by the urbanization of the Interstate-19 corridor. Environmentally, ranching tends to be located in the upland areas on the slopes and bajadas of the surrounding mountain ranges and located away from the rapidly developing riparian corridor of the Santa Cruz River.

Historical Summary of the Upper Santa Cruz Valley:

The initial occupation of the valley by the prehistoric Archaic peoples dates perhaps as early as 5,000 B.C., and while there are no Paleoindian occupation sites that have been identified, Paleoindian use of the valley perhaps as early as 10,000 B.C. is certainly possible. Previous archaeological investigations indicate that people have occupied southern Arizona for at least

11,000 years. Three major prehistoric archaeological time periods, Paleoindian, Archaic, and Hohokam are recognized in the Upper Santa Cruz region. Prehistoric sites were predominantly Hohokam sites (ca. A.D. 700-1450), but some sites dating to the earlier Archaic Period (ca. 5000-1000 B.C.) are also present.

Late Archaic sites have recently been found to represent a considerable occupation in the Tucson Basin in areas along the Santa Cruz River with reliable water. Given the water reliability at Canoa, it is possible that similar occupations may be present at the Canoa site. In addition to large village complexes along the upper floodplain, seasonal habitation and limited activity sites associated with plant procurement and processing are also likely to be present. Houses would take the form of shallow, round pit houses, and the artifact assemblage would be comprised largely of stone tools and ground stone, with no pottery vessels. Increasing reliance on agriculture and the beginnings of ceramic technology mark the transition to what archaeologists have termed the Hohokam sequence of occupation.

The Hohokam were a sedentary agricultural society who constructed houses built in shallow pits and later as above ground pueblo-like structures of rock and adobe. They produced both plain and decorated pottery and other crafts using shell, stone and clay. Villages tended to be organized into clusters of pit houses probably representing extended family groups, and public architecture in the form of ballcourts which gave way to later platform mounds were typical. Agricultural intensification is evidenced by use of the irrigable floodplain, as well as use of upland areas where dry farming and cultivation of agave became increasingly common. By the late Classic period, many of the villages were abandoned and populations aggregated into a smaller number of large integrated pueblo communities typically enclosed by a compound wall. While the causes of the decline of the Hohokam are not fully defined, some stresses may have been environmental, limits to food production, increased population pressure, conflict from changes in political and trade alliances, and perhaps social and religious factors. Whatever the suite of factors, by the end of the Classic period, the great cultural traditions of the Southwest, the Hohokam, Anasazi, and Mogollon, ended, and populations dispersed, marking the end of the Classic Period by about A.D. 1450.

Following the demise of the Hohokam tradition and the abandonment of the large villages, the ensuing period is not well-documented or well-understood. Social and economic changes are significant, with evidence for much lower organizational and socio-political complexity. The archaeological record is sparse and fragile suggesting mobility and small group size. By the time the Spanish arrive in the 1690s, these people are identified linguistically as northern Pimans. Settlement was dispersed into small groups living along river courses in simple brush structures pursuing an agricultural economy supplemented by hunting and gathering. Despite these considerable changes, the Pima and Tohono O'odham consider the Hohokam their ancestors, as do some of the Hopi clans.

The very first Spanish entradas to venture into southern Arizona in the 1690s were relatively late in comparison to earlier explorations elsewhere in the Southwest. Father Kino's arrival in southern Arizona was indeed a landmark event that brought significant changes in social and economic life as well as religious beliefs. In 1691, Kino first traveled from Sonora north along the Santa Cruz River to the Piman villages of Tumacacori and Guevavi and the Tucson area settlements at Bac and "stjuckshon," later known as Tucson. The very first mission was established at Guevavi and its "visita" at Tumacacori. The northernmost mission, San Xavier

del Bac was established by Kino in 1700 to serve the Tucson area. The route connecting these missions in the Santa Cruz River valley between Sonora and Tucson were protected by presidio garrisons as along other Caminos Reales elsewhere in New Spain.

With growing unrest among the Piman mission communities and increased pressure from Apache raiding, the Spanish military assumed increasing power over the communities almost exclusively served by the Missionaries. Following the Piman Revolt of 1751, a military presidio or garrison was established at Tubac in 1753. Efforts to "reduce" or concentrate the native Pimans into larger aggregate communities were increased. This concentration unfortunately created rich raiding opportunities for Apaches who repeatedly attacked these settlements. By the 1770s, Apache raiding was so devastating on the San Pedro River that the presidio of Terrenate was transferred. It lasted only four years before being transferred again. The native Sobaipuri abandoned their villages and joined the Tucson area settlements, leaving the Apaches to refocus their raiding on the Tucson mission villages. As a consequence of Apache raiding on the Tucson villages and to secure some protection for the route to Alta California, the Tubac presidio was relocated to Tucson in 1775, and the Tucson villages were "reduced" to Bac and Tucson. Also at this time, the Juan Bautista de Anza expedition from Sonora to establish the San Francisco, California settlement followed the route of the Camino Real along the west bank of the Santa Cruz River. Journeying north from Tubac, the expedition camped at "La Canoa," which is the first campsite location mentioned in the 1775 Spanish journals, "Llano Grande" near Sahuarita, and at San Xavier, all within the Upper Santa Cruz Valley.

Spanish and Mexican Land Grants & Early Ranches in the Upper Santa Cruz Valley:

With the implementation of a "pacification policy" that provided food and other goods to the Apaches living near the Tucson presidio, there were relatively peaceful conditions beginning in the 1780s, which lasted until Mexican Independence after 1821. During this time, Spain encouraged settlement by civilian farmers and ranchers by making large grants of land to potential settlers, and Mexico followed the same policy. Some 21 petitions for land grants were filed in southern Arizona during this time, including the San Ignacio de la Canoa Land Grant and El Sopori in the Upper Santa Cruz Valley. Together these claims totaled nearly 190,000 acres or about 300 square miles. While the Canoa land grant would be later upheld in US courts, the Sopori land grant was denied. Today these original land grants represent the very earliest attempts to establish cattle ranching by civilians in the Santa Cruz Valley outside of the mission settlements.

San Ignacio de la Canoa - In 1820, two brothers, Tomas and Ignacio Ortiz applied to the Spanish government for a land grant of four "sitios," or 17,000 acres, (1 sitio = 1 square league or 4,338.5 acres) along both sides of the Santa Cruz River and the Camino Real, beginning five leagues (1 league = 13,747 ft or 2.6 miles) north of Tubac at La Canoa and extending north to El Saguarito, today known as Sahuarita.

The Ortiz brothers received this grant at the transition to Mexican independence in 1821 and began cattle ranching later in the 1820s. However, increasing hostilities from Apaches drove the Ortiz families from the ranch in the 1830s, although they continued to raise cattle and retained title to the land. Rosa Ortiz later testified in the Ortiz land claim hearing that Indians burned their ranch house when she was a little girl and the family moved to Tubac. Some years later, Apaches also burned their Tubac house, and their land grant title papers were destroyed as well. Title was restored in 1849 by the Mexican government.

Following the Gadsden Purchase in 1854, which brought the Canoa Ranch into the United States, a group of 18 squatters from Maine under the leadership of a man named Edwin Tarbox established a lumber camp, hotel, and residences at La Canoa known as the Cross Road Tavern. This settlement of lumbermen at Canoa operated successfully for several years until it, too, was destroyed in an Apache attack in 1861 known as the Tarbox Massacre. All settlers were killed and the hotel and houses were burned to the ground. By the beginning of the American Civil War, the Santa Cruz Valley became the scene of intense warfare with the Apache, which lasted some 25 years.

Despite this ongoing threat, Tucson businessmen Frederick Maish and Thomas Driscoll purchased the Canoa Land Grant in 1876 from Tomas Ortiz and the heirs of Ignacio Ortiz who was killed by O'odham Indians in 1857. They petitioned the US government for recognition of the grant in 1879 and confirmed title in 1880. In 1899, the Government Land Office surveyed the boundaries of the Canoa Land Grant, setting stones at half-mile intervals and centered on the Santa Cruz River, which resulted in today's legal boundaries.

Maish and Driscoll continued the cattle ranching operation throughout their tenure, leasing the property for a brief period from 1910-1912, when the Canoa Land Grant was sold to Levi H. Manning in 1912, for \$165,000. He proceeded to expand and develop the ranch into what is reported to have been one of the finest cattle ranches in the southwest. In 1916, Manning sold the northern half of the land to the Intercontinental Rubber Company for a wartime experiment in the raising of guayule as a substitute for rubber. However, the economics of synthetic rubber precluded its becoming a success, and the project was abandoned, leaving the settlement of Continental as testimony to this experiment.

Meanwhile, Manning continued to expand the Canoa Ranch and acquired adjacent lands increasing the acreage of the Canoa Ranch to over 100,000 acres. In 1921, Manning's son Howell Sr. took over actual operation of the ranch, and by 1925 the Canoa Ranch had been developed into a hacienda complex of Sonoran-style adobe buildings housing the Manning family and as many as 35-40 cowboys and their families. A school was built for their children, and the Canoa Ranch, at its peak between 1912 to 1951, operated as a small village and became the social and economic hub of the middle Santa Cruz valley.

With the death of Howell Manning's son, Howell Jr. in 1951, Howell Sr. decided to consolidate his assets, and the Canoa ranch began to be sold off. In 1953, 128,000 acres of deeded and leased lands were sold to Kemper Marley of Phoenix, which now comprises the Marley Ranch holdings. The land was sold for about \$600,000 and took almost all of the Manning's holdings except for the southern half of the original Canoa Land Grant. In 1967, the Madera Land and Cattle Company purchased 2600 acres of the Canoa Ranch. Howell Manning Jr. is survived today by his wife, Louise "Deezie" Manning-Catron and two daughters, Anne and Leslie.

Since the sale of the ranch holdings, ownership of the southern half of the original Canoa land grant has changed numerous times, until the most recent purchase of 6400 acres by Fairfield Homes for about \$6.4 million or \$1000 per acre. The northern half of the original Canoa Land Grant now comprises the Green Valley community, pecan orchards owned by Farmers Investment Company (FICO) and other private holdings.

El Soporí Land Grant - The name Soporí is either a corruption of Sobaipuri, the name of the Pima Indian group encountered by Fr. Kino in the 1690s, or from the Spanish word, *sopor*, meaning peaceful or drowsy. Like Canoa, Soporí also was a place with reliable water where a spring, *Ojo del Agua de Soporí*, was used to irrigate the Soporí valley. Also like Canoa, this

was a place of long-term human settlement and an historic Pima village or rancheria, which had been occupied for many years prior to the Piman Revolt of 1751. Abandoned after the revolt and as a consequence of the Spanish policy to aggregate native peoples into mission communities, the Sopori rancheria became one of several ranches and a rich mine owned by Captain Juan Bautista de Anza when he was commander of the Tubac Presidio from 1760-75. With his departure and Mexican Independence in 1821, Sopori was again abandoned and depopulated.

Despite Apache raiding of outlying ranches, a wealthy Sonoran, Joaquin Astiazaran petitioned the Mexican government in 1838 for a grant of 31 and 7/8ths sitios in the "wastelands of Sopori," stretching from Tubac to San Xavier. He apparently never occupied the land, but his heirs were able to sell their rights of the unconfirmed land grant to American interests following the Gadsden Purchase of 1854. These interests, the Arizona Land and Mining Company and the Sopori Land and Mining Company, each purchased portions of the Mexican claims as well as the interests of American squatters who had occupied the land. During the late 1850s, pioneers such as Charles Poston and Frederick Ronstadt developed Sopori as a cattle ranch, cultivated the land, and worked a gold mine. In 1861, it is reported that several hundred Apaches swept through the Santa Cruz Valley and Sopori Ranch, killing the foreman driving off the livestock, and forcing the company to close down operations.

In 1866, the Sopori Land and Mining Company purchased all rights to the land and began the long struggle to confirm their title. There were conflicting claims from the Elias family who continued to live on the ranch, and the Penningtons had also lived on the ranch. In 1881, this confirmation was recommended for denial by Surveyor General John Wasson, "on the grounds that the original title papers are forged, ante-dated, and otherwise invalid." This recommendation was forwarded to Congress by the Secretary of the Interior, and the land claim of 142,000 acres was rejected by the Court of Private Land Claims in 1895. The US Supreme Court refused to hear an appeal. Following this rejection, there are records transferring some Sopori lands to the Elias family and the Sopori Land and Cattle Company beginning in 1902.

Later owned by James Converse, who also ran the Tanque Verde Guest Ranch, the Sopori Ranch changed ownership several times. Eventually, the Sopori Ranch Company eventually sold the entire ranch in 1950 to Ann Boyer Warner, widow of Jack Warner of Warner Bros. movie studio fame. Following the death of Ann Warner in 1991, the ranch which then encompassed some 59,000 acres was purchased by John Croll, an investor from Illinois, to settle the estate. Croll renamed Sopori Ranch the "Inscription Canyon Ranch," after a successful development project he directed in the Verde Valley. While Sopori Ranch remains one of the largest working ranches in Pima and Santa Cruz counties, it was clearly purchased as an investment property for development. Now with the recent death of John Croll, the heirs continue to operate the Sopori as a working cattle ranch; however, the future of the historic Sopori Ranch remains uncertain.

Other Early Ranches - During the late 1800s, there were other attempts to begin ranching and lumber operations in the middle Santa Cruz valley despite the Apache threat. Some of these ranches that were at least initially successful include Rhodes Ranch, Moyza Ranch, Reventon Ranch, and Batamote Ranch among others. Farther south, Pete Kitchen established El Potrero, known as the only safe location between Sonora and Tucson, and began freighting business using the Camino Real, which he named as the "Pete Kitchen Road - Tucson, Tubac,

Tumacacori, To Hell." Ranches supplied the growing cattle market in Tucson and the booming nearby mining districts in the foothills of the Sierrita and the Santa Rita mountains.

McGee Ranch - Another important historic ranch that has shaped ranching history in the Upper Santa Cruz Valley is the McGee Ranch founded in 1895 by a group of families en route to seek their fortunes in the mines of California. Today this community of some 110 families (about 350 people) is made up almost entirely of descendants of three frontier families, that of J.R. McGee, George Harris, and David Lively. Having met at the Carlisle Mine in New Mexico in 1882, the McGee and Harris families pursued their livelihood in mining and traveled to Greaterville east of the Santa Rita Mountains. They then looked to more lucrative mining claims in California. Near the Sierrita Mountains, their wagon broke down, and while waiting for the wheel to be repaired in Tucson, they began to search for gold. Finding at least some, as well as wild cattle, the families decided to stay. Eventually, the group found an abandoned homestead in the eastern foothills of the Sierrita mountains, where the McGee Ranch was established. When Arizona became a state in 1912, the land claimed by McGee Ranch was "checker-boarded" into State and BLM parcels. Parcels had to be "reclaimed" through the Homestead Act, and in the 1930s various family members consolidated their holdings and formed a family corporation to hold the land in trust for present and future community members. In 1966, the corporation purchased the Soto Ranch on the west side of the mountains. The ranch now encompasses some 30 square miles of the Sierrita Mountains, and it includes deeded land owned by the community and leased State and BLM lands. In addition to its lands in the Sierritas, McGee Ranch also utilized land on the Canoa Ranch as early as 1911, and again from the 1970s to 1995, when they ended their lease due to drought and gates that were always left open.

Today the McGee Ranch community has developed into a settlement of close-knit families whose members can trace their roots for the last 100 years to the first founding families. Many community members continue to live on the ranch and work for the community, and others work off the ranch. While the original families earned their living through mining and ranching, the McGee Ranch community later diversified their traditional industries to ensure employment and income for their family members. With the purchase of a government surplus bulldozer, they began to take on construction jobs to supplement their income. In 1942, they formed a family corporation, the "Sierrita Mining and Ranching Company," which today specializes in construction jobs in rough terrain in Arizona, New Mexico, and Nevada. This successful enterprise, together with cattle ranching, which remains a mainstay of the ranch community, and some mining, provides employment and income for the entire community.

The Santa Rita Ranch & Experimental Range - Unique to the Upper Santa Cruz Valley is the Santa Rita Experimental Range (SRER), which was founded in 1903, and is the oldest research area founded by the USDA Forest Service. It has been a principal site for pioneer range research on the improvement and management of semi-arid grasslands in the Southwest. Similarly, the Desert Botanical Laboratory some 35 miles north on Tumamoc Hill in Tucson was also founded in 1903 as a research station to monitor the vegetation of the Sonoran Desert while the SRER was established for grasslands research. The Santa Rita Range Reserve was originally contained within the Santa Rita Forest Reserve as established by President Theodore Roosevelt in 1902 and managed by the Department of Interior. These forest reserves were transferred to the Department of Agriculture in 1905 to form the Forest Service. In 1910, the Santa Rita Range Reserve was transferred to the Bureau of Plant Industry with no national forest designation. President Taft set aside nearly 42,000 acres for the SRER, and it was

again expanded a number of times, resulting in its present size of 53,159 acres, some 83 square miles.

The SRER remained part of the Forest Service Southwestern Station until 1975. In 1988, the SRER was part of a federal-state land exchange, which provided for an exchange of state trust lands for federal lands comprising the Santa Rita Experimental Range. The SRER was transferred to the Arizona State Land Department from the Forest Service in exchange for various State parcels located in Catalina State Park, Buenos Aires Wildlife Refuge, Arivaca Lake, the Central Arizona Project aqueduct in Pima County, Black Canyon in Yavapai County, and the Madera-Elephant Head trail in Pima County.

As a consequence, the SRER was classified as "trust lands in university grant status," and assigned to the University of Arizona for use for ecological and rangeland research purposes." The 1988 State Act (SB 1249) further notes that, "this use shall continue until such time as the legislature determines that the research use can be terminated on all or part of the lands." While there are no time limitations noted in the legislation for rangeland research, it is possible that the SRER could be sold in the future for development by the Arizona State Land Department. The SRER range is currently used by the University of Arizona for grasslands research in cooperation with a local rancher who holds the current grazing leases.

Since its establishment, the SRER has provided a location for long-term ecological research, and is generally viewed as a world-class facility because of the long-term historical and biological data bases that have been maintained since its creation. In addition to research on semi-desert grasslands, other research has focused on wildlife-livestock interactions, cattle foraging behavior, and small mammal habitat interactions, including extensive research on rodents, insects, quail, javelina, coyotes, and deer. Other research has been focused on range management principles for semi-desert grasslands, especially with regard to grazing systems, seasons of use, production-utilization levels, and general range ecology, so that range managers can use these data to design management plans and grazing strategies suitable for southwestern rangelands.

Today, the Upper Santa Cruz valley continues its ranching tradition and is home to about 25 ranches. While the ranch boundaries have changed over time, these still include lands that once comprised the Canoa and Sopori land grants and the Santa Rita Experimental Range. The valley is comprised of 449,684 acres (702.6 square miles), second only in size to the Altar Valley in eastern Pima County.

Land & Environmental Setting:

Located to the south of the urban Tucson Basin and running parallel to the San Pedro, Empire-Cienega, and Altar valleys, the Santa Cruz River in the Upper Santa Cruz Valley flows north from Santa Cruz County and Mexico and its headwaters in the San Rafael Valley in Santa Cruz County. It continues to flow north into the urban Tucson area and north into Pinal County. Fortunately, erosion and significant flooding events have not caused the Santa Cruz River in its upper reaches to become as deeply channelized as has occurred farther downstream. Unlike the urbanized Tucson area, the Upper Santa Cruz valley is largely rural with urbanizing areas along the river and Interstate-19 corridor. The valley has an estimated population of 31,030 people. Its principal settlements are Green Valley, Sahuarita, Continental, Corona de Tucson, McGee Ranch, and the Arivaca Junction-Amado area. The San Xavier District of the

Tohono O’odham Nation is located at the north end of the valley, and public preserves include the Santa Rita Mountains of the Coronado National Forest and the adjacent Santa Rita Experimental Range on the east side of the valley. There are no public preserves on the west side of the valley. Suburban and urbanizing areas characterize the Santa Cruz Valley along the river and the Interstate-19 corridor especially in the Green Valley area of the former Canoa land grant. Significant copper mining operations by ASARCO located to the west of the Santa Cruz River and Green Valley have had a significant impact on the landscape and represent almost twice as much land area as the urbanized portions of the valley.

The Upper Santa Cruz Valley is bounded by the Santa Rita Mountains and Coronado National Forest on the east, the San Xavier District of the Tohono O’odham Nation to the north, the Sierrita and Cerro Colorado mountains to the west, and the Santa Cruz County line to the south. The Upper Santa Cruz Valley watershed reflects a significant range in elevation from 2454 to about 8000 feet in Pima County. Just to the south in Santa Cruz County, Mt. Wrightson at 9453 feet is the highest point of the Santa Rita Mountains.

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 Santa Cruz River floodplain to higher elevation evergreen forests of the Santa Rita and Sierrita 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 Upper Santa Cruz Valley Watershed in Pima County

▶ Agriculture/Pasture	13,182 acres	2.9 percent
▶ Urban	15,860	3.5
▶ Mining	28,872	6.4
▶ Paloverde-cacti	75,914	16.9
▶ Water surface	138	0.0
▶ Creosote-Bursage	21,205	4.7
▶ Deciduous/Riparian	1,315	0.0
▶ Scrub Grassland	281,601	63.0
▶ Conifer Forest	211	0.0
▶ Evergreen Forest	<u>11,386</u>	<u>2.5</u>
TOTAL	449,684 acres	99.9 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 13 - 23 inches annually. This amount of rainfall covers nearly 96 percent of the subarea acreage.

Water is available from a number of springs found mostly in the Santa Rita Mountains on the east side of the valley and in the Sierrita Mountains to the west. Surface water covering only some 138 acres is found in the valley, but none is noted in the Santa Cruz River itself due to downcutting of the river channel and overdrafting of the aquifer for agricultural, mining, and other uses. It is somewhat ironic that the historic course of the Santa Cruz River whose waters once fostered prehistoric and historic Native American, Spanish, Mexican, and Anglo settlement, is now a much degraded, dry channel stripped of its cottonwoods, willows and

cienegas. Not surprisingly, no areas of shallow ground water have been identified in the Santa Cruz River floodplain. Only 1551 acres along Sopori Creek are classified as having areas of shallow groundwater. Numerous stock tanks and wells today supplement any remaining natural water sources for cattle and wildlife use. Domestic wells account for approximately 1100 wells that are recorded with the Arizona Department of Water Resources.

Table 2. Natural & Constructed Water Sources in the Upper Santa Cruz Watershed in Pima County

<u>Springs</u>	<u>Intermit Major Streams</u>	<u>Surf. Water</u>	<u>Stock Tanks</u>	<u>Shallow Grnd-Water</u>	<u>Wells</u>
24	ca. 30 mi.	138 ac	527	1551 acres	1931

As a consequence of its natural environmental setting that includes an abundance of grassland totaling about 63 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 Upper Santa Cruz Valley watershed continues to be a significant and sustainable land use.

Land Base & Land Uses:

Nearly all of the Upper Santa Cruz Valley subarea is located in unincorporated Pima County, except for the southern boundary of the City of Tucson to the south of the Interstate-10 corridor and the incorporated town of Sahuarita, which extends for 9206 acres along the Interstate 19 corridor from the southern boundary of the San Xavier District to just north of Green Valley. The balance of the watershed, like much of Pima County, is comprised of a mosaic of land ownership including federal, state, and private lands, and a significant portion of this land is publicly owned. Approximate acreages are provided below for each kind of ownership.

