

DRAFT

Resources of the Tortolita Subarea

Sonoran Desert Conservation Plan

May 2000



Pima County
Board of Supervisors

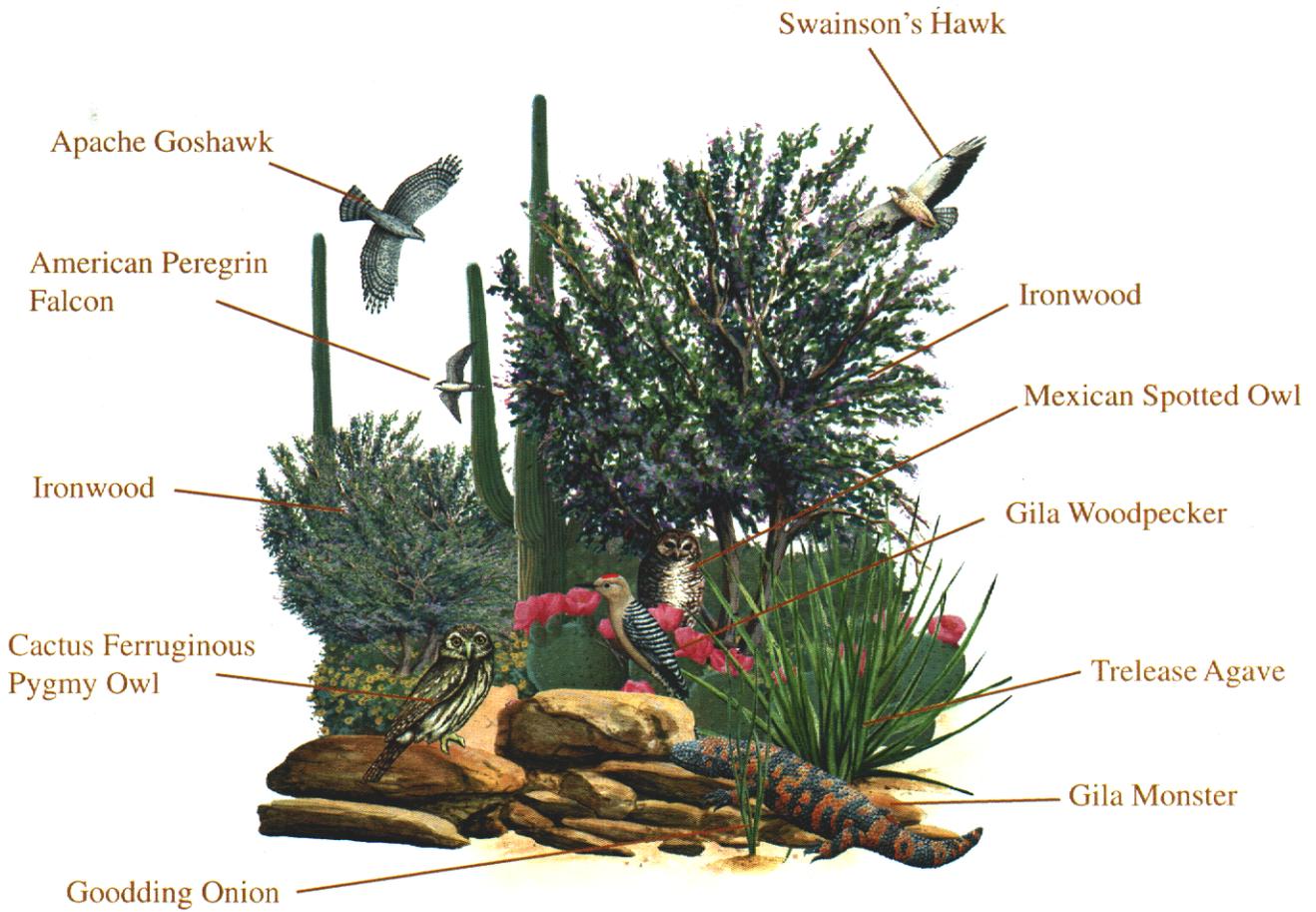
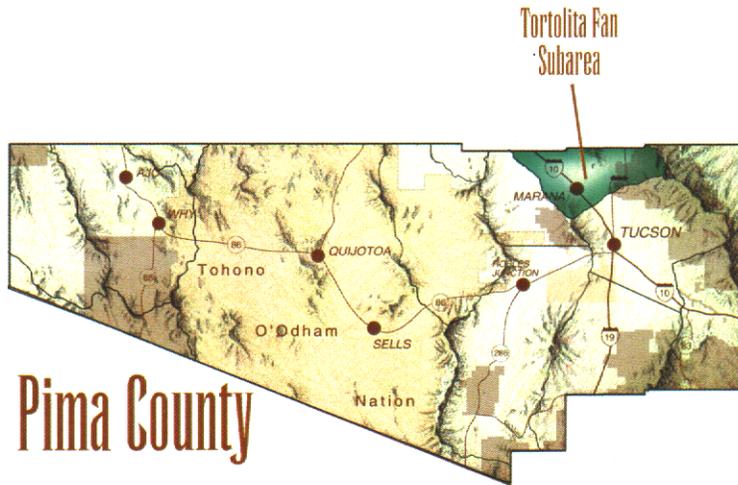
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County Administrator
Chuck Huckelberry

Draft 1

DRAFT

Sonoran Desert Conservation Plan



Current and former inhabitants of the Tortolita Fan



MEMORANDUM

Date: May 30, 2000

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

From: C.H. Huckelberry
County Administrator 

Re: *Resources of the Tortolita Fan*

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 Tortolita Fan. 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 June 3, 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.

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II. Habitat and Corridors Elements

Biological Stress Assessment and Review of Vulnerable Species

Attachment 1 is the Tortolita Fan 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 Tortolita Fan subarea is discussed in pages 115 through 135 of the text. A summary of the stress analysis is available in Table 35, and reproduced in part below.

Areas and Habitats of Concern	Species, Federal Concern	Sources of Stress
Pygmy-owl critical habitat	Gila topminnow	Population growth
Areas of perennial flow	Pygmy-owl	Lot splitting
Effluent-dominated stream flow	Mexican spotted owl	Storage basin, CAP line
Remaining xeroriparian	Lesser long nosed bat	Conversion of ag land
		Erosion of bajadas
		Developable land near preserve

Potential threats and stressors to other vulnerable species in the Tortolita Fan subarea are discussed in the