Table 3. Land Ownership & Jurisdictions in the Upper Santa Cruz Valley

National Forest	41,034 acres	9.1 percent
BLM	7,724	1.7
Indian Lands	31,612	7.0
State Lands	212,745	47.3
Private Lands	156,455	34.8
Unknown	<u>114</u>	<u>0.0</u>
TOTAL	449,684 acres	99.9 percent

Green Valley, Sahuarita, Continental, Arivaca Junction-Amado, McGee Ranch, and Corona de Tucson are the principal settlements in the Upper Santa Cruz Valley watershed, and the total population in the entire valley is currently estimated at only 31,030 people. Private lands, comprising some 35 percent of the land base, are located throughout the valley. While some 36 percent of these private lands, 57,102 acres, are classified as used for ranching or agricultural purposes, some 64 percent, 99,353 acres, of all private lands are categorized as non-agricultural lands. A significant area of these non-ranching private lands characterizes much of the west-central portion of the subarea that is dedicated to mining. Of these private

non-ranch lands, some 28,872 acres are identified as mining use. This area to the south of the Tohono O'odham Nation adjoins the Sahuarita area, which is experiencing urbanization from the Tucson metropolitan area. As noted earlier, the Interstate-19 corridor, Sahuarita, and Green Valley essentially mark where the transition from ranching to real estate development is occurring. Some of these lands along the river floodplain remain in agricultural use by the Farmers' Investment Company (FICO), and other areas in the I-19 corridor have been zoned for high density development and formally platted. Elsewhere in the valley, developing areas reflect both formal subdivisions and lot-splitting or wildcat subdivision areas in Corona de Tucson, Elephant Head, Montana Vista, east of Arivaca, Madera Canyon, south of San Xavier, and along Old Nogales Highway. There are a total of 28,127 parcels and 292 subdivisions recorded with the Pima County Assessor's Office. Platted subdivisions cover 13,782 acres.

Ranches:

As noted earlier, much of the Upper Santa Cruz Valley was home to early Piman peoples some of whom were called Sobaipuri. At the time of Spanish contact in the 1690s, these Piman people were living and farming along the Santa Cruz River in dispersed river settlements. Spanish missions and settlements were soon established at Guevavi, Calabasas, Tumacacori, Tubac, San Xavier, and at Tucson. Once established, these mission communities became targets of Apache raids, and a presidio was established at Tubac to protect the Upper Santa Cruz Valley. While the Spanish Colonial government encouraged the establishment of land grants to encourage civilian settlement, no land grants were applied for until the beginnings of the Mexican period, which saw the establishment of the Canoa and Sopori land grants. Even so, these Mexican land grants could not be developed as ranches until significantly later due to Apache hostilities. It was not until the Gadsden Purchase of 1854 that the Upper Santa Cruz Valley experienced its second significant wave of immigrants who were largely American mining prospectors; however, permanent settlement of the region did not occur until after the Civil War and the cessation of Apache raids.

With the establishment of the Southern Pacific Railroad in 1880 to the north of the valley, the Upper Santa Cruz Valley became more easily accessible for exploration and settlement. With the success of agriculture and ranching along the Santa Cruz River and local silver, gold and copper mines at Greaterville, near Arivaca, and elsewhere in the nearby mountains, the railroad at Tucson provided rail access to ranchers and miners who could ship cattle and ore to distant markets. This resulted in greatly increased productivity in ranching and great wealth for those ranchers who had the foresight to buy land, water, and mineral rights to expand and diversify their holdings. The principal routes in the valley, the north-south Old Nogales Highway and Interstate-19, follow the route of the Spanish period Camino Real on the west side of the river that later became known as the "Tubac to Tucson Road." Canoa Ranch, certainly the largest ranch in the valley, became the social and economic hub of the Upper Santa Cruz Valley in the early years of the 20th century.

Much of the original Canoa Ranch continues to be used in ranching. Today, some 25 ranches, many of which include lands from the original Canoa and Sopori holdings and later homestead claims, continue in operation in this subarea. Lands used in ranching include some 57,102 acres of private lands, 27 state trust land grazing leases, 8 state trust land grazing permits, about 8 BLM leases of various parcels, and 9 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.

Table 4. Ranches in the Upper Santa Cruz Valley Watershed in Pima County

<u>Ranch/Lease Name</u>	<u>Private Land</u>	<u>State Lease</u>	<u>BLM</u>	<u>National Forest Lease</u>
Andrada*		X		
Arivaca Ranch*	X	X	X	X
Aros		X		
Box Canyon	X	X		X
Byner	X	X		
De la Ossa*		X		
Dykman*		X		
Ethridge		X		
Gastelum	X	X		
Gun Sight*	X	X	X	
Hanley	X		X	
Madera	X	X		
Marley*	X	X	X	
Olivas		X		
Papalote	X	X		
Proctor				X
Rancho Seco*	X	X	X	
Rosemont*				X
Saddle Creek	X	X		
Santa Rita Ranch	X	X		X
Santa Cruz Ranch		X		
Sierrita Ranch	X	X	X	
Sopori Ranch	X	X		X
Twin Buttes Ranch	X	X	X	
Willow Springs*	X	X		

* Indicates ranches that overlap into adjacent watersheds.

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

Except for the active mines, platted and wildcat or lot-split subdivision areas, and the Green Valley, Sahuarita, and I-19 corridor areas, the Upper Santa Cruz Valley watershed has at least 308,285 acres of ranch lands, or about 74 percent of the entire watershed, excluding Indian lands. Lands not used in ranching or agriculture comprise some 109,787 acres or about 26 percent of the Upper Santa Cruz Valley watershed, again excluding Indian lands.

Of all private lands in the Upper Santa Cruz Valley totaling 156,455 acres, approximately 57,102 acres, or 36 percent, are used in ranching, and 99,353 acres, or about 64 percent, have other uses, such as mining which at 28,873 acres represents about 18 percent of all private lands. Much of the state trust lands, except for about 9440 acres, appears to be used in grazing, much of the BLM lands, except for 880 acres, and virtually all National Forest lands

totaling some 41,034 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 all National Forest lands are available for grazing in this watershed.

Table 5. Ranchlands in the Upper Santa Cruz Valley Watershed in Pima County

<u>Land Owner</u>	<u>Ranch Use</u>	<u>Non-Ranch Use</u>	<u>Total</u>
National Forest	41,034 ac	(Rugged terrain?)	41,034 ac
State Trust Land	203,305	9,440	212,745
Indian Lands	?	?	31,612
BLM Lands	6,844	880	7,724
Active Mining	0	28,872	28,872
Other Private Lands	57,102	70,481	127,583
Unclassified	_____	114?	114
	TOTAL 308,285 ac	109,787 ac	449,684* ac

* If Indian lands are subtracted, the total acreage used in ranching represents 74% of Upper Santa Cruz. If it is assumed that Indian lands are also used for grazing, ranching then characterizes some 76% of the Upper Santa Cruz Valley.

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 livestock and 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 surrounding mountains, and there are about 30 miles of intermittent streams, including the Santa Cruz River course. To supplement natural water sources, approximately 527 stock tanks have been constructed over time. Wells, recorded for both domestic use, for cattle and wildlife, and other uses number 1931 for the entire Upper Santa Cruz 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 Upper Santa Cruz 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 9 National Forest grazing allotments, 8 BLM leases, and 27 State grazing leases or permits allow for a maximum of 4315 animals to be grazed in the entire Upper Santa Cruz Valley watershed in Pima County. When this number is considered together with the total acreage of 308,285 acres or 482 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 higher 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 Upper Santa Cruz Valley in Pima County

<u>Range of AUs Allowed</u>	<u>Acres/Sq.Miles in Grazing</u>	<u>Total AUs Allowed</u>	<u>Avg.AU/Sq.Mi.</u>
3 - 16	308,285 ac. or 482 Sq.Mi.	4315	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 fully quantified, statistics provided by the US Forest Service indicate significant numbers of visitors to Madera Canyon and other recreational areas. While this has not been quantified, it is likely that recreational use of public lands in the Upper Santa Cruz Valley watershed is quite high given its proximity to the Tucson area.

Current Farms:

At the present time, agricultural lands are located primarily in the Santa Cruz River floodplain with some irrigated pasture noted along Sopori Creek. Available GIS data for vegetation suggest there are some 13,182 acres of land that were recently used for crops and pasture in the Upper Santa Cruz Valley, and that historically this number could be as high as 18,629 acres. However, current Assessor records show only 7,359 acres classified for agricultural use today, and much of this land is classified as "prime farmland" by the US Department of Agriculture.

Most of this decrease in agricultural lands reflects the transition of farms to real estate development in the Santa Cruz Valley floodplain, principally in the northern portion of the historic Canoa land grant, which has been transformed into the Green Valley community. GIS data suggest that irrigated farms were once the predominant use of the bottomlands of the Santa Cruz River floodplain and included both food and fiber crops and pasture.

Using Assessor records, the total area in the Upper Santa Cruz Valley currently in agricultural use is 7,359 acres. Much of this agricultural use today includes about 5,000 acres of pecan orchards owned and operated by Farmers Investment Company. Approximate acreages for current and historically irrigated agricultural lands are provided below.

Table 7. Current Farms or Irrigated Pasture in the Upper Santa Cruz Valley in Pima County

<u>Acres Ever in Agriculture</u>	<u>Food or Fiber Crops</u>	<u>Irrigated Pasture</u>	<u>COT parcels</u>
18,629 ac*	5000? ac	2359 ac	1282 ac

* GIS vegetation data suggest 13,182 acres.

Development Pressure & Threats to Ranching:

Development pressure in the Upper Santa Cruz Valley watershed in Pima County is variable, but certainly dependent on transportation corridors, proximity to the urbanizing Tucson area, and in areas adjacent to existing platted or wildcat subdivisions. As noted above, growth and urbanization is greatest in the Santa Cruz River and Interstate 19 corridor in the Green Valley-Sahuarita area and in the Corona de Tucson area in the northwest portion of the watershed near the Tucson City limits. Farther south in the Canoa Ranch area, plans for the development of the remaining Canoa Ranch property totaling about 6400 acres have been proposed, but are currently unresolved. Other rapidly developing areas include the private lands to the south of the San Xavier District in the vicinity of the ASARCO mines. With urbanization expanding south along the I-19 corridor and Old Nogales Highway, it is possible that the remaining agricultural lands and other private lands will be eventually sold for development as land values increase. While some of these lands are still grazed, ranching will not be viable for long as the transition of ranchlands to real estate continues to increase along this corridor.

In fact, it is just those ranches and grazing leases that adjoin the urban area and I-19 corridor that are most vulnerable to development. With increasing land values in these areas and higher development potential, the State Land Department has established 5 year time limits on 16 grazing permits called Special Land Use Permits (SLUPs) throughout eastern Pima County. These lands have been essentially reclassified for commercial use by the ASLD in anticipation of sale or lease of these lands for commercial or residential development. Portions of eight state SLUPs for grazing occur in the Upper Santa Cruz Valley subarea. These SLUPs comprise some 49,000 acres, or 77 square miles, and represent some 11 percent of the entire watershed. These lands are located in the vicinity of the ASARCO mines and along the I-19 corridor. The very largest area identified for commercial use extends from Los Reales Road south to the Santa Rita Experimental Range, west to the Santa Cruz River and east to Corona de Tucson. Under the terms of the SLUP, the rancher can be evicted in 30 days even if the 5 year permit is still current, and there will not be any reimbursements for any improvements to the land, as is customary for long-term grazing leases. Should these State SLUPs be sold or leased for development, a total of 49,000 acres of State land in the Upper Santa Cruz Valley will be removed from grazing use, diminishing the animal unit capacity regionally by about 693 head of livestock.

As a consequence of existing, planned, and anticipated development, the "urban boundary" in the Upper Santa Cruz Valley may be defined by the boundaries of long-term grazing leases located in the uplands to the east and west of the Santa Cruz River, with virtually no east to west continuity of natural open space or grazing lands that cross the river. As development continues along the I-19 corridor and expands in area, these remaining ranch areas will become increasingly isolated from ranching areas across the valley.

At the present time, there are 292 platted subdivisions comprising some 13,782 acres in the entire Upper Santa Cruz Valley watershed in Pima County, and there are a total of

approximately 28,127 recorded parcels of land. Approximately 15,860 acres have already been characterized as urbanized area in the Upper Santa Cruz 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 99,353 acres, or 64 percent, of all of private lands are currently not used in ranching. Of this total nearly 29,000 acres are dedicated to mining, leaving about 70,000 acres that may be developed. When reviewed on a map, these areas of non-ranch private land holdings cluster in the areas of the ASARCO mines, along Old Nogales Highway, in Green Valley, Continental, and Sahuarita, in the Corona de Tucson area, in the Montana Vista, Elephant Head and Madera Canyon areas, and to the east of the Arivaca area. With these exceptions, the remaining upland portions of the Upper Santa Cruz Valley represent largely unfragmented ranchlands. These lands occur to the west of Green Valley adjoining the Altar Valley and south to Santa Cruz County. To the east of Green Valley, unfragmented ranchlands currently extend from Interstate-10 south to the Santa Rita Experimental Range to the Coronado National Forest and Empire-Cienega Valley, and south to Santa Cruz County. This remaining unfragmented ranchland and natural open space is comprised of predominantly State land and private lands, some Forest Service lands, and a few scattered parcels of BLM land.

At the present time, there are a number of Pima County Specific Plan areas, including Quail Creek and Las Campanas, among others, and Rancho Sahuarita in Sahuarita that will be eventually developed into planned communities comprised of mixed residential, commercial, and resort oriented uses. The planned development at Canoa Ranch is not yet resolved, but portions of some of these specific plan and rezoned areas are currently leased for grazing. Where this occurs, the developer retains and uses ranch land designation by the Assessor's Office to lower property taxes while waiting for the opportune time to develop the area for high density residential or commercial use.

In addition to the proposed specific plan areas and existing subdivisions, the BLM has identified various parcels for either sale, trade, or commercial lease that total some 7857 acres in this watershed. While the BLM has parcels located throughout the valley, the State Land Department has identified two large tracts of state land, comprising some eight grazing permits for commercial use.

Specifically, the ASLD has identified eight Special Land Use Permit (SLUPs) areas located in the developing northern portions of the watershed. As described above, these State SLUPs are grazing lands in transition that have been reclassified by ASLD for commercial use. These State lands comprise some 49,000 acres within the watershed. While BLM land totaling some 7,728 acres has also been identified for sale or exchange, these parcels are scattered throughout the watershed and some in rural areas are likely to remain in ranch use or as open space. There is a much higher probability that the ASLD SLUP parcels identified for commercial sale or lease will be developed because of their proximity to the developing urban area and their location along the I-19 corridor. The total "disposable land" that could be sold, leased, and developed for commercial uses is nearly 57,000 acres.

In summary, the development pressure in the Upper Santa Cruz Valley watershed in Pima County is variable at the current time, but significant along the I-19 corridor. In the southern and upland portions of the Upper Santa Cruz Valley, development pressure is relatively low due to the stability of ranch land use, largely unfragmented private and public lands, the lack of committed high density zoning, and the distance from any major transportation corridors such

as Interstate 19. The principal threat to the stability of ranching in these portions of the valley is likely to be due in the future to the transition of private ranchlands to real estate, especially in the areas adjacent to existing development.

In the northern portion of the Upper Santa Cruz Valley, urbanization is occurring near the Tucson City limits and in the vicinity of Sahuarita, Green Valley, and along the I-19 corridor.

Ranchland Conservation Potential:

Unlike the adjoining Empire-Cienega and Altar valleys, which retain significant integrity of natural open space and ranchlands use, the Upper Santa Cruz Valley is significantly more threatened by urbanization and strip development from the Tucson urban area and along the I-19 corridor.

While there is good potential for the east and west upland portions of the Upper Santa Cruz Valley to remain in ranching, development pressure in the northern portion of the valley and along the river corridor effectively split the open space and ranch use of the valley into two halves. Contributing to the sustainability of ranching in these upland areas are the stability and long-term tenure of ranch lands comprised of private lands, State lands, BLM, and National Forest leases, low population pressure outside the urbanizing northern and central portions of the valley, proximity to existing preserves that allow grazing; a high proportion of productive grasslands; good average rainfall; and relatively high grazing capacity.

Assuming that the Upper Santa Cruz Valley watershed will continue to be subject to urban expansion, the overall ranchland conservation potential is perhaps lower in comparison to some of the other subareas of Pima County. Ranchland conservation is likely to continue to be variable -- the upland areas are likely to remain relatively stable, while other portions of the Upper Santa Cruz Valley, especially along the I-19 corridor, will continue to be susceptible to fragmentation and development.

Summary & Conclusions:

To conclude, portions of the Upper Santa Cruz Valley watershed continue to support stable and sustainable ranching operations especially in the upland areas of the valley in large part because of its environmental setting, the connectivity of its ranchlands and open space, the significant amount of public lands, and the lack of development infrastructure. The principal vegetation type is scrub grasslands, which comprises some 63 percent of the vegetation in the subarea.

Except for the urbanizing Green Valley-Sahuarita areas, the ASARCO mines, and other small subdivisions, the valley remains largely rural, and a high proportion of the land area, some 308,285 acres, approximately 74 percent of the land in the subarea, is used in ranching and agriculture. This includes 57,102 acres, or 36 percent, of all private lands. Some 109,787 acres of public and private lands, or approximately 26 percent, of the valley, are not used for ranch purposes, and Indian lands comprise some 31,612 acres.

At the present time there is limited threat from development pressure in the upland portions of the valley; however, urbanization of the central portion of the valley and the reclassification

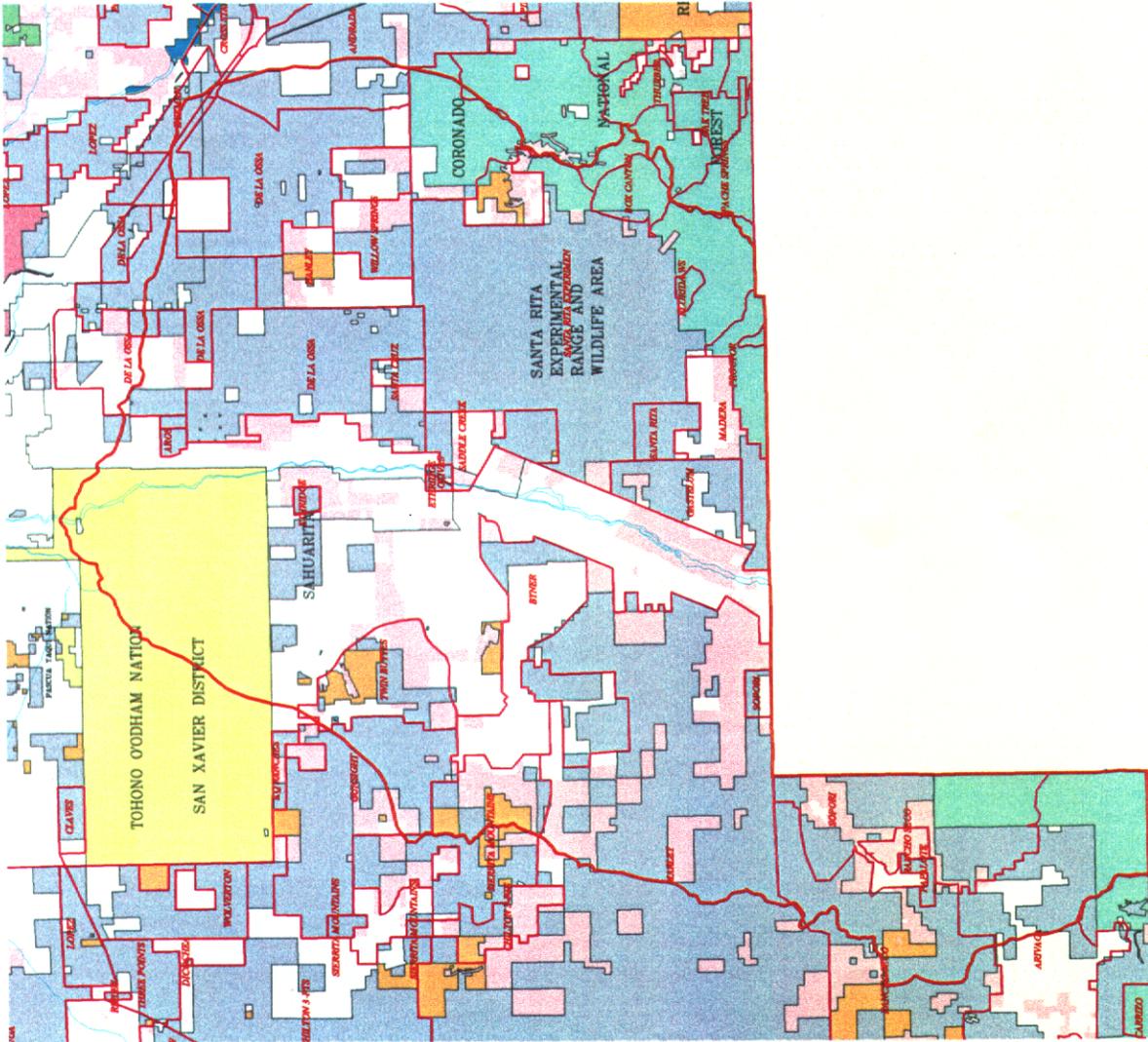
of some 49,000 acres by the State Land Department for commercial use poses a very significant future threat to sustainable ranching in this valley. Furthermore, because the Santa Rita Experimental Range of 53,000 acres has been transferred to the State Land Department from the federal government, it is possible that this historic ranch and research station could be similarly reclassified from its use for grasslands research by the University of Arizona and be made available in the future for commercial sale, lease, and development. Moreover, the disproportionate amount of State Trust Land, some 47 percent of the valley, together with all the private land, some 35 percent of the valley, suggests that some 82 percent of the Upper Santa Cruz Valley could be developed in the future.

Because of these significant threats of urban expansion, the Upper Santa Cruz Valley currently appears to have a mixed potential to continue sustainable ranching -- high in some of the upland areas and only low to moderate in the northern and central portions of the valley.

Pima County Ranches

SDCP PLANNING UNIT 3

-  Planning Unit Boundary
-  Ranch Boundaries
-  Major Washes
-  BLM
-  County Park
-  Indian Lands
-  Military Reservations
-  National Forest Lands
-  National Parks and Monuments
-  National Wildlife Refuge
-  Private Lands
-  State Lands
-  State Park
-  Ranch Use



Pima County Index Map



Index Map Scale: 1:1,000,000

The information depicted on this plan is the result of a field survey conducted by the Pima County Surveyors Office. The survey was conducted in accordance with the provisions of the Arizona Surveyors Act, Chapter 10, Article 1, of the Arizona Constitution, and the Arizona Surveyors Act, Chapter 10, Article 1, of the Arizona Constitution. The survey was conducted on or about the date of the survey. The survey was conducted by the Pima County Surveyors Office. The survey was conducted by the Pima County Surveyors Office. The survey was conducted by the Pima County Surveyors Office.

SCALE: 1:90,000



PIMA COUNTY DEPARTMENT OF TRANSPORTATION
TECHNICAL SERVICES
2015 NORTH STATE AVENUE, SUITE 100
TUCSON, ARIZONA 85705
TEL: (520) 795-3439
FAX: (520) 795-3439

Ranch Lands and Grazing Allotments

SDCP PLANNING UNIT 3

- Planning Unit Boundary
- Grazing Allotments
- Major Washes
- BLM
- County Park
- Indian Lands
- Military Reservations
- National Forest Lands
- National Parks and Monuments
- National Wildlife Refuge
- Private Lands
- State Lands
- State Park
- Ranch Use

STATISTICS FOR PLANNING UNIT 3

BLM	7,724 AC
COUNTY PARKS	0 AC
MILITARY RESERVATIONS	0 AC
INDIAN LANDS	31,612 AC
NATIONAL FOREST LANDS	41,034 AC
NATIONAL PARKS AND MONUMENTS	242,740 AC
STATE PARKS	0 AC
PRIVATE LANDS RANCH USE	57,102 AC
PRIVATE LANDS NON-RANCH USE	99,353 AC

Pima County Index Map

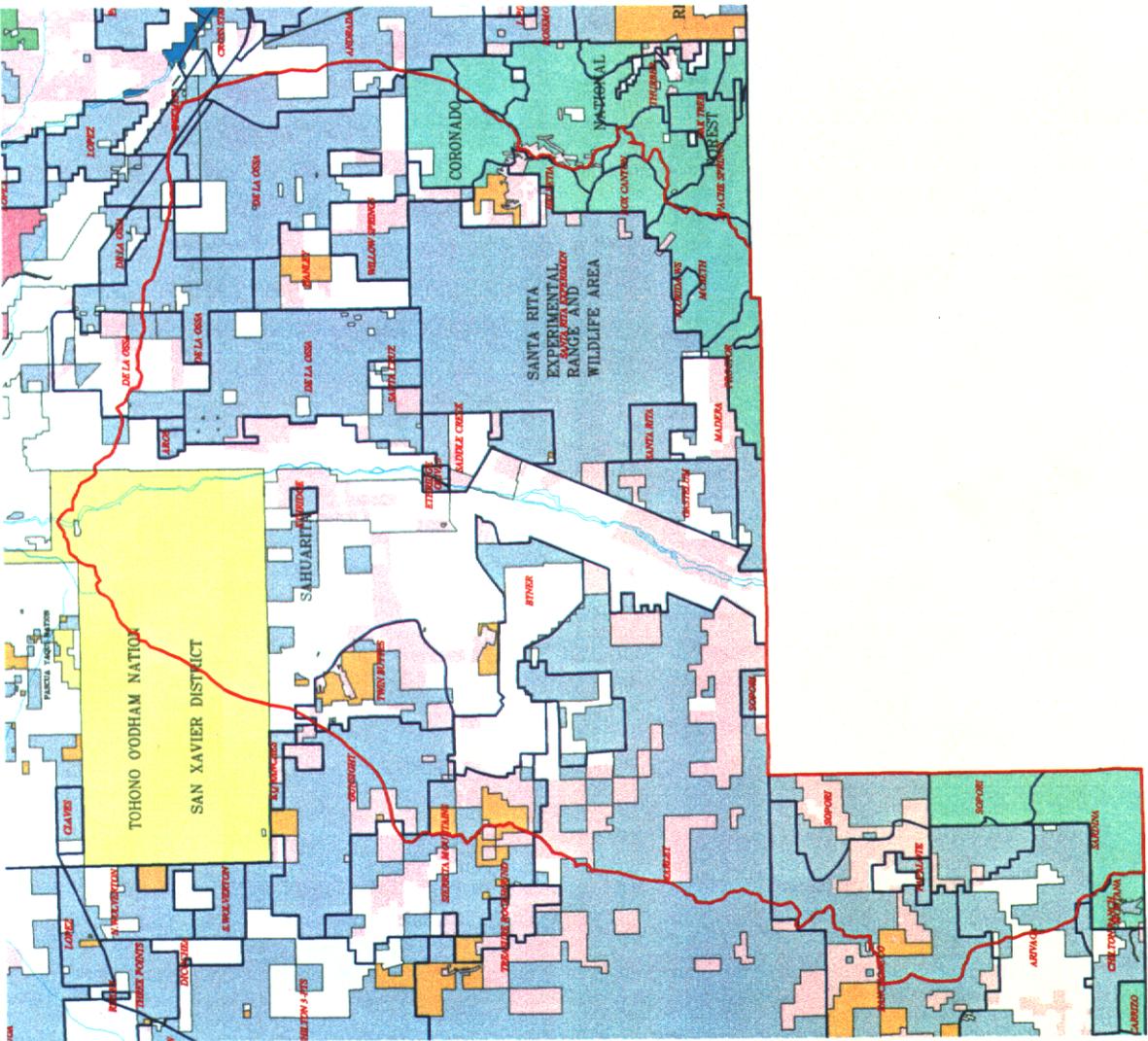


The information on this map is the result of the best available data. The user should verify the accuracy of the information for their specific use. The user should also verify the accuracy of the information for their specific use. The user should also verify the accuracy of the information for their specific use.

Scale 1:90,000



TECHNICAL SERVICES
 101 North Stone Mountain Blvd., 8th Floor
 Tucson, AZ 85706
 TEL: 520-318-3459
 FAX: 520-318-3459
 WWW: www.tscs.com



BLM Long Term Management Lands

SDCP PLANNING UNIT 3

- Planning Unit Boundary
- Major Washes
- BLM Long Term Management Lands
- BLM
- County Park
- Indian Lands
- Military Reservations
- National Forest Lands
- National Parks and Monuments
- National Wildlife Refuge
- Private Lands
- State Lands
- State Park
- Ranch Use

STATISTICS FOR UNIT 3
ACRES OF BLM LONG TERM MANAGEMENT: 0

Pinna County Index Map



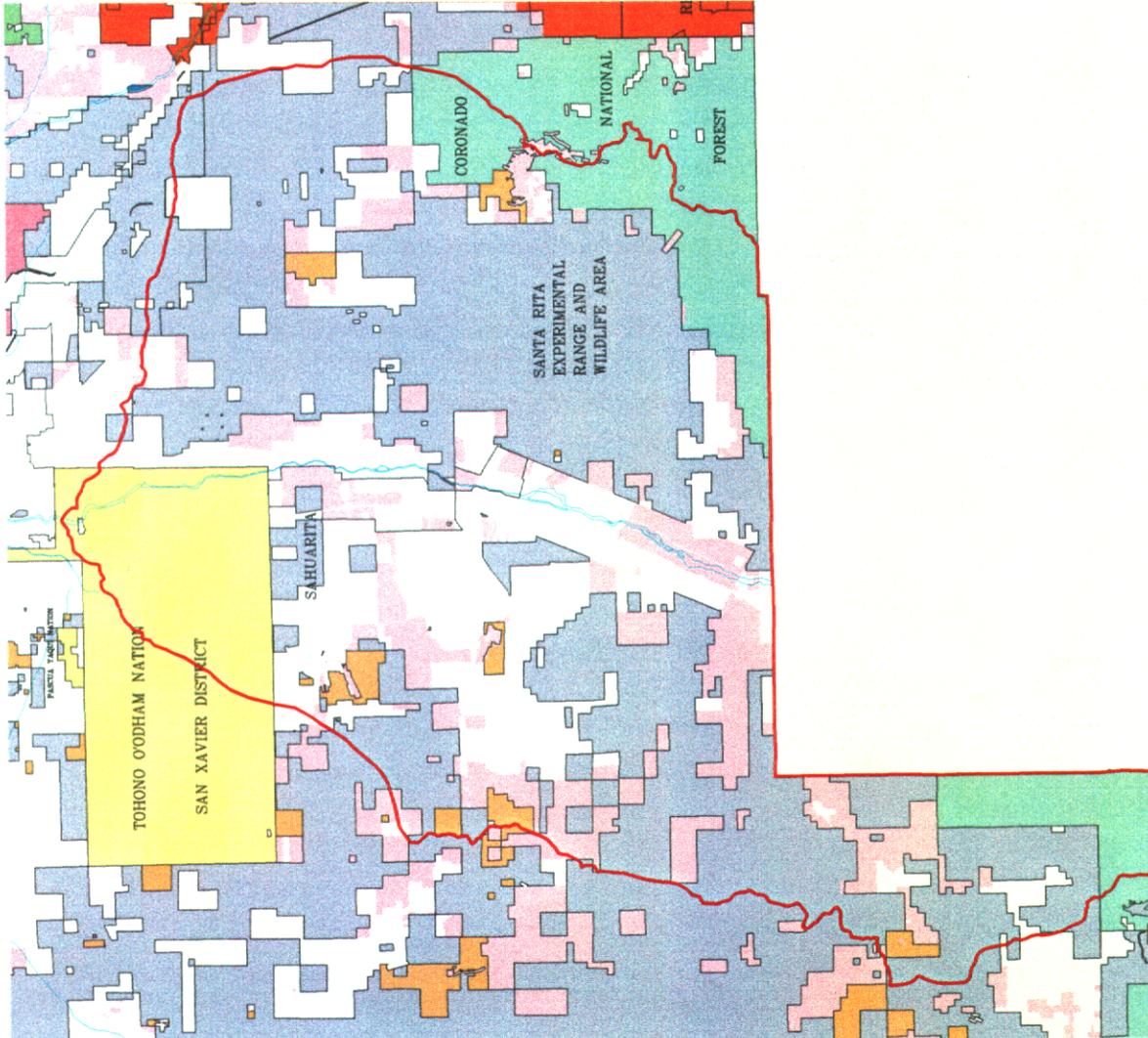
Index Map Scale: 1:100,000

The information displayed on this map is for informational purposes only. It is not intended to be used as a legal document. The BLM does not warrant the accuracy or completeness of the information displayed on this map. The BLM is not responsible for any errors or omissions on this map. The BLM is not responsible for any damages or liabilities arising from the use of this map. The BLM is not responsible for any claims or lawsuits arising from the use of this map. The BLM is not responsible for any claims or lawsuits arising from the use of this map.

Scale 1:90,000



Pinna County Technical Services
301 North Stone Avenue, 2nd Floor
P.O. Box 24000, Tucson, AZ 85724-0000
Phone: (520) 799-3429
Fax: (520) 799-3429





**Sonoran Desert Conservation Plan
Upper Santa Cruz Valley Subarea
Cultural and Historical Resources Inventory Report
May 8, 2000**

FIRST DRAFT

I. PURPOSE: The purpose of this report is to describe in summary form what is known about three kinds of cultural resources in the Upper Santa Cruz Valley subarea: archaeological sites, historic resources, and traditional cultural places, each of which is defined below. Cultural resources inform about human history and culture, and as such, contribute to a sense of place and social identity enhancing the quality of life. However, archaeological sites, historic resources, and traditional cultural properties are limited in number and can be easily damaged or destroyed. Therefore, including cultural resources in land use planning and saving those that warrant preservation for future generations is in the public interest. This report is intended to provide baseline information needed to consider cultural resources in the Sonoran Desert Conservation Planning process.

II. SUBAREA: The subarea defines the watershed draining the Sierrita Mountains on the west and the Santa Rita Mountains on the east into the Santa Cruz River, the subarea’s primary watercourse. The southern boundary of the planning unit is marked by the Pima County Santa Cruz County line and its northern end runs along the City of Tucson’s South Valley as indicated on the map entitled, **Modern Communities, Transportation, and Ownership**. This area encompasses approximately 702 square miles.

The Upper Santa Cruz Valley subarea contains approximately 449,569 acres, within which land status is broken down as presented in the table below. Like many parts of Pima County, State Lands make up a sizeable portion of the countryside. This is followed by private lands, federal lands, and Indian land in that order.

Table 1. Upper Santa Cruz Valley Land Ownership by Acreage and Percent		
Ownership	Acres	Percentage
Bureau of Land Management	7,724	1.7
Indian Lands	31,612	7.1
National Forest Lands	41,034	9.1
Private Land	156,454	34.8
State Lands	212,745	47.3
Total	449, 569	100

Principal communities in the subarea are Arivaca Junction, Canoa, Continental, Green Valley, Sahuarita, Corona de Tucson, and portions of the South Valley of Tucson. Additional population is dispersed on ranches and other rural settlements throughout the area. Traditionally, the economy has been dominated by mining, ranching, farming, which continue to the present day. However, a growing service sector is associated with those areas experiencing rapid urbanization such as Green Valley. The population estimate for the year 2000 is 31,030.

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

A. Archaeological sites

Definition: "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" (Preserving Cultural and Historic Resources, Pima County, May 1999).

Archaeologists learn about the past by collecting and analyzing information 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 walk 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 and excavation data together to interpret the past; however, as new information becomes available and as new ideas about the past are developed, this interpretation changes over time.

Previous Research

Archaeological investigations in the Upper Santa Cruz Subarea have been conducted since the 1920s, and over the years, evidence has accumulated suggesting that human beings have occupied the valley and its highland margins for the last seven millennia. The first investigations involved sampling prehistoric pottery found on archaeological sites located between Tubac and Sahuarita in an effort to build a cultural time line for the region. Exploration of ruins in Sonora Mexico in the early 1930s also included the southern reaches of the subarea. It was noted at the time that similarity between Red on buff decorated pottery found in southern Arizona and pottery found in Sonora, Mexico suggested a connection between the two areas. In the mid 1940s Ted Danson (father of actor Ted

Danson Jr.) conducted a large scale survey of the Upper Santa Cruz Valley recording over 200 archaeological sites dating to the prehistoric and historic time periods. From this work Danson was able to recognize differences in the artifacts between the upper and lower portions of the Santa Cruz Valley suggesting different cultural groups lived in these areas during prehistory. These early investigations of the Upper Santa Cruz Valley were conducted at a time when archaeologists throughout the Southwest region were attempting to describe the extent of archaeologically recognizable cultures in time and space.

In the early 1950s, Paul Frick, a graduate student at the University of Arizona, investigated the flood plain and lower terraces of the Santa Cruz River, again between Tubac and Sahuarita, to identify and record sites for his Master's thesis. This effort resulted in 216 sites being recorded within an area covering approximately 80 square miles. Frick was able to discern patterns in where people settled on the landscape, noting several site concentrations suggesting distinct communities. He further distinguished between places that were used for habitation from those that appeared to have been used for food production and was able to classify sites by time period within the Hohokam archaeological sequence (A.D. 700 - 1450). Frick noted that the highest number of sites appeared to date to between A.D. 950 and 1150 suggesting a peak population in the valley during that time period. Excavations at the Paloparado Ruin near Otero by Charles Di Peso in 1953 revealed that the site had been periodically occupied during the Hohokam, historic Piman, and early Spanish Colonial times spanning a period from AD 900 to the 1700s.

With the passage of environmental laws in the mid to late 1960s, federally funded or authorized projects required an assessment of impacts to archaeological sites and other kinds of cultural resources prior to development. As a consequence, the number of archaeological surveys and excavations in the Upper Santa Cruz Valley increased notably with a concomitant increase in information about and understanding of the past. This occurred at a time in the discipline of American archaeology when the questions of interest shifted from descriptive inquiries of what happened in the past, where and when, to an emphasis on explaining how cultural behavior changes through time and why.

Work during the 1980s revealed a more complete picture of human land use in the Upper Santa Cruz River Valley through time. While most archaeological survey investigations involve looking at the ground surface in relatively small areas on the level of tens of acres or smaller, a number of surveys involving many thousands of acres were conducted during this time revealing past land use patterning over a broad area. Large scale surveys were conducted east of the Sierrita Mountains in the Tinaja Hills; on the Tohono O'odham Reservation, San Xavier District; north of Sahuarita on the east side of the Santa Cruz River; within the Santa Rita Experimental Range; and, on adjacent land in the Coronado National Forest. These investigations were prompted by a combination of legal mandates, publicly funded research, and academic studies that in total covered thousands of acres of federal, tribal, state, and private lands. Hundreds of archaeological sites were recorded from a variety of ecological and elevational settings, and a number of these were subject to partial testing and full excavation programs. It was during this time that archaeologists were able to correlate shifts in the position of the Santa Cruz River over time with changes in how the Hohokam Indians practiced

farming along the valley floor. After about AD 1000, it appears that the east side of the river was favored for settlement and the populace began to make extensive use of the upland bajadas for the cultivation of agave through dry farming, a pattern also identified in the Tortolita Mountains to the north.

While research on the late prehistoric time period associated with the pottery bearing Hohokam culture expanded during the 1980s, research on the pre-ceramic or "Archaic" period added time depth to human occupation in the Upper Santa Cruz and elsewhere in the region. For instance,, survey conducted for a land exchange on US Forrest Service land in the Rosemont area of the northern Santa Rita Mountains resulted in the excavation of 10 sites dating to the Middle and Late Archaic time Period spanning the years 4800 B.C. to A.D 350. This research also demonstrated that Archaic populations were well established in the upland areas and that the pattern of settlement involved using small, short term camps for hunting and gathering and larger base camps that were used by residential groups for longer periods of time. Excavation of a site located in the Santa Cruz flood plain in the early 1980s revealed deeply buried archaeological deposits that also date to the Middle and Late Archaic time period and demonstrated the existence of sites of this age in the deeper layers of soil along the river's margins.

The 1990s have seen additional survey and excavation projects in the subarea, most notably the investigation of 6400 acres in the Canoa Land Grant, in Green Valley. This project, conducted in 1995, identified 122 historic and prehistoric sites, indicating that the terraces along this portion of the Santa Cruz River have been utilized for a period of at least 2000 years. Excavations at the Continental site, the remains of a large Hohokam village just north of the town of Continental, revealed further evidence that certain parts of the flood plain were intensively utilized. Land use intensity can be measured by determining the number of sites found in an area that has been well surveyed. In the central portion of the subarea adjacent to the Santa Cruz River site density averages 9 sites per mile whereas in other areas more removed from the river site density averages around 2 sites per mile. The Canoa Land grant survey and the on going excavation at the Continental Site indicate that this portion of the subarea was a highly attractive location for human settlement because of its access to arable land, water for farming and domestic use, as well as its proximity to the mountains, upland areas, and the flood plain for hunting and gathering wild plants, animals, and other resources.

In sum, 80 years of archaeological survey and excavation within the subarea reveals that the Upper Santa Cruz River Valley was repeatedly used by human populations over many thousands of years, first by highly mobile hunter gatherers and later by large village based agriculturalists, and that certain places on the landscape have been favored over others. This research has contributed to knowledge on the age of archaeological sites, how people settled on the land, what they ate and how they acquired their food, the manner in which people related to one another, the kinds of communities they lived in, and how people interacted with others in the rest of the valley and beyond.

Survey data

Archaeological survey is the first step in characterizing the nature, age and distribution of archaeological sites within an area like the Upper Santa Cruz Valley and there are two different kinds of survey that archaeologists typically perform: Linear surveys and block surveys. Linear survey involves inspecting 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 survey involves examining non-linear properties ranging in size 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 and Site Locations**” shows the areas within the subarea that have been archaeologically surveyed and the sites that have been recorded.

The map demonstrates that a number of large block surveys and some linear projects have been conducted with the subarea, notably on the east side of the Sierrita Mountains, east of the San Xavier District boundary, within the Coronado National Forest on the west side of the Santa Rita Mountains and within the Santa Rita Experimental Range and Wildlife Area. This latter survey is an example of a systematic sample survey consisting of linear corridors that were examined separated by spaces that were not examined. Not shown are the 46 sites that were recorded during this survey. Presented below is a breakdown of survey data currently available at the Arizona State Museum presented by acreage and survey type including the percentage of the subarea that has been investigated.

Table 2. Upper Santa Cruz Valley Subarea Survey Acreage by Survey Type			
Survey	Number	Acreage	Percent of Subarea
Linear	53	5513	1.2
Block	120	68,355	15.2
Total	173	73,868	16.4

While the total acreage figures indicate that more of this subarea has been investigated than elsewhere within Eastern Pima County, such as the Altar Valley at 5.3 percent and the Avra Valley at 8.0 percent, these figures still indicate that approximately 83% of the area has not been formally investigated. This means that research conclusions about the past within the subarea are always under going revision as new areas are explored and more data are made available.

Site Data - Chronology

Table 3 presents information on the number of prehistoric sites in the subarea by time period as reported by the Arizona State Museum.

Table 3. Upper Santa Cruz Valley Subarea. Prehistoric Archaeological Site Data					
TIME PERIODS	PaleoIndian 12,000 B.C. - 8,000 B.C	Archaic 8,000 B.C.- A.D. 200	Ceramic A.D. 200- A.D. 1540	Unknown	Total
Site Counts	0	21	172	189	382

While no sites dating to the PaleoIndian Period have yet been reported in the subarea, four sites dating to this time period are known in the San Pedro River Valley to the east and several diagnostic spear points have been found on the Tohono O'odham reservation to the west. The term "PaleoIndian" describes the earliest period of human occupation in the Americas. This was a time following the end of the last 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, archaeologists refer to them 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 wild foods as they 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. Early in the succeeding Archaic Period, the environment became warmer, the large game animals disappeared, and modern plant and animal species were established.

The Archaic Period is represented in the subarea with 21 sites, one of which dates to the time period between 1500 B.C. and A.D. 200; the rest cannot be more accurately dated based on survey data. New information collected from the Canoa Ranch survey project, however, has identified seven sites that date to between 5000 B.C. and A.D. 100. The Archaic Period represent a time span of almost 8000 years during which human beings adjusted their way of living in response to new environmental conditions. In order to survive, people became generalists in their subsistence practices, hunting and gathering a wide variety of plants and animals and becoming more efficient in how they processed their food as indicated by the presence 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 172 sites dating to the Ceramic Period are known within the subarea indicating intensive use of the Avra Valley during this time in prehistory. Fourteen sites date to the Early Ceramic times (A.D. 200 - A.D. 1000), 47 to the Middle Ceramic Period (A.D. 1000-A.D. 1300) but only one is known dating to the end of the Hohokam Sequence (A.D. 1300-A.D. 1500); the rest cannot be more accurately dated with survey data. 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, including the Avra Valley, 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 quantities and with enough consistency to support large populations and the culture collapsed around A.D 1450.

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

While a few sites dating to this time period are known in the Tucson Basin to the north, the Upper Santa Cruz subarea has not yet revealed evidence of occupation during the time after the Hohokam collapse and before the arrival of the Spanish.

Table 4. Upper Santa Cruz Valley Subarea Historic Archaeological Site Data			
Euro-American	Native American	Unknown	Total
15	3	11	29

Table 4 presents archaeological data on the Historic Period, spanning the years between A.D. 1540

and 1950. The history of the Santa Cruz Valley is rich and complex.

One of the first Europeans to enter the desert southwest was Francisco Vasquez de Coronado who with a large entourage of some 300 Spaniards and 1300 Indians is believed to have passed up the San Pedro River Valley in A.D. 1540 on a journey that ultimately brought him to the Rio Grande River in the vicinity of Albuquerque, New Mexico. But it wasn't until the 1690s that attempts were made by the Spanish to settle in southern Arizona. During these forays, Spanish soldiers and clergy encountered people who spoke the O'odahm (Piman) language living in numerous villages in the area. In 1691, Esubio Kino, a Jesuit priest, began a series of trips into the Pimera Alta, to meet with the native population. This resulted in the construction of the mission church at the village of San Xavier del Bac starting in 1700 south of Tucson and the founding of a large church at Guevavi in the Upper Santa Cruz Valley, north of modern day Nogales.

The introduction of Christianity changed the native ways of life profoundly, Livestock, wheat, and other domesticated were added to the economy. Diseases introduced by the Europeans wiped out entire Indian villages and native settlements of Sonora and Arizona were reorganized with a new focus on mission communities. Presidios, or forts, established by the Spanish at strategic places, originally for protection from the Apaches, were also occasionally used to keep the usually friendly Pimans in check. This was of particular concern to the Spanish in the years between 1734 and 1760 when Piman populations were agitating against Colonial rule culminating in the Pima Revolt of 1751. Following these event, Spanish security concerns focused on the Apaches, who threatened Spanish outposts all along the northern frontier. The need for defense prompted the Spanish to establish a presidio at Tubac in 1752, which was later removed to the location of Tucson in 1775. In the same year, Juan Batista de Anza set off from Tubac, passed up the Santa Cruz River Valley turning west along the Gila River and journeyed to the Pacific Coast culminating in the founding of San Francisco.

In the later years of the Spanish Colonial period, ranching, mining, and agriculture were the principal economic activities in the Santa Cruz Valley and elsewhere. This was a time of relative peace until the Mexican War of Independence ended the colonial period in 1821. The missionization and military protection programs of the Spanish colonial government encouraged an influx of Spanish colonists early in the 18th century that eventually brought an end to the dispersed pattern of Indian Villages along the length of the Santa Cruz River. The Santa Cruz Valley became dominated by the inhabitants of Spanish and Mexican descent who survived mainly by farming, ranching, and trade. Apaches began raiding extensively in southern Arizona after 1830 and were a major threat to the Mexican Settlements. By the time of the Gadsden purchase by the United States in 1853, Spanish and later Mexican settlements were well established, and ranching and mining had replaced much of the traditional agricultural subsistence base. One of the larger holdings in the Upper Santa Cruz Valley, the San Ignaciao del la Canoa Land Grant, was established by brothers Tomas and Ignacio Ortiz just prior to Mexican independence in 1820. The grant, covered some 17,000 acres on both side of the Santa Cruz River from north of Tubac to Sahuarita, was operated as a cattle ranch throughout the Mexican period despite repeated Apache attacks

The Mexican war of 1846 and subsequent transfer of the Gadsden purchase to U.S. ownership in 1854 were the primary historical events leading to the end of Spanish and Mexican domination of the Santa Cruz Valley. Arizona officially became a territory in 1863, during the American Civil War. Tucson was briefly occupied by the Confederacy in 1862, only to be chased out by Union Troops a short time later. National politics, and the presence of proven mineral wealth, convinced President Abraham Lincoln to recognize Arizona as a territory separate from that of New Mexico. After the war, ranching and mining dominated the territorial economy and brought in Anglo-Americans in search of gold, silver, copper and other minerals. However, lumbering and farming also contributed as economic opportunities expanded. Continued confrontation with the Apaches prompted the establishment of a permanent US military presence throughout southern Arizona, and a number of posts, camps, and forts sprung from Tubac to Holbrook. The war with the Apaches ended in 1886 with the surrender of Geronimo ushering a period of peace and prosperity. With the coming of the railroad in 1880 Tucson became connected to the rest of the nation, bringing greater population growth and a more commercially oriented economy.

Statehood came to Arizona in 1912 after many fruitless years of trying to convince the Congress of the Territory's worthiness. Statehood also resulted in the establishment of the state trust lands that still to this day cover vast territory throughout southern Arizona. The establishment of the US Forest Service (1905) prior to statehood and the Bureau of Land Management afterwards (1946) had a tremendous impact on rural life in the region including the Upper Santa Cruz Valley adding forest and range management requirements to lands that traditionally had none. The effects of the first and second World Wars cannot be overstated in that each of these national convulsions brought an influx of people and technology to southern Arizona making Tucson the main population center in the region. Copper mining became a major economic force in the area region including the east flanks of the Sierrita Mountains, but farming and ranching continued to be important in the Santa Cruz Valley and elsewhere. It was during the 1960s, that the population of Tucson began to grow explosively reaching its present size of approximately 800,000. As a result of this demographic trend, urbanization has begun to creep down the Upper Santa Cruz as new communities have become established in what was open range along the valley floor. Despite these changes, the Upper Santa Cruz subarea today remains largely rural and dependant upon ranching and farming just as has for hundreds of years.

A total of 29 Historic Period sites have been identified in the subarea by the Arizona State Museum, 15 of which are Euro-American, three are Mexican American in ethnic origin and the cultural identity of eleven sites is unknown. Low sample size, the greater visibility of some sites and not others, and a lack of research interest in the archaeology of the historic time period distorts the true picture of historic period land use in the subarea. Given the long history of the valley, it is certain that archaeological remains associated with the trends discussed above exist within the subarea and will be recorded as more areas are explored.

Site Data - Function

The site data from both the historic and prehistoric eras can also be examined from a functional perspective to highlight land use trends within the subarea. The following is a summary of

archaeological site data for the subarea that is presented by gross time period and site function. These data are made available by the Arizona State Museum, University of Arizona. Please note: the data presented in table 5 includes archaeological sites found on Indian lands. The data used to prepare Table 6 and the map figures showing site distributions have removed the sites found on Indian lands from analysis, therefore, the site counts differ.

Table 5. Upper Santa Cruz Valley Subarea Archaeological Site Data Time Period by Site Function					
PERIOD	Prehistoric	Historic	Both	Unknown	Total
FUNCTION					
Agriculture	4	2	1	0	7
Art	4	3	0	0	7
Disposal	4	3	0	1	8
Government	2	2	0	0	4
Habitation	12	7	2	3	24
Resource Processing	83	1	1	11	96
Resource Procurement	0	3	0	1	4
Religion	1	0	0	0	1
Transportation	0	1	1	0	2
Unknown	272	7	5	35	319
Total	382	29	10	51	472

The site counts presented in Table 5 show that prehistoric sites outnumber the historic by more than 13 to one and that in ten instances, occupations from both major time periods are present on the same site. The prehistoric site counts are dominated by Resource Processing (food and non food resources) and Habitation (residential) as the most common of the identifiable functions. Agriculture (i.e. fields, water control features), Art (rock art) and Disposal (trash) appear in equal, but small numbers. Two prehistoric sites are functionally identified as governmental in nature, meaning they contain features that are believed to be communal, such as public architecture. One site is believed to represent Religion or ritual functions, such as a shrine or other place of worship. That Resource Procurement (food and non food resources) activities, such as evidence of hunting or stone quarrying, is completely lacking, is probably a function of research bias towards recording larger, more visible sites. As is the case in the other subareas in Pima County, the largest number

of prehistoric sites cannot be functionally identified based on survey data.

The historic sites emphasize residential needs, with Habitation being the primary functional category represented. Its interesting to note that three sites with Art as the site function are present. These are almost certainly Native American rock art sites that date to the historic period, possibly Tohono O'odham in origin. Disposal and Resource Procurement functions are present in the subarea with three sites each, followed by two sites identified as having agricultural uses and two with governmental functions. Lastly, Resources Processing, such as a kiln or ore processing feature, and Transportation, meaning a road or trail, are present with one site each.

Ten site have both prehistoric and historic occupations on them that are functionally identified as Habitation (2), Agriculture (1), Resource Processing (1), and Transportation (1) being the dominant function at these sites where site use can be determined. There are also 51 sites where function can be determined but their general age cannot, with Resources Processing, Habitation, Disposal and Resource Procurement being the primary site functions at these sites in descending numbers. This kind of situation is often revealing of Native American site occupation more than sites occupied by Euro-Americans, because similar kinds of behaviors were practiced by Native Americans in both the prehistoric and historic time periods that only simple tools and left little physical evidence; for example, collecting and processing cactus fruit.

Of all sites from both the prehistoric and historic time period, the data presented in Table 5 indicates that site use within the subarea is dominated by Resource Processing at 96 sites. Residential needs are represented by Habitation sites and is the second highest site function by count (24), followed in order by Disposal (8), Agriculture and Art (7), Government and Resource procurement (4) Transportation (2) and lastly Religion (1). Not surprisingly, the vast majority of those sites that could be functionally identified relate to processing food and non food resources, and housing.

To sum the information on archaeological sites, the Upper Santa Cruz Valley subarea has witnessed intensive archaeological survey and site excavation, but still only a fraction of the whole of the subarea has been investigated. Because of this, site distribution is still more a reflection of where investigation has occurred than past land use patterning. Nonetheless, the following statements can be made based on the archaeological record: 1) It is evident that human beings have occupied the Upper Santa Cruz Valley subarea for many thousands of years, with a peak occupation during the period between A.D. 200 and A.D. 1300; 2) certain parts of the landscape have been more heavily utilized than others especially along the margins of the Santa Cruz River where surface water has been available; and, 3) the predominant use of the landscape relates to processing both food and non food resources and meeting residential needs.

B. Historical Resources

Definition: "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 places 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” (Preserving Cultural and Historic Resources, Pima County, May 1999).

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 railroad tracks are also historical resources. Information on these places is recovered through drawings and design plans, photographs, maps, surveys, and personal recollections.

The Upper Santa Cruz Valley subarea has a number of places of historic importance including occupied historic communities, abandoned settlements or ghost towns, places that have been recognized for their historic value and registered on the National Register of Historic Places, and a historic trail. These are represented on the attached map entitled, “**Upper Santa Cruz Subarea Historic Resources.**”

Historic Towns: The following table lists historic communities in the subarea and either a founding date or the date the post office was opened.

- Continental. The town of Continental originated as a rail stop named after the Continental Rubber Company, which bought part of the old Canoa Land Grant. The plant Guayule, from which rubber is derived, was grown for many years; however, in 1949 the company sold its land to be used for farming. In recent years, the economic focus in the town has shifted from agriculture to residential and today it is within the Green Valley development corridor. The first post office was established in 1916.
- Sahuarita was originally part of the Sahuarita Ranch, which was established by James Kilroy Brown in 1879. The ranch headquarters was used by Pedro Aguirre as a stage stop between Tucson, Arivaca and Quijota. The community was named after the ranch and opened its first post office in 1882. Brown’s sale of the ranch in 1886 lead to a decline that lasted until 1911 when a second post office was opened in town. Originally named after the abundant saguaro cactus in the area, Sahuarita is today a growing community.

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 reflect by-gone eras. The table below lists the known ghost towns in the subarea.

- Helvetia. This was a mining community, and like so many in the region, suffered the ups and downs of the marker for copper ore. Mines were probably in use after the civil war but it wasn’t until the early 1880s that several large mining claims were developed including the Old Dick, Heavyweight, and Tallyhoo mines. In 1890s the Helvetia Copper Company formed and it was in response to the mining under this company that the community of Helvetia developed. Copper mining continued until 1911 when low copper prices lead to a shut down, although

sporadic mining continued through the years of the First World War. The post office opened in 1899 and was closed by 1921.

- Olive. Named in honor of Olive Stephenson Brown, wife of James Kilroy Brown (see Sahuarita above), this mining community owed its existence to silver not copper and served a number of mines in the area including the Olive, San Xavier, Wedge, Michigan Maid, and the Richmond mines. Olive Camp, as it was known, was active during the 1880s. It was a unique mining settlement in that ore was not milled on site and there was no smelter or machinery. Instead raw ore was shipped elsewhere for processing. Olive Brown lived in the camp with her husband and was known to treat the men to a free chicken dinner every Sunday, an act of kindness that was eagerly anticipated by the miners. The mine was sold in the late 1880s and was abandoned shortly thereafter. The post office opened in 1887 and closed in 1892.
- Twin Buttes. This copper mining town developed around 1903 when the Twin Buttes Mining and Smelting Company was formed and operated the Senator, Morgan, Copper glance, Copper Queen, and Copper King mines. Ore was shipped by rail to the smelters at Sasco until 1914. The settlement itself burgeoned with the success of the mining operation and a bunkhouse, assay office, store, boarding house, and school were built to serve a population of some 300 people. The opening of a post office and a rail link connecting Twin Buttes with Sahuarita both occurred in 1906. Despite good fortune in the early years, the inevitable ups and downs of life dependant upon copper prices lead to the eventual abandonment of the town and by 1930 the post office was discontinued.

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.

- Air Force Facility Missile Site. This is the site of a Titan II missile silo that contained a nuclear tipped missile on 24 hours alert from 1963 to 1982. Known officially at Titan Missile Site 571-7, this formerly top secret facility is the sole remaining Titan Intercontinental Ballistic Missile complex left in the country. In 1988 it was opened as a museum containing both above ground and below ground components of the launch operations including, the operations center, multiple blast shields, crew quarters, and the silo itself, a concrete lined hole 55 feet wide and 154 feet deep that housed a single missile capable of delivering between 10 and 20 megatons to a target 6000 nautical miles away. The property was listed to the National Register in 1992 for its military, architectural and engineering significance as a symbol of the Cold War.

Historic Landscapes:

This is 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.

This is a new concept in cultural resources preservation; however, its use recognizes that there are places on the landscape that have been altered, both intentionally and unintentionally, by human behavior in ways that make the landscape and the historic resources that are associated with it, a single, coherent entity of historic value. A historic ranch and its associated ranch lands may be the best example of a rural historic landscape where ranching activities over time have resulted in modifications to the natural environment that are recognizable as such.

The Canoa Land Grant, established in 1820, may possess the qualities needed for designation as a rural historic landscape because of its historic use for ranching dating from the end of the Spanish Colonial period up to the 20th century.

Trails: In many places historic and even prehistoric trails crossing the landscape often become the basis for historic roads and modern highways and the Upper Santa Cruz subarea is no exception.

- Anza Trail. This is the route taken by Juan Batista de Anza in the expedition of 1775-1776 when he lead a group of some 250 colonists and 1200 head of livestock from Sonora to found a presidio and mission for Spain at San Francisco Bay. The trail extends from Nogales, Arizona to San Francisco, California, a distance of 1200 miles. There are approximately 60 miles of trail in Pima County along the west bank of the Sant Cruz River, with six campsites at Canoa, Llano Grande (south of Sahuarita), San Xavier del Bac, Tucson (north of downtown Tucson). Llano del Azotado (at the north end of the Tucson Mountains), and Oitipars (near the Pinal County Line). The Anza Trail has been nominated as a National Historic Trail by the National Park Service. Today, Interstate 19 follows the original route up the Santa Cruz Valley.

To sum the discussion of historic resources, the subarea contains a variety of places that are symbolic of different historic forces that have affected southern Arizona and the nation as a whole ranging from 18th Spanish Colonial expeditions into the unknown, to Mexican era Land Grants, to 19th century copper mining boom towns, and finally to the modern age of global missile defense.

C. Traditional Cultural Places

Definition: "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” (Preserving Cultural and Historic Resources, Pima County, May 1991).

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 Piman speaking groups (including the Salt River Pima Maricopa Indian Community) 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 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. Other places with traditional cultural value of particular importance to Native Americans are rock art sites and all archaeological sites containing human graves. Four sites within the subarea are identified as prehistoric rock art localities and in addition, 12 prehistoric sites were used for habitation, which often contain human graves. It is reasonable to assume, that Native Americans would identify these places as having traditional cultural value. More than likely, there are many places with these kinds of values that exist in the Upper Santa Cruz Valley subarea.

IV. THREAT ASSESSMENT: The next map, entitled “**Archaeological Sites and Land Ownership**” shows the distribution of sites in relation to land status. Most of the 396 sites reported in the subarea are on state lands followed by private property, federal lands (BLM and National Forest Lands), and Pima County land in that order. Legal protections against unauthorized disturbances are afforded archaeological sites and other cultural and historical resources on state and federal lands, 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 Table 6 below showing the number of archaeological sites by land status and degree of legal protection for cultural resources.

**Table 6. Upper Santa Cruz Subarea
Archaeological Sites by Landownership and Legal Protection**

Jurisdiction	No. of Archaeological Sites	Protection Status/Level
BLM	15	Protected/high
National Forest Lands	11	Protected/high
State Lands	189	Protected/moderate
Private Lands	181	Unprotected/low
Total	396	

A total of 26 of the 396 sites or only 6.5% have high protection status because of their location on federal lands. One hundred and eighty-nine sites are moderately protected from public and private actions. The remaining 181 sites or approximately 45.7% are on private lands and thus have low protection status. Since state lands can be sold for development, and private lands are subject only to local zoning, 370 of the 396 or 93.4% of the total number of known archaeological sites are potentially threatened by future development in the subarea. Furthermore, since the majority of the land base in the subarea has never been archaeologically surveyed (83.6%), hundreds even thousands of sites may exist in the subarea that could be affected.

One way to estimate this number is to divide the number of square miles surveyed in the subarea by the number of reported archaeological sites to get an average of the number of archaeological sites per square mile. The Arizona State Museum reports a total of 73,868 acres (115.4 square miles) have been surveyed (see Table 2) and 472 sites, including those on Indian lands, have been recorded for a little over 4 sites per square mile. The subarea is approximately 702 square miles, thus as many as 2,808 sites may be within the subarea. State lands represent 47.3% of the subarea and private lands represent 34.8%. Using an average of 4 sites per square mile and multiplying the state and private land percentage into 2802, indicates that as many as 1,328 sites may be located on state lands and another 977 sites may be on private land. In all, over 2300 archaeological sites could be vulnerable to future developmental pressure by this calculation.

Archaeological sites are not evenly distributed across the landscape; people do not settle on or utilize the land in a uniform manner and therefore some areas will be more heavily used than others. As such, site densities will be lower than the average of approximately 4 sites per square mile in some places and higher in others. Since private lands concentrate along valley bottom adjacent to the Santa Cruz River, among other places, and since proximity to water is a reasonable predictor of where human being have tended to settle in the past, private lands may actually hold more of the archaeological sites in the subarea, with state lands holding fewer sites than predicted. Low survey coverage and bias in survey recording contributes to the problems of this analysis making it no more than an educated guess. Even so, the results suggests the scale of the potential loss in the subarea

and the conversely the size of the conservation problem.

The loss of cultural and historical resources and the threat of further loss in the Upper Santa Cruz subarea can be summarized as follows..

Resource Loss:

There are three principal sources of cultural resource loss in the subarea: Mining, farming and urbanization as depicted on the map entitled, **GAP Vegetation with Archaeology Site Locations**. Intensive copper and silver mining on the east side of the Sierrita Mountains has over many years has disturbed approximately 29,000 acres and the cultural resources that they contain. Similarly, agricultural uses of the bottom lands and adjacent terraces of the Santa Cruz River has resulted in additional loss of resources, particularly archaeological sites. There are currently more than 7300 acres of land in agricultural use along the Santa Cruz, stretching from the southern end of Green Valley north to Pima Mine Road, most of which has been modified for development of pecan orchards. Historically, as much as 13,000 acres were in non ranching agricultural use in this same area. The last and most recent phenomenon to affect cultural resources is associated with the process of rapid urbanization that is occurring on both sides of I-19 within Green Valley but also including the communities of Continental and Sahuarita. Data available through Pima County indicates that approximately 15,860 acres in this area are "urbanized" and that this land too is located adjacent to the Santa Cruz River.

Archaeological Survey data along the western flanks of the Sierrita Mountains indicate that two to four sites can be expected per square mile, whereas as many as nine sites will be located in certain locations on the valley bottom adjacent to the Santa Cruz River. It should be noted that surface water was not always available between the area of modern day Continental and San Xavier and so site density would be expected to be lower in this area, perhaps as few as 2 sites per square mile. With this caveat in mind, given the density estimates and the acreage totals of disturbed lands it is possible to make an educated guess about how many archaeological sites have been affected by the combined disturbances of mining, farming and urbanization. At 2-4 sites per square acre, mining has probably affected between 90 and 180 sites. If a range of 2-9 sites per square mile is used for the Santa Cruz River area, for an average of 5.5 sites per square mile, then farming on the Santa Cruz River, has probably affected another 110 sites, and the land use associated with urbanization has impacted another 135. In short, the combined effect of these forces are likely to have damaged or destroyed between 335 and 425 archaeological sites within the subarea.

It is important to note that other kinds of cultural resources, including historic buildings and structures, engineered features, roads, railroads, and trails, have also been impacted over the years by the combined forces of mining, farming, ranching, and urbanization. That it is easier to quantify these effects for archaeological sites does not mean that important historical resources have not been similarly affected by both man made and natural forces. It is certain that the vestiges of the history of life on the Western frontier have also been lost.

Resource Threat:

The greatest threat to cultural resources of all kinds is continued urbanization from both platted subdivisions and unplatted or “wildcat” development of individual lots. The area of principal development pressure is along the central axis of the valley paralleling I-19 and the Santa Cruz River from Green Valley to South Tucson. There are, however, other places in the subarea, such as the Corona de Tucson area to the east and north of the Santa Rita Mountains, that are also experiencing rapid growth and which can be expected to continue to develop in the future.

Since private land can be split into five lots or less and developed without platting under current state law, and state trust land is vulnerable to sale for residential development, cultural and historical resources will continue to be threatened on state and private lands, especially adjacent to area that are already experiencing growth. In unincorporated Pima County, development of unplatted land as individual parcels or in “lot split subdivisions” is not subject to the same environmental regulations, including cultural resources requirements, as formally platted subdivisions. Under these circumstances, cultural resources may be destroyed without first being recorded and no opportunities exist for in place preservation through avoidance. Even in cases where development is subject to full review by the county, cultural resources may be destroyed provided they are first investigated. Thus both platted and unplatted residential growth threatens cultural resources, particularly archaeological sites, but not exclusively. Green Valley is not incorporated and is therefore subject to county development requirements. However, Sahuarita is an example of a community that has incorporated but has not adopted cultural resources protection mandates. Development in this area occurs without cultural resources investigations and thus resources are lost without even been noted.

In reviewing the map entitled, **Archaeological Sites and Land Ownership**, it is worth noting that private land tends to concentrate along the Santa Cruz River in areas both demonstrated to contain high concentrations of archaeological sites and predicted to be archaeologically sensitive. State lands in close proximity to the River are similarly rich and can be expected to be “hot spots” for archaeological sites where ever surface water was available in the past. See for instance the high concentration of archaeological sites on state lands to the east of the San Xavier District. These are the areas that are most threatened by urban expansion and for which cultural resources have the fewest legal protections.

Sensitivity Zone:

Because survey coverage within the subarea is limited (16.4%), the distribution of cultural resources is unknown, thereby making risk assessment and conservation recommendations difficult. In an effort to predict areas with high sensitivity for cultural and historical resources, proximity to water is used as an objective predictor; this assumes that in the desert places closer to water will tend to have been used more heavily by past human populations than places more removed from water sources. The relationship between land use and proximity to water has been alluded to elsewhere in this report and so the following analysis is an attempt to use this relationship as a tool to predict site location within the subarea.

The map entitled **Cultural Resources High Sensitivity Areas** identifies zones within the subarea that are predicted to be highly sensitive for cultural resources. The model encompasses the Santa Cruz River, as well as spring sites in both the Sierrita Mountains and the Santa Rita Mountains, and areas of shallow ground water along Sopori Creek. Different buffers widths are used for the sensitivity model. The River is buffered by two miles on either side for a total of four miles in width. The springs receive a one mile buffer around them as does the area of shallow ground water. The distribution of known archaeological sites is also provided in this figure and demonstrates that many, but not all known sites are captured within the sensitivity zones as defined. The buffers used are arbitrary and the statistical efficacy of the model is untested, even so this projection provides an idea of where common sense would predict sites to be located.

The buffered areas capture the distribution of known sites along the Santa Cruz River, adjacent to springs in the Santa Rita Mountains, and along Sopori Creek. The model also includes the Historic communities of Continental and Sahauriata, and the ghost town of Helvetia. It does not include all sites or historic resources thereby demonstrating the limit of its utility to predict past land usage. Obviously, proximity to surface water is only one factor that conditioned human behavior in the past. Nonetheless, the model does appear to work with sufficient capacity as a good guess where cultural resources, particularly those associated with habitation, can be expected to be found. Adding tributary drainages along with data on historically exploited mineral resources would contribute to the utility of the model.

V. SUMMARY: The cultural resources of the Upper Santa Cruz subarea are the product of thousands of years of human settlement from the earliest prehistoric times to the modern day. In that sense, they represent a collective history of this portion of the Valley that can inform and educate future generations about the past. But these resources are non renewable: there are only so many archaeological sites, historic buildings or places with traditional cultural value, and once they are gone there are no replacements. It is for this reason that Pima County has included cultural resources in its planning for the Sonoran Desert Conservation Plan.

This report provides information on known cultural resources within the subarea describing their nature and distribution and attempts to predict where other cultural resources may be found. Clearly, much more is known about the archaeological record than either historic resources or traditional cultural places. This is because more formal study has been directed to the archaeological record, whereas research on historic resources is limited, and ethnographic information on traditional cultural properties is almost completely lacking. It is also apparent that the subarea has received different levels of research attention in different locations over the years. While archaeological survey data indicate that approximately 16.4% of the subarea has been intensively investigated, the focus of this research has been scattered here and there, with little or no data on to connect these areas; thus the picture of land use patterning is fragmented. Despite the low survey coverage, those areas that have been studied suggests that up to 10,000 years of human history is represented in the subarea, and that the peak use of the valley occurred during late prehistory when the subarea was occupied by the Hohokam Indians. Historic uses of the valley for mining, ranching and agriculture contribute to its importance as a place with high scientific, educational and recreational potential,

an assessment that is further supported by site density estimates indicating that as many as 2800 archaeological sites may be within the subarea.

The historic communities of Continental and Sahuarita are products of agriculture and ranching respectively, both of which contributed to the rich history of the subarea and which continue to be practiced today. The ghost towns of Olive and Twin Buttes on the west and Helvetia on the east are examples of 19th and early 20th century mining communities that historically were a part of the western mining phenomenon that has contributed so much to the building of the nation.

The subarea has a single places that is listed on the National Register of Historic Places for its importance to the historic era known as the "Cold War," a period that historically has just come to a close, but that influenced many facets of modern American life.

Lastly, Native American claims identify the subarea as part of their traditional use areas and the possibility that places with traditional cultural value exist in the subarea is high, especially those associated with the archaeological record. In short, the subarea, while still mostly unrecorded, has rich record of cultural and historical resources with a high potential for many more resources than are currently known. Since the majority of the Subarea is composed of private lands and state trust lands that 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.

Archaeological Sites and Land Ownership

SDCP PLANNING UNIT 3

- Watershed Planning Boundary
- Archaeology Sites
- BLM
- County Park
- Indian Lands
- Military Reservations
- National Forest Lands
- National Parks and Monuments
- National Wildlife Refuge
- Private Lands
- State Lands
- State Park

ARCHAEOLOGY SITES BY LAND MANAGEMENT JURISDICTION

JURISDICTION	# OF SITES
BLM	15
COUNTY PARK	0
COUNTY OWNED LAND	0
INDIAN LANDS	0
MILITARY RESERVATIONS	11
NATIONAL FOREST LANDS	0
NATIONAL PARKS AND MONUMENTS	0
NATIONAL WILDLIFE REFUGE	0
PRIVATE LANDS	164
STATE LANDS	169
STATE PARKS	0
COUNTY OWNED LAND	0
TOTAL	396

Pinna County Index Map

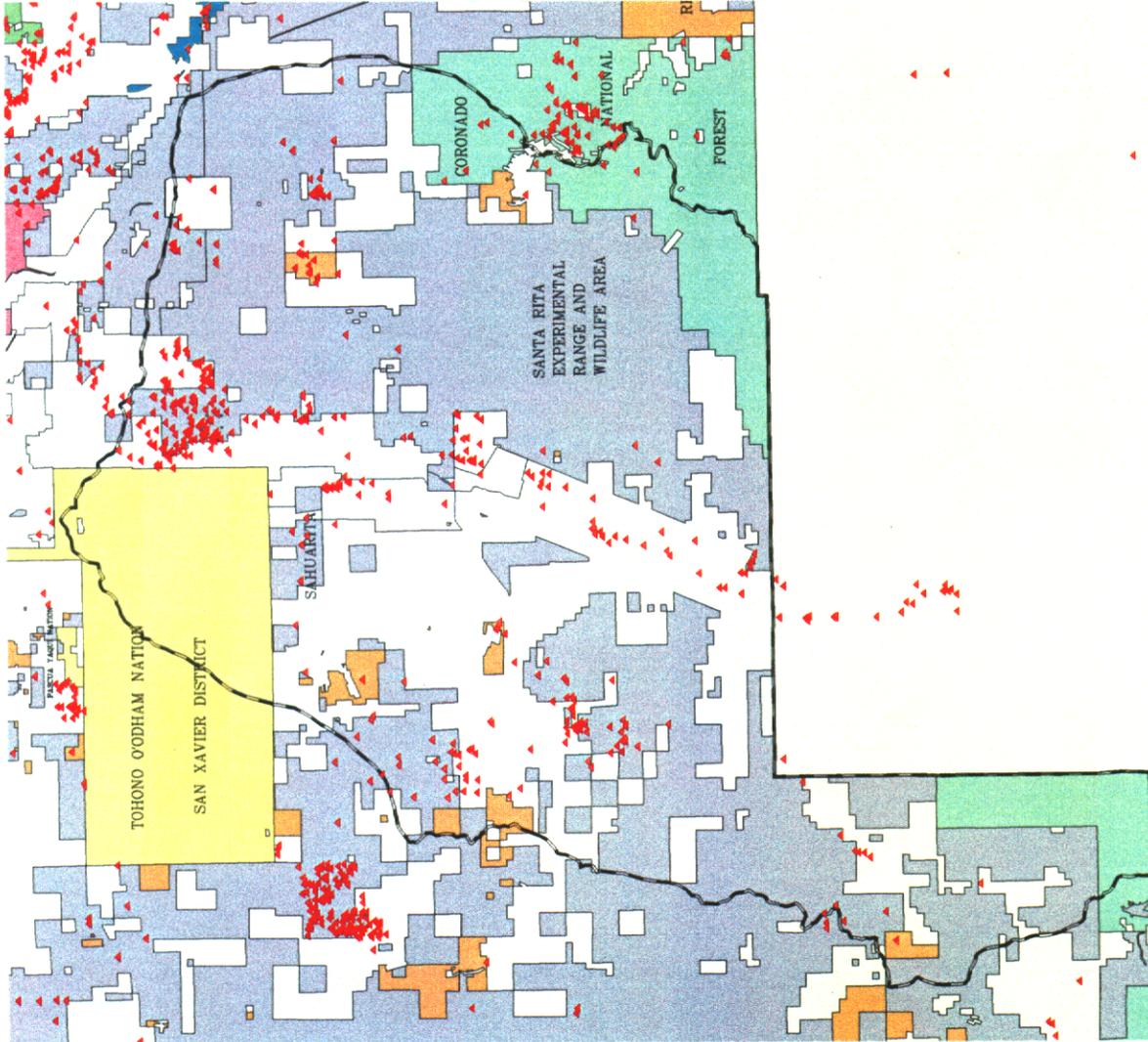


The information presented on this map is for informational purposes only. It is not intended to be used as a legal document. The user assumes all responsibility for the accuracy of the information presented on this map. The user also assumes all responsibility for the accuracy of the information presented on this map.

Scale 1:90,000



Pinna County Technical Services
 201 North Stone Avenue, 1st Floor
 P.O. Box 2000, P.O. Box 2000
 Tucson, AZ 85701-2000
 Phone: (520) 795-3429
 Fax: (520) 795-3429



One Mile Buffer ~ Springs And Major Washes

SDCP PLANNING UNIT 3

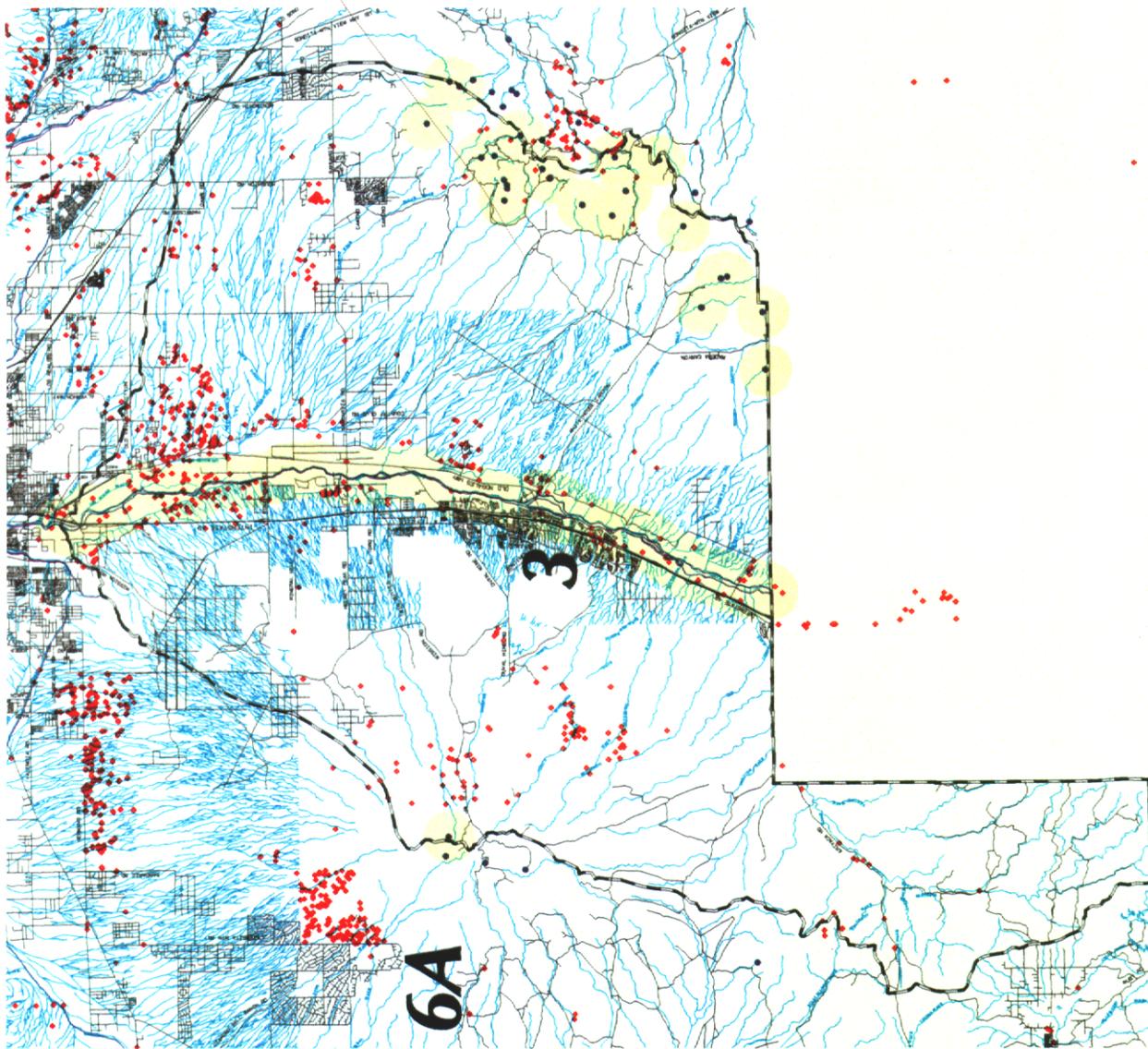
-  Streets And Roads
-  Minor Washes
-  Major Washes
-  Subarea Boundary
-  Archaeological Sites
-  Springs

 One Mile Buffer Around Springs And Major Washes

Number Of Sites Within Buffered Wash Area: 143

Number of Sites Within Buffered Spring Area: 10

Total Number of Archaeology sites: 481



Pima County Index Map



Scale: 1:85,000

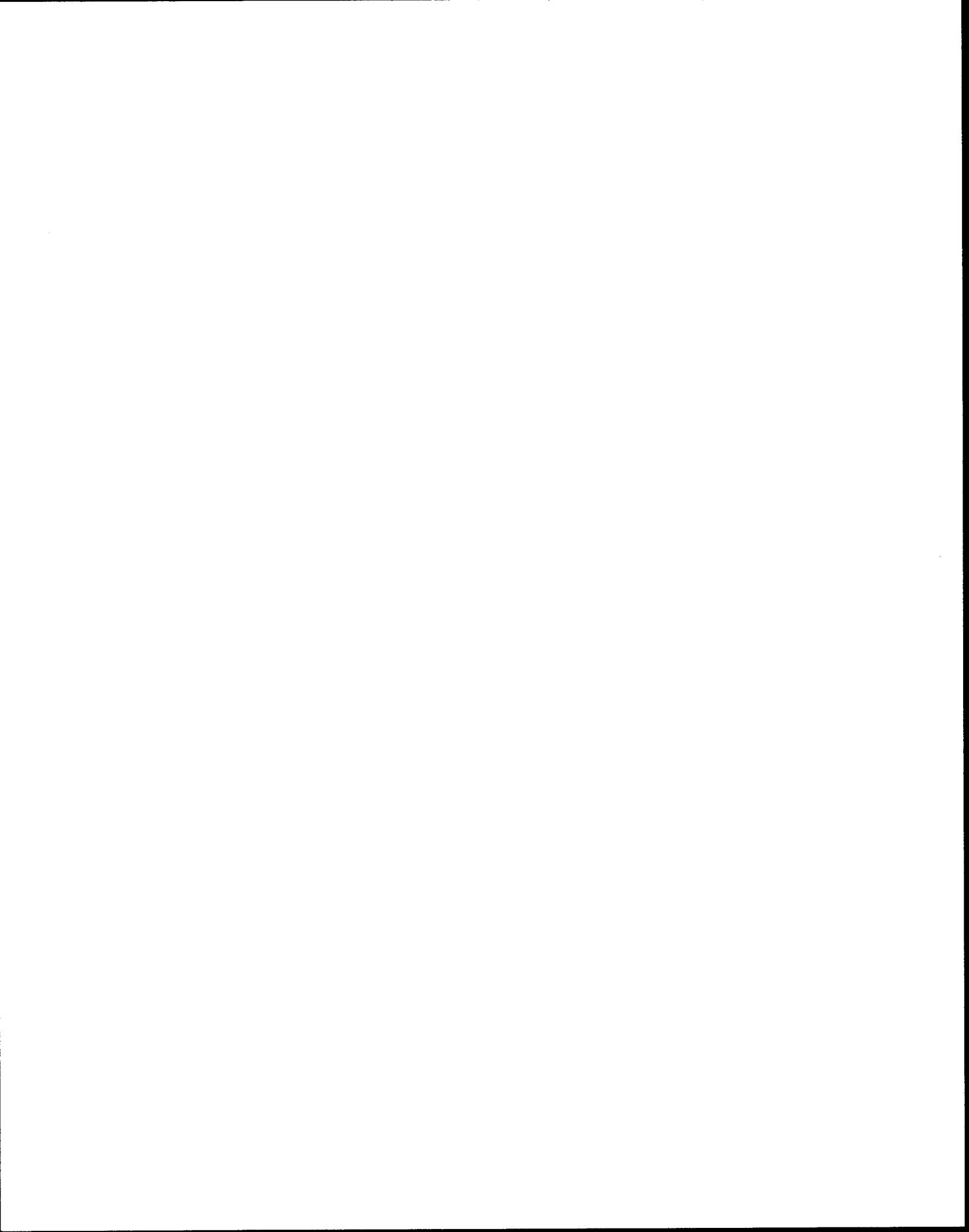


Scale 1: 85,000



PIMA COUNTY TECHNICAL SERVICES
1000 N. GILBERT AVENUE, SUITE 1000
TULSA, OKLAHOMA 74103-1000
PH: 918.492.3429
FAX: 918.492.3429
http://www.dot.co.okla.us





□

Sonoran Desert Conservation Plan

Upper Santa Cruz Watershed Sub-area Report

Drill

Pima County

May 2000

TABLE OF CONTENTS

TITLE	PAGE
I Summary	I
II Site Inventory and Analysis	1
A. Location	1
B. Ownership	1
C. Land Use and Zoning	1
D. Topography	9
E. Hydrology	11
F. Soils	11
G. Environmental Characteristics	11
H. Viewsheds	12
I. Infrastructure	18
J. Open Space	21
K. Archaeological and Cultural Resources	21
L. Real Estate Market Conditions	21
M. Capital Improvement Projects	22
N. Permits	23
Appendices	
References	
End Notes	

I. SUMMARY

The Upper Santa Cruz Watershed sub-area lies immediately south of Tucson, north of Santa Cruz County and east of Altar Valley. It encompasses an area of approximately 449,685 acres. The land ownership is comprised primarily of State Trust, County and private land holdings, and public preserves.

The land east of I-19 is predominantly vacant or is comprised of public preserves, barring the couple of large subdivisions and a smattering of un-regulated development. Roughly 14,100 acres (3.42 percent) have been developed as single family residential in varying densities. Industrial land measures about 32,680 acres and commercial about 1,880 acres. About 55,386 acres of agricultural land is devoted to ranching and grazing purposes. The planned land uses, on approximately 250,000 acres of vacant land include Rural and Urban uses; Resource Conservation, Protection and Transition; Industrial; and, Activity Centers (CAC, MFC, NAC, RUAC). Approximately 249,313 acres of vacant land have zoning designations, of which roughly 229,000 acres (91.8 percent) are zoned RH Rural Homestead. There are several rezoning cases, mostly requests for a change to GR Rural Residential, accounting for a proposed 33,323 dwelling units on 3,095 acres of land.

Of approximately 8,963 acres, the current land use in the Town of Sahuarita is predominantly vacant land, with several mixed use subdivisions of land. The major residential development underway is Rancho Sahuarita, on 2,880 acres.

The Upper Santa Cruz watershed is cradled between the Sierrita and Santa Rita Mountains, with altitude between 1,200 and 2,000 meters above the mean sea level (MSL). The Santa Cruz valley varies in altitude ranging between 800 and 1,200 meters above MSL. There is one perennial stream and five intermittent streams in the watershed.

The Upper Santa Cruz watershed's prime viewsheds are those of the Santa Rita and Sierrita Mountain Ranges, offering wonderful panoramic views.

The major areas of development are 1) along I-19 in the Town of Sahuarita and 2) the unregulated subdivisions of Corona de Tucson and New Tucson south of Sahuarita Road.

The primary open spaces in the watershed are the public reserves of the Santa Rita Experimental Range, Coronado National Forest and Mount Wrightson Wilderness Area.

There are currently 31 capital improvement projects underway amounting to a total of \$132,789,402.

Between 1997 and 1999, the total number of permits issued was at an all-time high in 1998 (941 permits). Of these, 473 (50 percent) were for new single family residence and 142 (15 percent) were for mobile homes.

II. SITE INVENTORY AND ANALYSIS

A. Location

The Upper Santa Cruz Watershed sub-area lies immediately south of Tucson, north of Santa Cruz County and east of Altar Valley. The San Xavier District of the Tohono O'odham Nation lies to its north-west and the Santa Rita Experimental Range lies to its south-east. It extends from the Coronado National forest, about five miles east of the Town of Arivaca, to the intersection of I-19 and Los Reales Road. The watershed encompasses an area of approximately 449,685 acres.¹

The Town of Sahuarita is located in the historic Santa Cruz valley, within the watershed. The San Xavier District of the Tohono O'odham Nation is to its north, tailings of the ASARCO mines are to its immediate west, unincorporated Green Valley (Pima County) is to its south, and State Trust, County and private lands are to its east. The Santa Rita Experimental Range is located to the southeast of the Town.

The Town of Sahuarita was incorporated in September 1994 and currently encompasses approximately 8,963 acres. It is a linear city along a north-south axis, on both the east and west sides of Interstate 19, with good access to Tucson, Nogales, Madera Canyon, Lake Patagonia and other areas of attraction. The Town's northern corporate limits are approximately 16 miles south of downtown Tucson. It is also home for people who work in the southern part of Pima County and Santa Cruz County, such as Border Patrol and Immigration and Naturalization Services employees. The Town of Sahuarita is often associated with its neighbor immediately to the south, Green Valley, and *vice versa*. The Town is also associated with surrounding communities such as Sahuarita Heights, which are not within the corporate limits of the Town.

The Town is bound either by separate jurisdictions or by current land uses on the north, west and the south. These barriers to annexation leave only the east, beyond the Santa Cruz basin, for future expansions. At present, the Santa Cruz basin predominantly supports pecan groves and expanses of ironwood trees.

B. Ownership

The land ownership is comprised primarily of State Trust, County and private land holdings, and public preserves. The Town of Sahuarita, the entire Santa Rita Experimental Range and a portion of the Coronado National Forest lie within the watershed.

C. Land Use and Zoning

1. Land Use

The land east of I-19 is predominantly vacant or is comprised of public preserves, barring the developments of Corona de Tucson and New Tucson, and a smattering of un-regulated development south of Sahuarita Road. Along I-19, on both sides, the Town of Sahuarita and the unincorporated part of Pima County known as Green Valley form a linear development

corridor, along a north-south axis. The Santa Rita Experimental Range, measuring 50,811 acres and roughly 29,000 acres of the Coronado National Forest account for about 18 percent of the watershed. **Table 1** shows the existing land use.

Table 1

EXISTING LAND USE - UPPER SANTA CRUZ WATERSHED

LAND USE	JURISDICTIONS AND ACREAGES			
	PIMA COUNTY	SAHUARITA	TUCSON	TOTAL
RURAL	5,801.04	500.80		6,301.84
0.2 TO 0.4 RAC	3,000.64	207.26		3,207.90
0.4 TO 0.75 RAC	873.66	81.86		955.52
0.75 TO 1.25 RAC	1,127.89	305.34		1,433.23
1.25 TO 3.0 RAC	303.37	67.04		370.41
3.0 TO 6.0 RAC	984.78	67.07		1,051.85
6.0 TO 10.0 RAC	469.79	3.25		473.04
10.0 TO 15.0 RAC	195.44	30.96		226.40
15.0 TO 25 RAC	52.67	11.04		63.71
GRTR THAN 25 RAC	4.79			4.79
AGRICULTURAL	61,831.32	1,237.27		63,068.59
COMMERCIAL	1,825.81	51.38		1,877.19
DED. OPEN SPACE	1,029.77	195.88		1,225.65
GOLF COURSE	1,226.46			1,226.46
INDUSTRIAL	32,294.97	385.16		32,680.13
INSTITUTIONAL	256.12	186.25		442.37
LODGING	3.27	1.65		4.92
MISC GOV'T	151.28	1.29		152.57
OFFICE	26.59			26.59
OTHER	337.95	11.11		349.06
PARTIAL	81.43	5.04		86.47
PRIVATE STREET	1.65			1.65
PUBLIC PRESERVE	93,378.00			93,378.00
SPLINTER	31.74			31.74
TRANS FACILITIES	579.28	31.51		610.79
UTIL/TELECOMM	48.04	9.19		57.23
VACANT	170,451.60	4,866.31	3,907.93	179,225.84
VACANT-JUR	17,175.43	74.54	97.63	17,347.60
VACANT-STATE	1,954.09		1,105.75	3,059.84
CHK	3,387.25	84.15		3,471.40
TOTAL ACREAGE	398,886.12	8,415.35	5,111.31	412,412.78

PERCENT OF AGRICULTURAL IN RANCHING AND GRAZING: 88% (55,386 ACRES)

New Tucson is an un-regulated development with mostly mobile homes. Corona de Tucson has been platted but only half of the lots have been built upon, with equal portions of regular single family homes and mobile homes.

The existing land use data reveal that roughly 14,100 acres or 22 square miles (3.42 percent of the watershed) have been developed as single family residential use with densities ranging from 0.2 RAC to 25.0 RAC and above.

Industrial land in the watershed accounts for about 32,680 acres, of which 32,295 acres lie in unincorporated Pima County and 385 lie within the corporate limits of the Town of Sahuarita. Commercial land accounts for roughly 1,880 acres, all of it within Pima County, except about 51 acres in the Town of Sahuarita.

Another significant land use is that of ranching and ranch conservation. "Pima County has participated in a number of ranch conservation efforts,...."² Within the watershed, about 55,386 acres of agricultural land is devoted to ranching and grazing purposes.

The current land use in the Town of Sahuarita is predominantly vacant land, with several mixed use subdivisions of land, those of specific significance being Madera Highlands and Rancho Sahuarita. Of approximately 8,963 acres, 73 percent is vacant land, as shown in **Table 2**. A little over 2,200 acres of land have been built upon or have been committed to construction. There are no public preserves, other than community parks, within the corporate limits; and, the agricultural land is comprised of predominantly pecan groves.

The development of land in the Town has experienced new heights, attributable to both the booming regional economy and Sahuarita's pleasant demeanor of a bedroom community. The commute to Tucson is regarded by many as considerably less problematic than the ones on I-10 and North Oracle Road from Marana and Oro Valley. Development is primarily residential which has occurred mostly through the regulated process.

The Town has two interchanges off of I-19. The Sahuarita Road interchange is viewed as the activity node of Educational and Government/Public related services. The school facility, Kinder Garten through 12th grade, and the Town facilities (Town Hall, Planning, Fire, Police and Emergency Management services) are located to the west of the interchange. The Duval Mine Road interchange, about 3.5 miles south of Sahuarita Road, is considered the commercial node of the Town, with the Town's current core commercial and mixed use development.

The construction of a casino in the San Xavier district of the Tohono O'odham Nation, along the Pima Mine Road interchange on the Town's northern boundary, is viewed as a potential catalyst for commercial development in Sahuarita, to accommodate hotels, gas stations and similar uses.

There is very little industrial development within the Town limits, despite industrial land designations on Duval Mine and Pima Mine roads.

The major residential development underway is Rancho Sahuarita. It is a planned community on 2,880 acres, with 286 acres of public facility open space, 160 acres for drainage, 115 acres of Rights-of-Way, 122 acres for a Town Center (mixed use development), 170 acres of Industrial Park, a 216-acre mobile home retirement community and the majority of the remainder for single family residences. It is projected to have up to 10,680 single family residences and up to 1,881 additional dwelling units other than site built single family residences.

The other planned community is Madera Highlands, on 920 acres with a maximum of 1,800 dwelling units. Other planned uses within this development are a school site on 20 acres, public facilities on 23 acres, Town Center (mixed use development) on 66 acres, 139 acres of open space and 218 acres of golf courses.

Table 2

STATUS OF LAND - TOWN OF SAHUARITA

STATUS	ACRES
Built or Committed	2,244.13
3.0+ RAC Zoning: Approved Subdivision or DP	166.50
3.0+ RAC Zoning	3,103.99
1-3 RAC Zoning: Approved Subdivision or DP	20.43
1-3 RAC Zoning	1.36
0.3-1.0 RAC Zoning: Approved Subdivision or DP	100.26
0.3-1.0 RAC Zoning	802.79
<0.3 RAC Zoning	1,845.09
TOTAL	8,284.55

2. Planned Land Use

The planned land uses, on approximately 250,000 acres of vacant land in the watershed, include Low, Medium and Medium/High Intensity Rural and Urban uses; Resource Conservation (RC); Resource Protection (RP); Resource Transition (RT); Industrial (Heavy and Urban); Activity Centers (CAC, MFC, NAC, RUAC); and, Rural Crossroads (RX), as shown in **Table 3**.

Low Intensity Rural planned land use on vacant land accounts for 123,659 acres or roughly 50 percent of the land. Other uses dominant uses include Resource Conservation (about 19,600 acres); Medium Intensity Rural (roughly 9,100 acres); Low, Medium and Medium/High Intensity Urban (about 7,060 acres) and Development Reserve (5,760 acres).

Table 3

**PLANNED LAND USE ON VACANT LAND--UPPER SANTA CRUZ WATERSHED
UNINCORPORATED PIMA COUNTY**

PLANNED LAND USE	ACRES
RC	19,592.27
RP	2,715.92
LIU-1.2	369.46
LIU-3.0	2,911.43
MIU	3,071.13
MHIU	707.89
NAC	186.90
MFC	73.72
CAC	441.68
DR	5,758.24
HI	493.96
I	1,152.89
LIR	123,659.35
MIR	9,110.69
RX	42.74
RUAC	57.13
OUTSIDE PLAN AREA	79,350.45
TOTAL	249,695.85

For the Town of Sahuarita, the land use patterns of the future are likely to replicate the existing ones. Most of the Town's residential land is platted for regulated development, with some projects currently under construction. Housing units are projected to be primarily site-built homes; although, Rancho Sahuarita does have plans for a mobile home retirement community, currently designed for approximately 350 units. Within the last three or four years, Sahuarita has afforded two apartment complexes with a total of 196 units. Commercial development, mainly in and around the Duval Mine Road interchange will see additional grocery stores and other related retail establishments. A shopping center is planned to be built soon and a movie theater complex is currently being built. A small industrial area alongside the Titan Missile Museum is located in the southwest corner of the Town's corporate limits, which, in the future, has the potential to foster more commercial development in the general area.

Sahuarita's planned land uses include High Density Residential (HDR), Medium/High Density Residential (MHDR), Medium Density Residential (MDR), Medium/Low Density Residential (MLDR), Low Density Residential (LDR), Town Center, Commercial (C), Park Industrial (PI), Mining (M), Institutional/Public (I/P), Development Reserve (DR), Park/Open Space (P/OS)

and Drainage (D), as shown in Map of Planned Land Use on Vacant Land. **Table 4** shows the Town's planned land uses.

Table 4

PLANNED LAND USE ON VACANT LAND--TOWN OF SAHUARITA

PLANNED LAND USE		ACRES
LDR	Low Density Residential	683.09
MLDR	Medium Low Density Residential	670.48
MDR	Medium Density Residential	2,026.99
MHDR	Medium High Density Residential	268.97
HDR	High Density Residential	40.27
TC	Town Center	241.20
Tca	Town Center - Special Area Policy	52.58
C	Commercial	343.15
PI	Park Industrial	421.91
I/P	Institutional/Public	62.41
DR	Development Reserve	387.75
GC	Golf Course	33.02
P/OS	Park/Open Space	694.35
D	Drainage	22.28
TOTAL		5948.45

The Town's planned land use on approximately 6,000 acres is primarily residential, covering about 62 percent of the total land. Other uses include Town Center (5.0 percent), Commercial (5.8 percent), Park/Open Space (11.7 percent), and other uses, as shown in **Table 4**.

3. Zoning

Zoning, on vacant land, is predominantly RH Rural Homestead. Other zoned vacant land, in excess of 1,000 acres, include GR-1 Rural Residential (8,131 acres), IR Institutional Reserve (4,615 acres) and CR-1 Single Residence (1,157 acres) and SP Specific Plan designations (3,074 acres), as shown in **Table 5**.

Currently, an area of approximately 249,313 acres are vacant with zoning designations. Of the total vacant land, approximately 229,000 acres (91.8 percent) are zoned RH Rural Homestead i.e. land earmarked for low-density residential uses. Industrial land (General and Heavy) totals roughly 625 acres and commercial vacant land measures less than 270 acres.

Table 5

**ZONING ON VACANT LAND--UPPER SANTA CRUZ WATERSHED
UNINCORPORATED PIMA COUNTY**

ZONING DISTRICT	ACRES
IR	4,614.73
RH	229,116.74
SR	621.25
GR-1	8,131.45
CR-1	1,157.17
CR-2	103.03
CR-3	534.39
CR-4	87.88
CR-5	59.53
SH	220.13
CMH-1	136.94
CMH-2	46.57
TH	19.00
TR	274.56
CB-1	104.88
CB-2	163.62
CI-1	12.17
CI-2	611.36
GC	223.46
SP	3,073.95
TOTAL	249,312.81

There are several rezoning cases that are either being reviewed currently or have been left open from as far back as the early 1960s, as shown in **Table 6**. Some of these have conditional zoning while others do not. Residential rezonings, as shown in **Table 6**, is proposed to yield a total of 33,323 lots - subject to zoning changes - on a total of 3,095 acres (at maximum allowable density for each zone district).

Most of these rezonings are requests for a change to GR Rural Residential, from primarily SH Suburban Homestead, CR Single Residence and CMH Mobile Home zone districts. There are four major rezoning requests that propose 4,878 to 6,094 lots or dwelling units.

Table 6

CASE NUMBER	TO	FROM	ACRES	PROPOSED # OF LOTS	CONDITIONAL	T-R-S	BASEMAP #
C09-69-52	GR	TH	3.25	51	YES	15-14-31	139
C09-71-52	GR	CMH-1	27	147	YES	16-14-06	139
C09-96-05	R-1	SH	1.11	2	YES	16-14-06	139
C09-69-61	GR	TH	7	144	YES	16-14-07	190
C09-70-38	GR	TH	7	144	YES	16-14-07	190
C09-71-12	GR	SH	19	46	YES	17-14-21	473
C09-69-28	GR	SH	80	193	YES	17-14-22	473
C09-84-141	GR	SH	55.5	134	YES	17-14-22	470
C09-84-141	GR	CMH-1	133.5	726	YES	17-14-22	470
C09-84-141	GR	CMH-2	17.5	381	YES	17-14-22	470
C09-84-141	GR	CR-4	13.99	174	YES	17-14-22	470
C09-84-141	GR	CB-1	5	145	YES	17-14-22	470
C09-64-87	GR	CR-1	120	145	YES	17-16-29	560
C09-64-87	GR	TR	3	860	YES	17-16-29	560
C023-87-03 (Santa Rita Springs)	GR-1, RH	SP	1,116	6094	YES	17-16-30	560
C09-69-02	GR	TR	37	1611	YES	18-13-06	664
C09-69-02	GR	CR-3	80	435	YES	18-13-06	664
C09-73-12	GR	TR	112	4878	YES	18-13-15	772
C09-73-12	GR	CR-3	70	381	YES	18-13-15	772
C09-73-12	GR	CR-5	100	2178	YES	18-13-15	772
C023-92-02 (Las Campanas)	RH	SP	532	1590	YES	18-13-03	772
C09-96-64	RH	CR-1	137.98	137	YES	18-13-27	887
C09-74-49	GR	CR-3	5.55	30	YES	18-13-21	887
C09-74-49	GR	GR-S	34.31	747	YES	18-13-21	887
C09-74-49	GR	TR	116	5052	YES	18-13-21	887
C09-74-49	GR	CB-1	9.3	405	YES	18-13-21	887
C09-74-49	GR	SR	11.98	3	YES	18-13-21	887
C09-74-49	GR	CR-2	18.03	49	YES	18-13-21	887
C09-96-14	RH, SR	CR-1	26.1	31	YES	19-13-08, 05	1141
C09-96-14	RH, SR	TR	123	5357	YES	19-13-08, 05	1141
C09-97-08	RH	CMH-1	13.03	70	YES	19-13-30	1428
C09-68-31	GR	TH	42	914	YES	19-12-36	1583
C09-68-31	GR	TR	3	130	YES	19-12-36	1583
C09-64-45	GR	CR-3	15	81	YES	19-13-36	1583
C09-94-68	GR-1	CMH-1	0.66	3	YES	19-12-36	1583

Draft

The Town of Sahuarita zoning on vacant land is shown in **Table 7**. The predominantly large zoning districts are RH Rural Homestead (27.0 percent) and Specific Plans (55.7 percent). Another major district is GR-1 Rural Residential, accounting for 13.2 percent.

Commercial vacant land zoned CB-1 or CB-2 measures roughly 51 acres and industrial vacant land, zoned CI-1 Light Industrial/Warehouse, equals about 26.4 acres. In keeping with a bedroom community status, these zone districts are not viewed as overly desirable.

Table 7

ZONING ON VACANT LAND - TOWN OF SAHUARITA

ZONING DISTRICT	ACRES
RH Rural Homestead	1,825.92
SR Suburban Ranch	19.17
GR-1 Rural Residential	894.90
CR-1 Single Residence	12.65
CR-2 Single Residence	21.79
CR-3 Single Residence	33.62
CR-4 Mixed Dwelling Type	94.79
CR-5 Multiple Residence	22.42
CB-1 Local Business	19.72
CB-2 General Business	31.08
CI-1 Light Industrial/Warehouse	26.37
Madeira Highlands Specific Plan (SP)	891.08
Rancho Sahuarita Specific Plan (SP)	2,880.00
TOTAL	6,773.51

D. Topography

The Upper Santa Cruz watershed is cradled between the Sierrita and Cerro Colorado mountain ranges to the west and the Santa Rita Mountains to the east. The topography is composed of peaks and ridges from the east to the west on the southern half of the watershed with a large valley cradling the Santa Cruz River, spreading out north into the Middle Santa Cruz watershed.

The valley, in different parts varies in altitude ranging between 800 and 1,200 meters above the mean sea level (MSL). The mountain ranges vary in altitude between 1,200 and 2,000 meters above MSL. Some small peaks reach the altitude of 900 to 1,100 meters. **Table 8**, lists some of the prominent peaks of the mountain ranges that lie within the Upper Santa Cruz watershed.

Table 8

MOUNTAINS	PEAKS	ALTITUDE (METERS)*	LOCATION
SANTA RITA	Castle Dome	2,022	T19S, R15E
	Granite Mountain	1,550	T19S, R15E
	Harts Butte	1,900	T18S, R15E
	Huerfano Butte	1,220	T18S, R15E
	Mount Fagan	1,886	T18S, R16E
CERRO COLORADO	Batamote Hill	1,300	T19S, R11E
	Cerro Colorado	1,282	T20S, R10E
SIERRITA	Horse Pasture Hill	1,640	T18S, R11E
	Keystone	1,900	T18S, R11E
	Lobo	1,500	T18S, R11E
	Placer	1,786	T18S, R11E
	Red Boy	1,850	T18S, R11E

Source: USGS 30 x 60 minute quadrangle (1:100,000 - metric scale), 1994.

* Highest point of any given peak (within watershed)

The watershed has several canyons and passes connecting peaks and ridges of the mountain ranges to the valley. These are in two main locations, 1) along the Santa Rita Mountain ranges, and 2) along the Sierrita/Cerro Colorado Mountain ranges. **Table 9**, lists some of the prominent canyons and washes that lie within the Upper Santa Cruz watershed.

Table 9

CANYON	AVG. ALTITUDE	LOCATION	PROXIMITY
Apache	1,200	T22S, R11E	W. of Tumacacori Mountains
Box	1,500	T19S, R15E	N. of Castle Dome
Cedar	1,100	T22S, R11E	W. of Tumacacori Mountains
Enzenberg	1,700	T19S, R15E	S. of Castle Dome
Jalisco	1,200	T22S, R11E	W. of Tumacacori Mountains
Madera	1,250 - 1,500	T19S, R14E	S. of Santa Rita Experimental Range
Moyza	1,200	T21S, R11E	W. of Tumacacori Mountains
Murphy	1,200	T22S, R11E	W. of Tumacacori Mountains
Sardinia	1,200	T21S, R11E	W. of Tumacacori Mountains
Sycamore	1,250	T18S, R15E	S. of Corona de Tucson
West Sawmill	1,350	T19S, R15E	W. of Castle Dome
White Iron	1,500	T18S, R11E	W. of Sierrita Mine

In the western part of the watershed, west of I-19, the dominant washes include Batamote, Demetrie, Escondido, Esperanza, Papalote, Proctor, Saucito and Sopori. In the eastern part of I-19, the dominant floodways/washes are Florida Canyon, Madera Canyon, Sawmill Canyon, and the Santa Cruz River.

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.”³ These in turn have given rise to “the loss of 85 to 95% of quality riparian habitat during the last century,…”⁴

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.”⁵

Of the 55 perennial stream reaches, the effluent dependent Santa Cruz River is the only one that lies in the watershed. Of the 82 intermittent stream reaches, the Box Canyon, Florida Canyon, Madera Canyon, Santa Cruz River and the Sycamore Canyon flow through the watershed, as identified in *GIS Coverages of Perennial and Intermittent Streams, and Areas of Shallow Groundwater*.

F. Soils

For soil information, please contact Department of Environmental Quality (DEQ)

G. Environmental Characteristics

1. Vegetation

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.”⁶

The vegetation types include Chihuahuan Desertscrub (Creosotebush - Tarbush), Chihuahuan Desertscrub (Mixed Scrub), Madrean Evergreen Forest (Encinal), Madrean Evergreen Forest (Oak - Pine), Madrean Montane Conifer Forest (Pine), Sonoran Desert Scrub (Paloverde - Mixed Cacti), Sonoran Desert Scrub (Saltbush), Sonoran Desert Scrub (Creosotebush - Bursage), Sonoran Interior Marshland (Cattail).⁷ Some vegetation types are unclassified in the GAP/EROS maps.

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 Upper Santa Cruz watershed's prime viewsheds are those of the Santa Rita and Sierrita Mountain Ranges, offering wonderful panoramic views.



Plate I (above): The Upper Santa Cruz Valley (looking east from I-19 and Sahuarita Road intersection)

Plate II (below): Catalina Mountains (looking north from intersection of Country Club & Santa Rita Roads)





Plate III (above): Santa Rita Mountains (looking east - White House Canyon and S. Camino de la Canoa)

Plate IV (below): Santa Rita Mountains (looking east - White House Canyon)

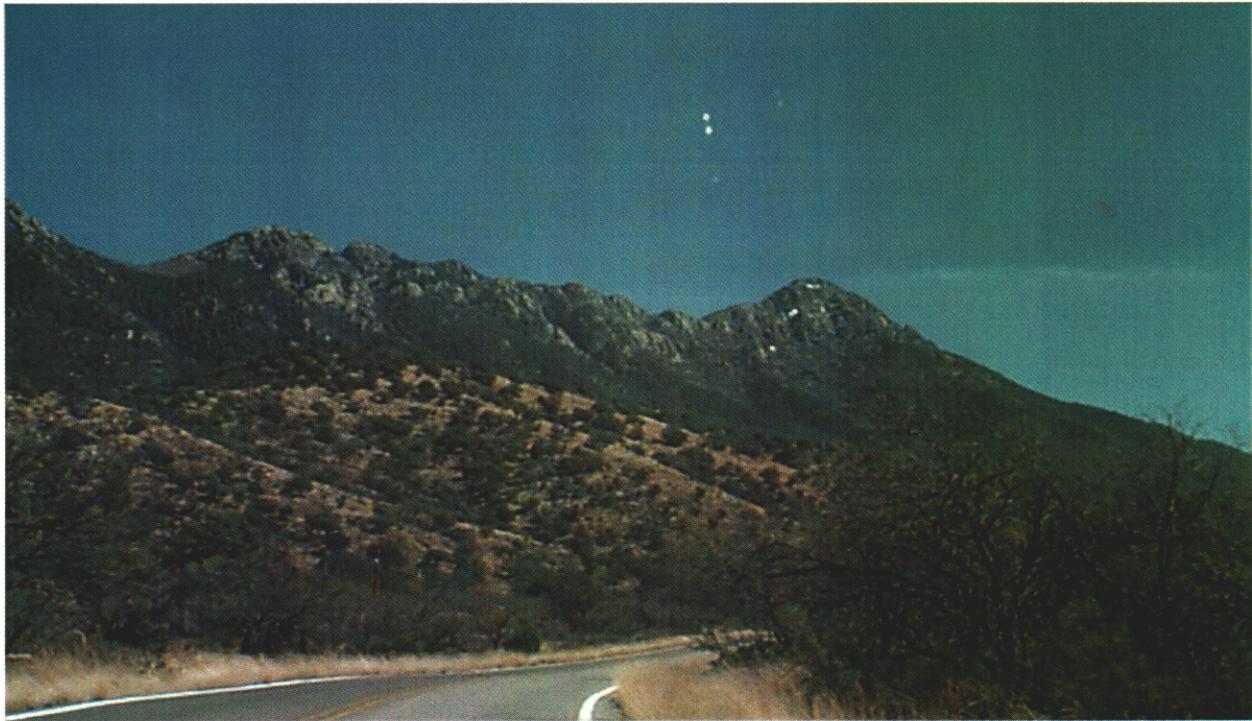




Plate V (above): Entrance to Madera Canyon (looking east)

Plate VI (below): Madera Canyon (looking west)

Draft





Plate VII (above): Santa Cruz River (looking south from Sahuarita Road)

Plate VIII (below): Pecan groves (looking south-east, from one mile east of I-19 on Sahuarita Road)





Plate IX (above): Green Valley (looking west from White House Canyon and S. Camino de la Canoa Roads)

Plate X (below): Sahuarita Heights (looking south-west, from Sahuarita Road)

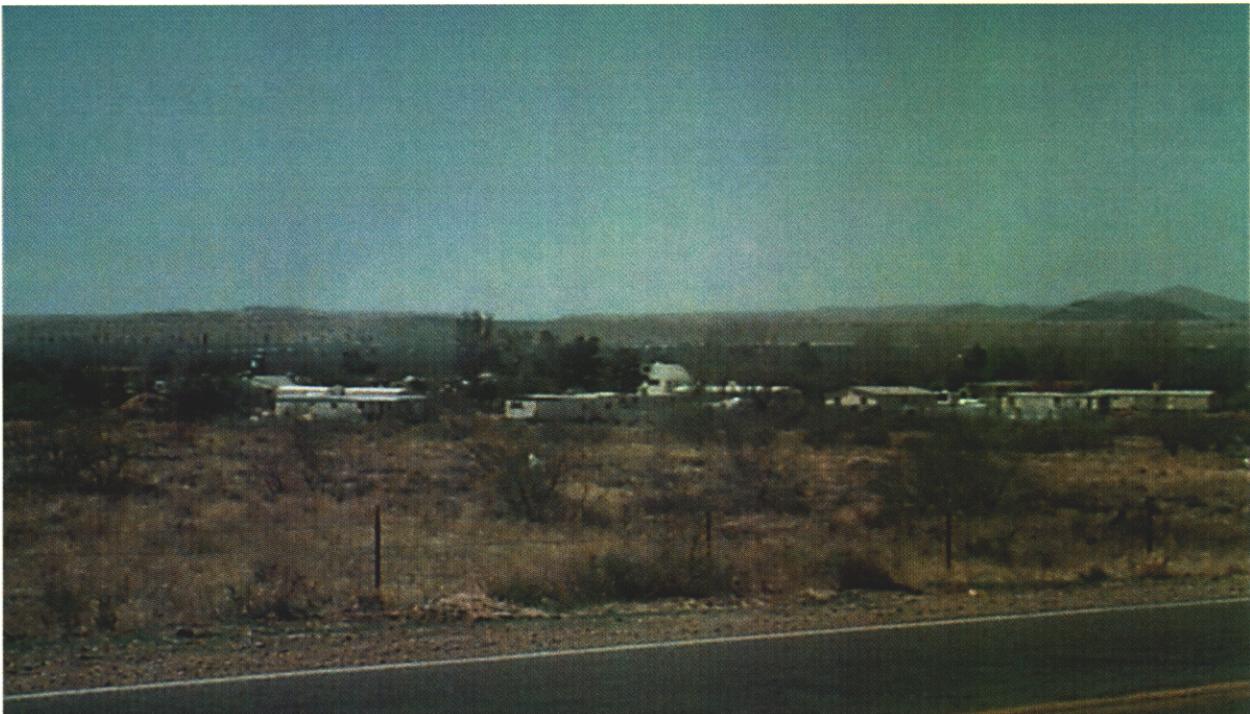
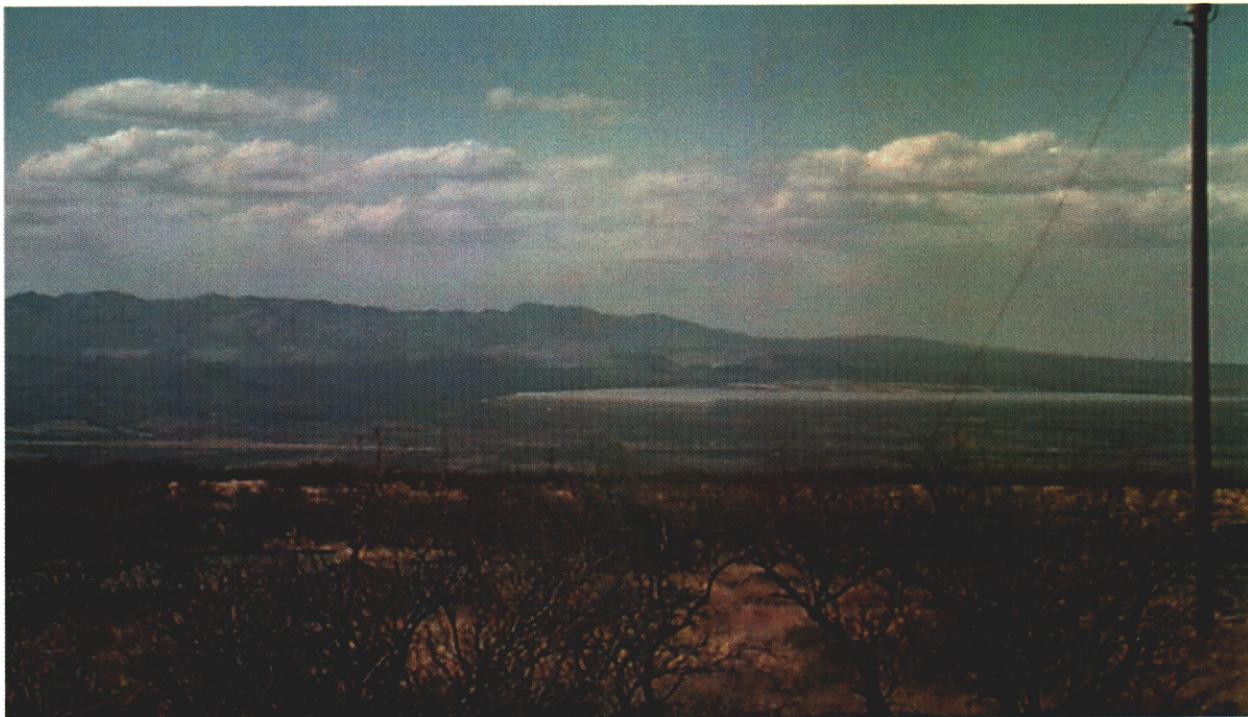




Plate XI (above): Mine on Santa Rita Mountains (looking east from interchange of I-19 and Sahuarita Road)

Plate XII (below): Mine and tailings (looking west, from White House Canyon Road)



I. Infrastructure

The major areas of development are 1) along I-19 in the Town of Sahuarita and 2) the unregulated subdivisions of Corona de Tucson and New Tucson south of Sahuarita Road.

1. Roads and Access

Interstate 19 is the major north/south bisector of this watershed; it links Tucson to Nogales by way of Green Valley and Amado. Mission Road, Old Nogales Hwy, Wilmot, Houghton, and Wentworth Roads are all secondary but significant north/south linkages. The major east/west routes are Sahuarita Road, Continental/White House Canyon Road, and Arivaca Road. According to the Pima County Major Streets and Scenic Routes Plan, all of the above-mentioned roads, except Wilmot Road, are designated "Scenic and Major" routes with special zoning regulations for abutting properties. Wilmot Road is a designated major street but not a scenic route. Other major streets in the watershed are Duval Mine Road, Old Vail Connection, Pima Mine Road, and Twin Buttes Road.

2. Water

This watershed is within the Department of Water Resources Tucson Active Management Area. The following water companies and their general service areas within the watershed are:

- a. Farmers Water Company (along Old Nogales Hwy from approx. Pima Mine Road to north of Duval Mine Road)
- b. Sahuarita Village Water Co. (portion of Section 12 of T17S R13E)
- c. Quintas Serenas Water Co. (within Sections 23 & 26 of T17S R13E)
- d. Santa Rita Bel Aire Service Area (Corona de Tucson area)
- e. Tucson Water Company (52 year service boundary extends south to Helmet Peak Road along I-19).

Areas not served by water companies are served by private wells regulated by the Department of Water Resources.

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 Upper Santa Cruz watershed is served by the Green Valley Waste Water Treatment Facility. The proposed sanitary sewers in the area are primarily in the Canoa Northwest development.

The Arivaca Junction Relief Sewer is being built to relieve the treatment pond at the south edge of the County at Arivaca Junction. The southern portion of the sewer has been built up to Elephant Head Road at the south boundary of the land grant. The sewer is intended to continue north on the east side of I-19 to Calle Tres and connect to the proposed Canoa Northwest off-site sewer.

The Green Valley Waste Water Treatment Facility serves a portion of Sahuarita. The Town of Sahuarita voted to own and operate their own sewer treatment and conveyance system for the area of the Town that is not already served by Pima County Wastewater, which would primarily be the area of Town north of the Old Nogales Highway and east I-19.

4. Natural Gas

Southwest Gas Company provides natural gas to the Corona de Tucson/New Tucson and Green Valley communities. Areas not otherwise served by Southwest Gas Co. use private propane tanks.

5. Telephone and Electricity

U.S. West provides telephone service to the area. The central portion of the watershed is served by Tucson Electric Power Company. Trico Electric Company serves the Corona de Tucson/New Tucson communities and the area west/southwest of I-19 and Green Valley.

6. Schools

The Sahuarita School District overlays the western and north central portions of the watershed. The district has two elementary schools, one middle school and one high school. The Continental School District covers the southeastern portion of the watershed and has one elementary school. The eastern portion of the watershed is under the jurisdiction of the Vail School District. This district has three elementary schools, one middle school, and plans to build a high school. A charter high school is located on South Rita Road. A small portion of the Sunnyside School District overlaps the area around Interstate 19 and the Tohono O'odham Nation San Xavier District. In total, Sunnyside School District has 13 elementary, four middle, and two high schools.

7. Parks

There are four Pima County park facilities within this watershed - the Southwest Regional Park (a.k.a. Pima County Fairgrounds) which is south of Benson Hwy and west of Houghton Road, the Kay Stuy Sorori Neighborhood Park in Amado, the Sahuarita District Park and Joan M. Swetland Community Center in Sahuarita, and the Anamax Neighborhood Park near I-19 and Twin Buttes Road. The Santa Rita Experimental Range and Wildlife Area which is managed by the University of Arizona and the Coronado National Forest (Santa Rita range) are also within this watershed.

Town of Sahuarita Infrastructure

Transportation

Currently, the Town's transportation access to Tucson, on I-19, is very favorable. An alternate route is Old Tucson/Nogales Highway (SR 19B), parallel to- and approximately 1.5 miles east of I-19. I-19 is also the major route to Mexico.

The Town has opted to utilize a Level of Service Category C as its standard for transportation studies, at present. It is felt that "the roadways currently perform at an acceptable level."⁸ Transportation planning in small areas of the Town have been done, in accordance with the Town of Sahuarita, Arizona: Small Area Transportation Study.

The prospects of the Sahuarita Corridor, connecting I-19 to I-10, reveal potential consequences of urbanization along the Corridor and its effects on conservation. The proposed Corridor is intended to connect I-19 at a point about 1.5 miles north of Sahuarita Road with the current intersection of I-10 and Wentworth Road.

Parks and Open Space

It is the Town's intent to identify open space in the General Plan Update. Sahuarita will work to create a complete open space system to include the Santa Cruz River, parks, schools, trails, residential areas, etc. The Santa Cruz River and its flood prone areas, in a north-south axis, serve as open space while the De Anza Trail, along the river, is being accommodated for. Currently, there are east-west connections by way of trails for hiking, biking and equestrian activities. The development plans for Madera Highlands and Rancho Sahuarita have set aside open spaces in their master plans.

Other Infrastructure

Sahuarita gets its water from private companies. Water is a major issue, as it is in the entire region, from both conservation and development standpoints. Currently, the Town does not operate a sanitary sewer system; however, with the completion of Rancho Sahuarita and the sewer system for part of that development, will see the Town assume a new role of operating and

maintaining its own sanitary sewers. There are no plans to expand on the prospective sewer system. A Pima County sanitary landfill is located within Sahuarita, with plans for an additional cell to open soon. Pima County has recently done a drainage management study for the Town of Sahuarita.

J. Open Space

The primary open spaces in the watershed are the reserves. Studies were done where “reserve boundaries were verified by land managers,”⁹

Table 10

NO	RESERVE	PROTECTION STATUS (GAP)	ACRES (APPROX).	LOCATION
1.	Santa Rita Experimental Range	3-b	50,811	T18-19S, R14-15E
2.	Coronado National Forest (part.)	3-b	24,500	T21S, R11E/T18-19S, R14-15E
3.	Mount Wrightson W. A.	N/A	4,500	T19S, R14-15E
	TOTAL		79,811	

The reserves that lie partially or wholly within the watershed are Santa Rita Experimental Range, Coronado National Forest and Mount Wrightson Wilderness Area.¹⁰ The combined total of the reserves account for about 79,811 acres (17.75 percent) of the total land area in the watershed. **Table 10** also shows the various status of protection for the reserves, as per the Gap Analysis Program.¹¹

K. Archaeological and Cultural Resources

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

L. Real Estate Market Conditions

“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.”¹²

There are a few unregulated developments in the watershed. There are also a number of mobile homes. In terms of contribution to the County’s tax base, “since 1977-78, there has been a 38 percent drop in the primary property tax value and a 36 percent drop in secondary value. To compensate for this declining tax base, the tax rate is increased with regulated development subsidizing the cost of providing services to unregulated areas.”¹³

There are large areas of unplatted land (wild cat, lot-splitting) which contribute to the disparity in fiscal capacity when compared with platted land. The watershed has only part of one of the sixteen urbanizing areas in Pima County.¹⁴ In terms of infrastructure and fiscal strength, the full cash value of unplatted land in eastern Pima County (non-urbanized areas) is \$3,560 per acre, in comparison with the value of \$159,011 per acre of platted land.¹⁵ It can be said that “the basic reason for this disparity is that unregulated development offers little in the way of sewers and roads, and the major housing type in unregulated areas has a valuation method which assumes depreciation over time, but improvements are the bulwark of the tax base.”¹⁶

M. Capital Improvement Projects (by Departments)

There are currently 31 capital improvement projects underway amounting to a total of \$132,789,402.

Parks and Recreation

Canoa Ranch (General Obligation Bond No. SD-08)	\$2,000,000
Anamax Neighborhood Park Renovations (General Obligation Bond No. P-03)	521,200
Sahuarita District Park Improvements (General Obligation Bond No. P-14)	700,000
Southeast Regional Park Improvements (General Obligation Bond No. P-22)	1,000,000
Old Nogales Park Land Acquisition (General Obligation Bond No. P-26)	<u>2,755</u>
Total:	\$4,223,955

Transportation

Madera Canyon Rd. at Medium Wash (County HURF, Federal Aid for Bridge Repair and Replacement)	\$1,496,000
Madera Canyon Rd. at Florida Canyon Wash (County HURF, Federal Aid For Bridge Repair and Replacement)	1,509,000
I-19 Southbound Frontage Rd. at Continental Rd. (HURF Bond No. DOT-25, State of Arizona)	1,480,000
Abrego Dr. at Drainage way No. 1/Box Culvert (HURF Bond No. DOT-35)**	150,000
Camino del Sol/West Parkway: Continental Rd. to Duval Mine Rd. (HURF Bond No. DOT-36)	2,500,000
I-19 Northbound Frontage Rd.: Canoa T1 to Continental T1 (HURF Bond No. DOT-37, State of Arizona)	3,500,000
Duval Mine Rd.: La Canada to Abrego Dr. (HURF Bond No. DOT-48, Urban HURF, Impact Fees, State of Arizona)	12,088,000
La Canada/Las Quintas Highway Drainage Improvements (HURF Bond No. DOT-51)	1,400,000
Old Tucson-Nogales Highway Summit Neighborhood (HURF Bond No. DOT-53)	1,025,000
Abrego Dr. at I-19 Northbound Frontage Rd. (HURF Bond No. DOT-26)	170,000
Camino del Sol: Continental Rd. to Ocotillo Wash (HURF Bond No. DOT-34, County HURF, Impact Fees)	6,279,000
Montana Vista Drainage (County HURF)	<u>103,072</u>
Total:	\$31,700,072

Flood Control

Green Valley Drainage way No. 9 (General Obligation Bond No. FC-09)	\$110,197
Continental Vista Erosion Protection (General Obligation Bond No. FC-10)	255,441
Santa Cruz River Study (Corps of Engineers, Flood Control Tax Levy)	412,654
Sahuarita Drainage Improvements (General Obligation Bond No. FC-07)	500,000
Santa Cruz River Park: Paseo de Las Iglesias Restoration (Corps of Engineers, Flood Control Tax Levy)	<u>40,025,000</u>
Total:	\$73,003,364

Facilities Management

Green Valley Performance Art Center (General Obligation Bond No. CC-06)	\$1,334,180
---	-------------

Wastewater Management

Green Valley Trunk Sewer Protection at Drainage way No. 7 (System Development Funds)	\$9,035
Green Valley Sewer Protection (System Development Funds)	15,325
Green Valley WWTF Upgrade and Expansion (Sewer Bond No. SS-02, System Development Funds)	7,350,125
Corona de Tucson WWTF Soil Cement Pond Lining Repair (System Development Funds)**	220,595
Green Valley Effluent Reuse for Turf Irrigation (Sewer Bond No. SS-17, System Development Funds)	<u>1,904,546</u>
Total:	\$9,499,626

Solid Waste

Sahuarita Expansion (General Obligation Bond No. SW-03, Solid Waste Revenue)	\$978,197
Sahuarita Cell: Closure (1982 General Obligation Bonds, Solid Waste Revenue)	<u>1,050,382</u>
Total:	\$11,528,205

Cultural Resources

Canoa Ranch Building Rehabilitation (General Obligation Bond No. CH-29)	\$1,500,000
---	-------------

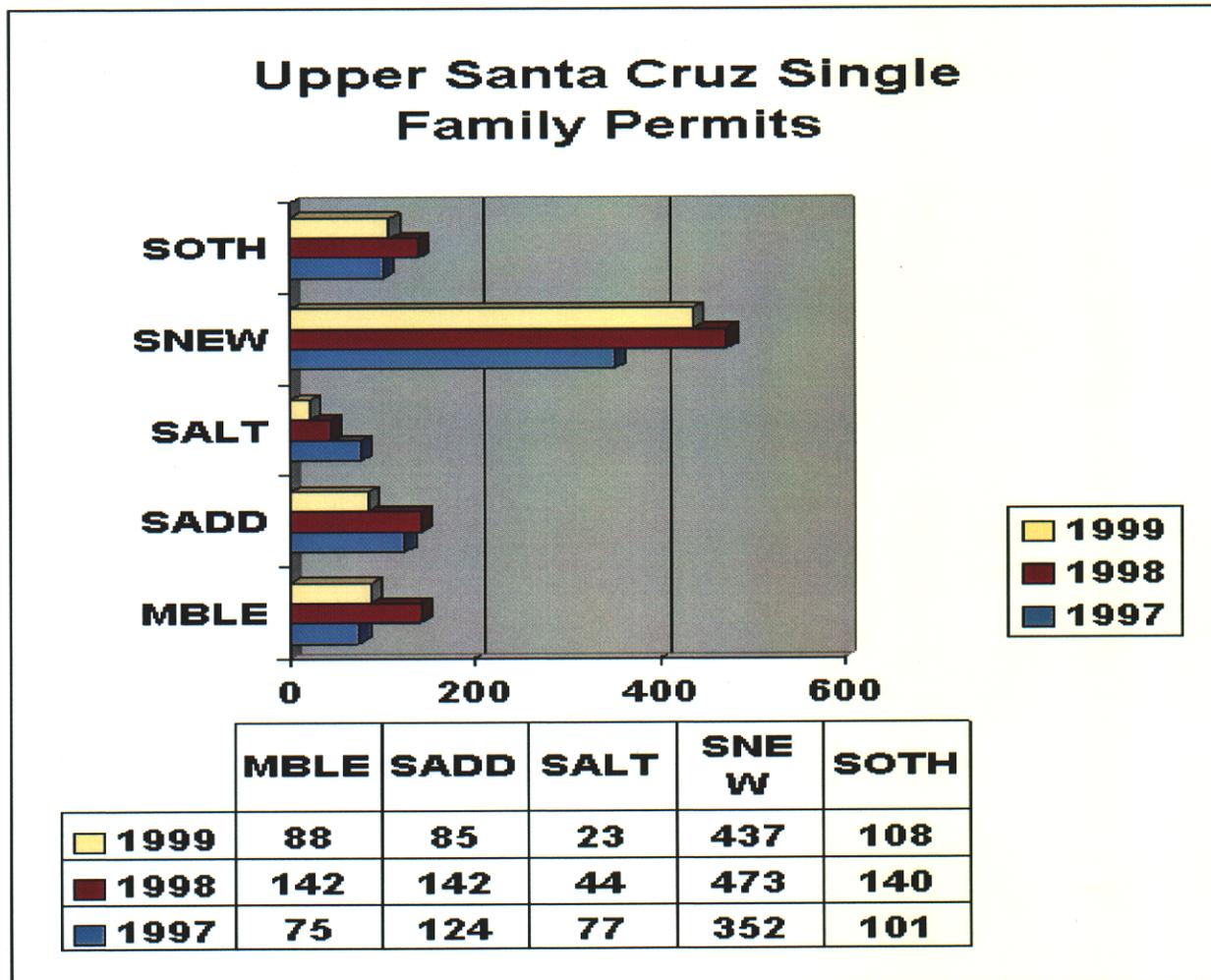
** completed project

N. Permits

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

Graph 1 shows that, between 1997 and 1999, the total number of permits issued was at an all-time high in 1998 (941 permits). Of these, 473 (50 percent) were for new single family residence and 142 (15 percent) were for mobile homes. In 1999, the number of single family residence permits went down from 473 to 437, while mobile home permits saw a decline, by roughly 38 percent, from 142 to 88. Overall, between 1997 and 1999, the number of permits issued had increased by 29 percent.

Graph 1

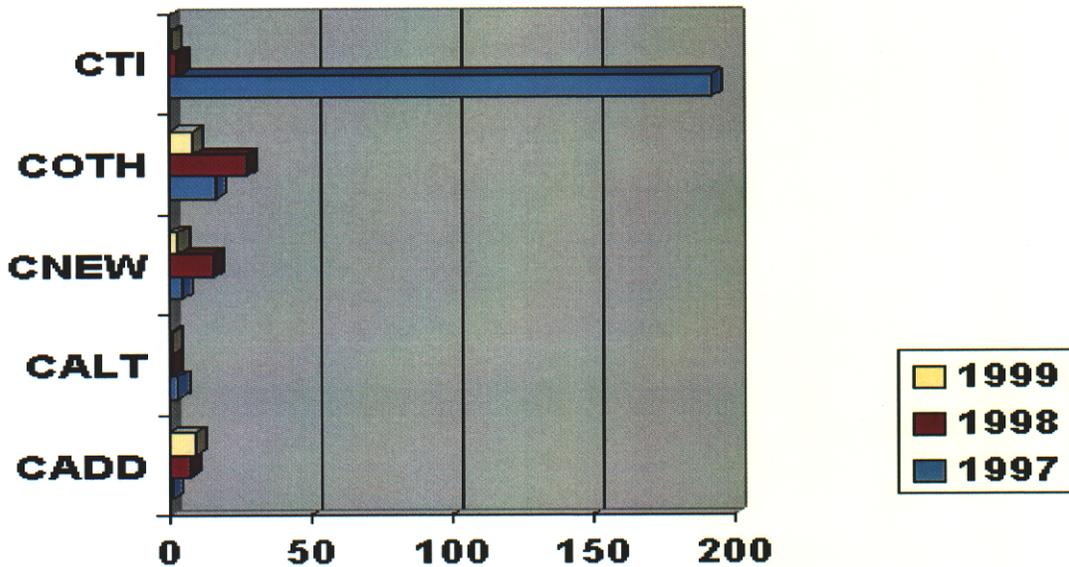


SOTH = SINGLE FAMILY (OTHER); SNEW = NEW SINGLE FAMILY; SALT = SINGLE FAMILY ALTERATIONS; SADD = SINGLE FAMILY ADDITIONS; MBLE = MOBILE HOMES

Graph 2 shows the number of commercial permits issued within the watershed. In 1998, there were 15 permits issued for new commercial, which dropped to three in 1999. There were 192 Commercial Tenant Improvement permits issued in 1997 which dropped drastically to three in 1998 and one in 1999. Overall, permitting for commercial uses was at its lowest in 1999.

Graph 2

Upper Santa Cruz Commercial Permits



	CADD	CALT	CNEW	COTH	CTI
1999	9	1	3	8	1
1998	7	1	15	27	3
1997	1	3	4	16	192

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 (Pima County and Town of Sahuarita)
3. Map of Planned Land Use (Pima County and Town of Sahuarita)
4. Map of Committed Land (Pima County and Town of Sahuarita)
5. Map of Subdivisions on Vacant Land

Drawn

REFERENCES

- Lueck, Curtis & Associates, *Town of Sahuarita, Arizona - Small Area Transportation Study*,
- Pima County. "Impact of Unregulated Development at the Community and Watershed Level", *Fiscal Impact of Land Use*.
- Pima County. "Impact of Unregulated Development on the Pima County Tax Base, Service Demand and Future Infrastructure", *Fiscal Impact of Land Use*.
- 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. *Ranching in the Avra Valley*.
- 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*.
- USGS. Silverbell Mountains, ARIZONA. *30 X 60 Minute Quadrangle*.

END NOTES

1. Pima County, *Land Stewardship in Pima County, Sonoran Desert Conservation Plan*, February 2000, Table 6, p. 14.
2. Pima County, *Sonoran Desert Conservation Plan*, October 1998, p. 5.
3. Pima County, *Water Resources and the Sonoran Desert Conservation Plan*, July 1999, p. ii.
4. Ibid, p. 3.
5. Ibid.
6. Pima County, *Land Stewardship in Pima County, Sonoran Desert Conservation Plan*, February 2000, p. 1.
7. Ibid, Figure 2, p. 8.
8. Curtis Lueck & Associates, *Town of Sahuarita, Arizona - Small Area Transportation Study*, September 1999, p. 11.
9. Pima County, *Land Stewardship in Pima County, Sonoran Desert Conservation Plan*, February 2000, p. 4.
10. Ibid, Figure 1, p. 5.
11. Ibid, p. 1.
12. 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.
13. Pima County, "Impact of Unregulated Development at the Community and Watershed Level", *Fiscal Impact of Land Use*, March 2000.
14. Ibid.
15. Ibid.
16. Ibid.

EXISTING LAND USE

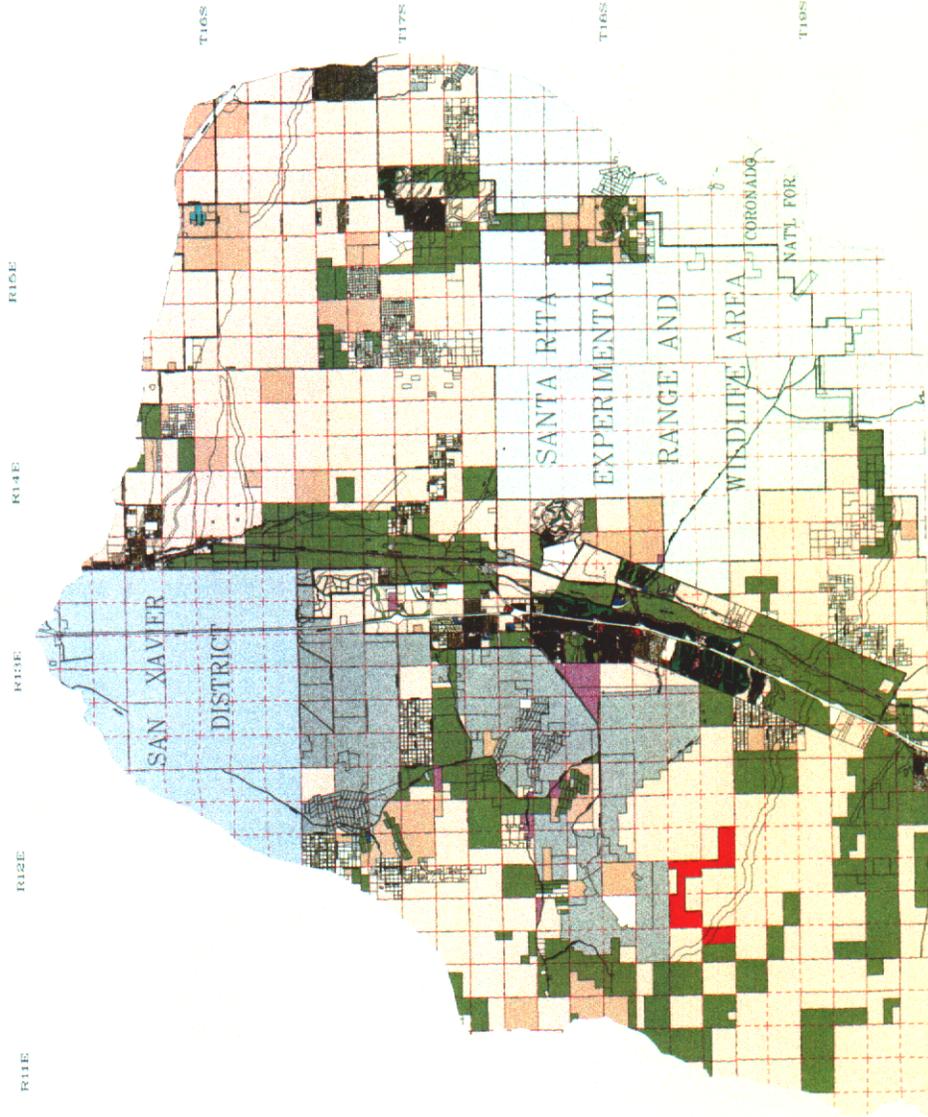
Upper Santa Cruz Watershed

16-MAR-2000

Legend

Existing Land Use	
VACANT	INDUSTRIAL
RURAL	INSTITUTIONAL
0.2 TO 0.4 RAC	MISC. GOVERNMENT
0.4 TO 0.75 RAC	TRANSPORT FACIL
0.75 TO 1.25 RAC	UTILITIES/TELECOMMUNICATIONS
1.25 RAC TO 3.0 RAC	PARK
3.0 TO 6.0 RAC	GOLF COURSE
6.0 TO 10.0 RAC	AGRICULTURE
10.0 TO 15.0 RAC	DEDICATED OPEN SPACE
15.0 TO 20.0 RAC	OTHER
GREATER THAN 20 RAC	MILITARY/ET. POLICE
LOGGING	VACANT-STATE
RESORT	VACANT-JURISDICTION
OFFICE	PARTIALLY DEVELOPED
COMMERCIAL	NO DATA
PVT STREETS	

Basemap Features	
Public Preserve	Public Preserve Boundary
Tribal Lands	City and Town Limits
	Sections



This map is prepared in accordance with the Santa Cruz County Board of Supervisors Resolution No. 17-99, adopted on 11/17/99, and the Santa Cruz County Board of Supervisors Resolution No. 18-00, adopted on 1/17/00.



Map of Existing Land Use
Upper Santa Cruz Watershed
16-MAR-2000

EXISTING ZONING ON VACANT LAND

Unincorporated Pima County Upper Santa Cruz Watershed

20-MAR-2000

Legend

- Zoning Districts**
- IR Institutional Reserve
 - RM Rural Homestead
 - GR-1 Rural Residential
 - BR Suburban Ranch
 - SR-2 Suburban Ranch Estate
 - SR 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
 - CMH-2 Mobile Home 2
 - TH Trailer Homebite
 - MU Multiple Use
 - MR Major Resort
 - RVC Rural Village Center
 - CB-1 Local Business
 - CB-2 General Business
 - CP Campus Park Industrial
 - CI-1 Light Industrial/Warehouse
 - CI-2 General Industrial
 - CI-3 Heavy Industrial
 - SP Specific Plan
 - GC Golf Course
- Basemap Features**
- Built or Committed Land
 - Cities and Towns
 - Sections
 - Public Preserve Boundary
 - Public Preserve
 - Tribal Lands
 - Reaching or Draining Land
 - Case#1 Zoning Boundary

Note: Vacant land shown by zoning district color

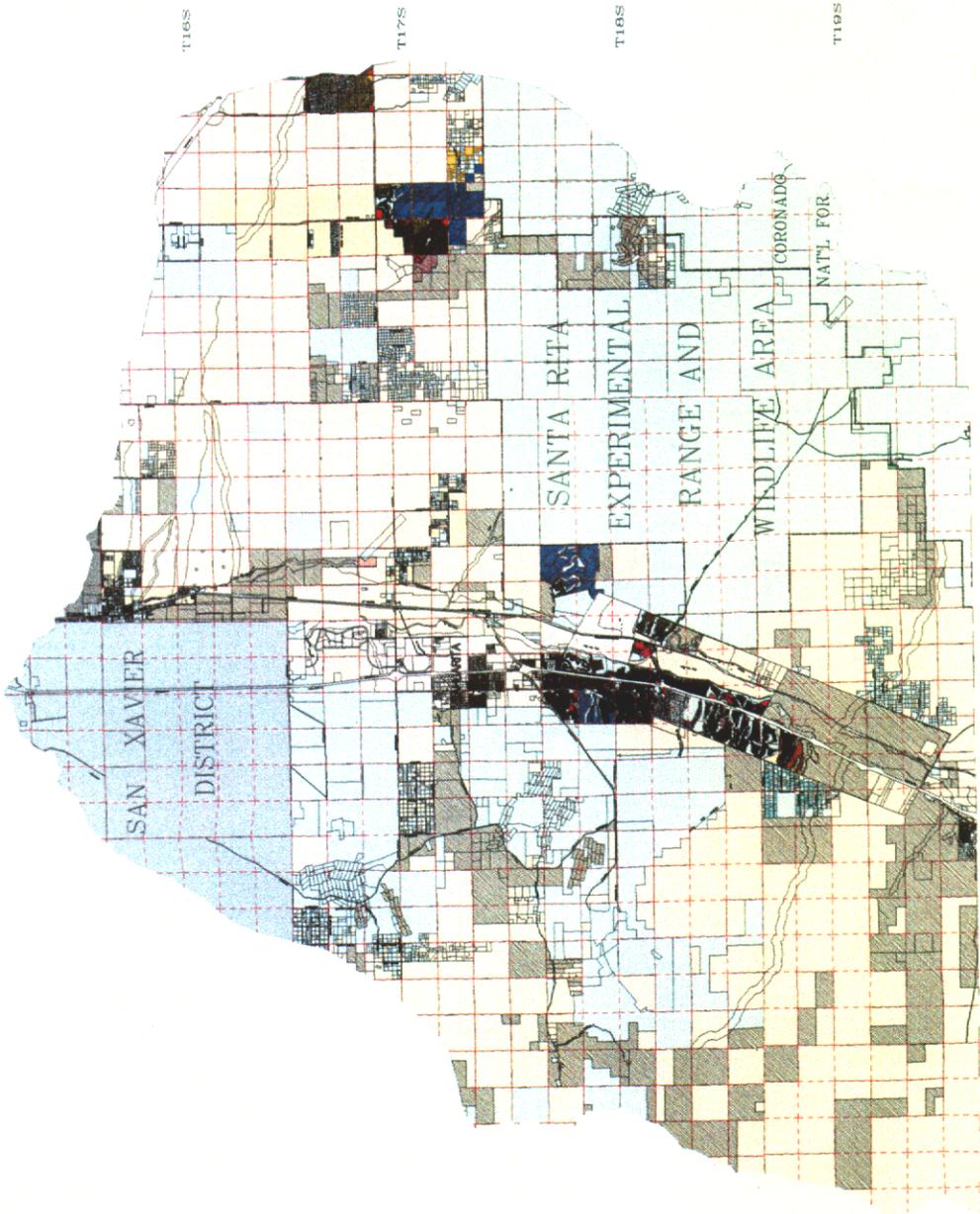


This map is prepared in accordance with the provisions of the Arizona State Planning Act, Chapter 10, Article 10, Section 10-101, and the Pima County Assessor's Office.



PIMA COUNTY
PIMA COUNTY ASSASSOR'S OFFICE
100 N. GILBERT AVENUE
TULSA, ARIZONA 85701
520.744.2000

R1E1E R1E1E R1E1E R1E1E



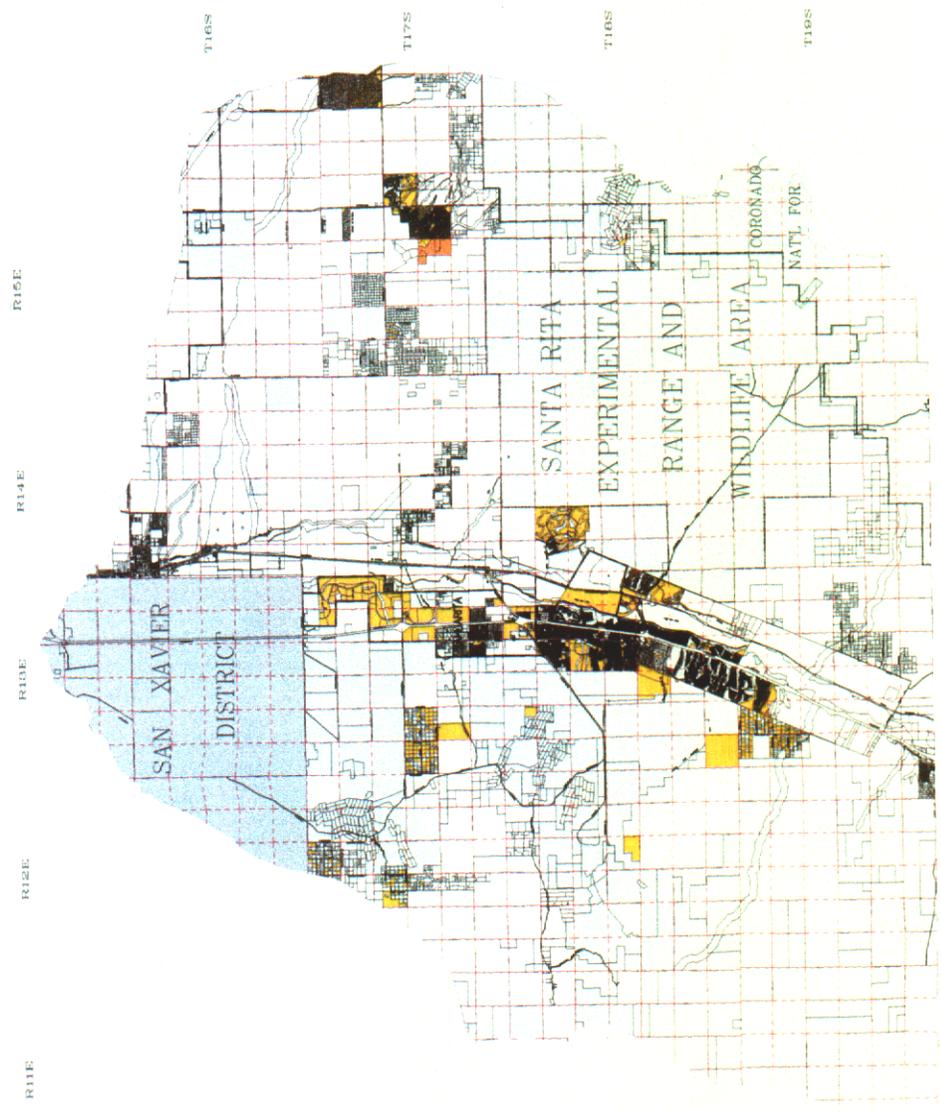
**APPROVED AND PROPOSED
SUBDIVISIONS
ON VACANT LAND
Upper Santa Cruz Watershed
22-MAR-2000**

Legend

- Approved Subdivisions or Development Plans
- Proposed Subdivisions or Development Plans

Basemap Features

- Built or Committed Land
- City and Town Limits
- Sections
- Public Reserve Boundary
- Public Reserves
- Tribal Lands



This map is prepared by the Santa Cruz County Planning Department. It is based on the Santa Cruz County General Plan, the Santa Cruz County Zoning Ordinance, and the Santa Cruz County Subdivision Map Act.



Platted Subdivisions

SDCP PLANNING UNIT 3

- Planning Unit Boundary
- Major Washes
- Parcel Lines
- Platted Subdivisions
- BLM
- County Park
- Indian Lands
- Military Reservations
- National Forest Lands
- National Parks and Monuments
- National Wildlife Refuge
- Private Lands
- State Lands
- State Park
- Ranch Use

STATISTICS FOR UNIT 3
 NUMBER OF PLATTED SUBDIVISIONS: 382
 ACRES OF PLATTED SUBDIVISIONS: 13,785
 NUMBER OF PARCELS: 28,127

Pinna County Index Map



Index Map Scale 1:50,000

The information presented on this map is for informational purposes only. It is not intended to be used for legal purposes. The user assumes all responsibility for the use of this information. The user should consult with the appropriate authorities for the most current information regarding the accuracy of the information presented on this map. The information is provided by the Department of Planning and Administration.

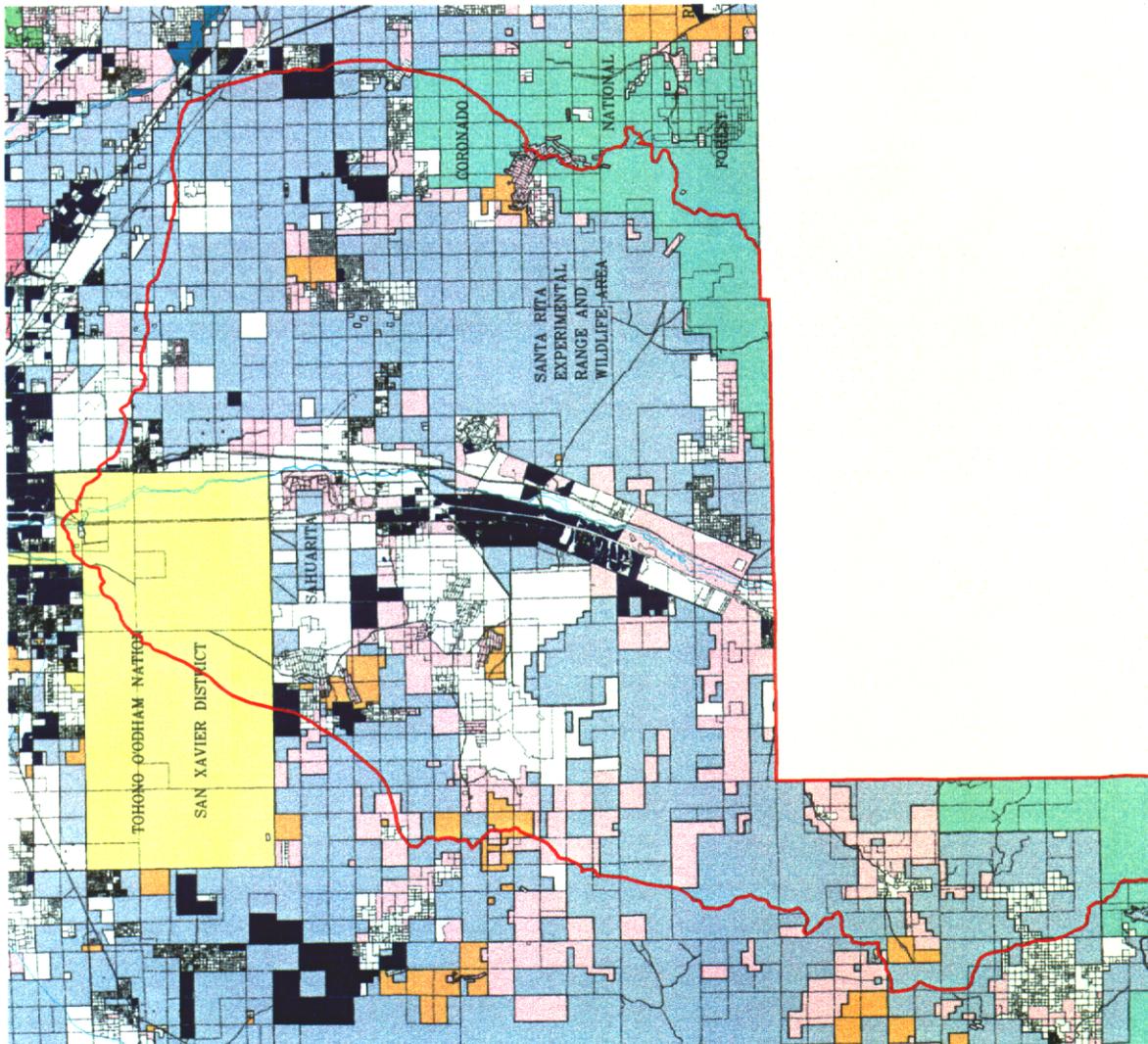
Scale 1: 90,000



THE COUNTY DEPARTMENT OF PLANNING AND ADMINISTRATION
TECHNICAL SERVICES

Pima County Technical Services, Inc.
 201 North Stone Avenue, 10th Floor
 Tucson, Arizona 85701
 PHS/70-588-0001, CO-5138-01-08

Department of Planning and Administration / (520) 243-1234 / (520) 243-1234 / (520) 243-1234



8/2/08

PLANNED LAND USE ON VACANT LAND Unincorporated Pima County Upper Santa Cruz Watershed

15-MAR-2000

Legend

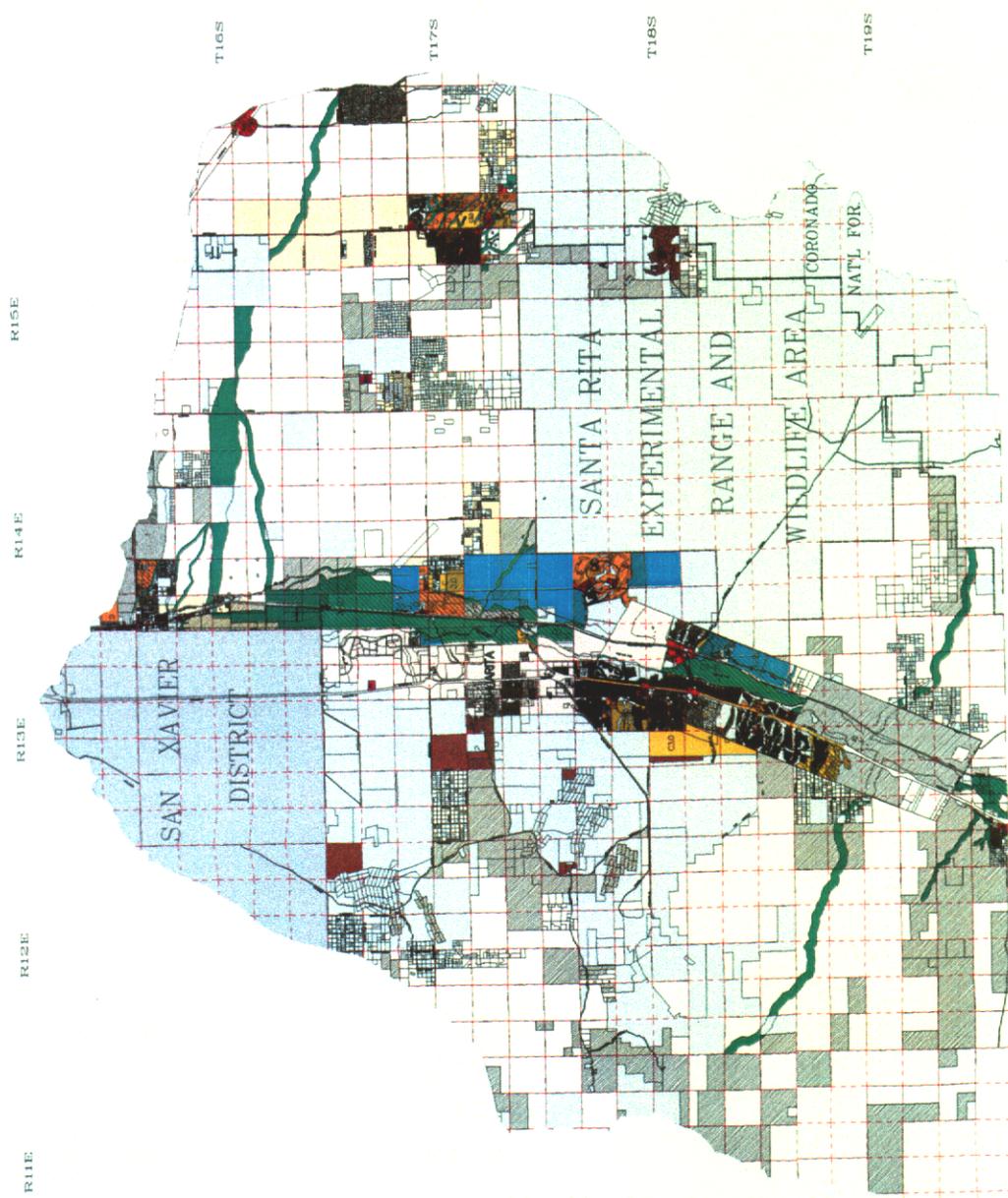
Planned Land Use

	Rural Activity Centers		Medium Intensity Rural
	Community Activity Center		Low Intensity Rural
	Neighborhood Activity Center		Resource Transition
	Neighborhood Resource Center		Resource Productive
	Development Reserve		Industrial
	Medium Intensity Urban		High Intensity Industrial
	High Intensity Urban		Resource Conservation
	Low Intensity Urban		Special Areas
	Low Intensity Urban 3.0		Not in Plan Area
	Low Intensity Urban 0.5		
	Low Intensity Urban 0.3		
	Rural Activity Centers		
	Rural Activity Center		
	Rural Greenroads		

Basemap Features

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

Note: Vacant land shown by planned land use color



This map is prepared by the Planning Department, Pima County, Arizona. It is based on the 1997 General Plan, and the 1997 Comprehensive Zoning Ordinance. The map is subject to change without notice.



PLANNED LAND USE ON VACANT LAND
UNINCORPORATED PIMA COUNTY
UPPER SANTA CRUZ WATERSHED
15-MAR-2000

COMMITTED LANDS

Unincorporated Pima County

Upper Santa Cruz Watershed

20-MAR-2000

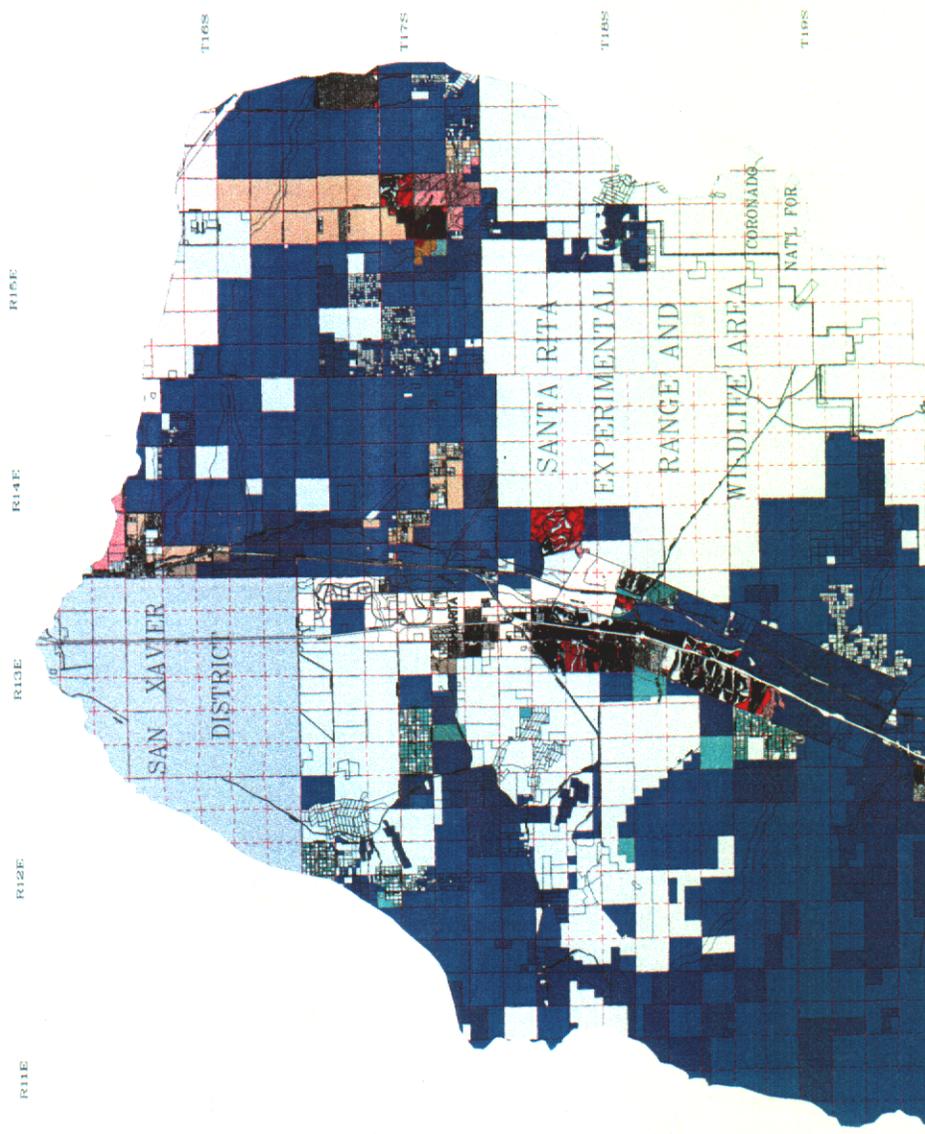
Legend

Land Status

- Categories of Vacant Land**
- Built or Committed Land
 - Rural Zoning
 - Rural Zoning-Subdivision or Development Plan Applied For
 - Rural Zoning-Approved Subdivision or Development Plan
 - 0.9-1.0 RAC Equivalent Zoning
 - 0.9-1.0 RAC-Subdivision or Development Plan Applied For
 - 0.9-1.0 RAC-Approved Subdivision or Development Plan
 - 1.0-2.0 RAC Equivalent Zoning
 - 1.0-2.0 RAC-Subdivision or Development Plan Applied For
 - 1.0-2.0 RAC-Approved Subdivision or Development Plan
 - 3.0+ RAC Equivalent Zoning
 - 3.0+ RAC-Subdivision or Development Plan Applied For
 - 3.0+ RAC-Approved Subdivision or Development Plan

Basemap Features

- Cities and Towns
- Public Preserve Boundary
- Public Preserves
- Tribal Lands
- Ranching or Grazing Land
- Sections



This map is prepared to assist. One use is to determine vacant lands, including the Public Preserves and Ranching or Grazing Land. For more information, contact the Planning and Development Department, Pima County Administration Office.



PLANNING AND DEVELOPMENT DEPARTMENT
PIMA COUNTY ADMINISTRATION OFFICE
100 N. GILBERT AVENUE
TULSA, OKLAHOMA 74103
TEL: 918.493.2200
FAX: 918.493.2201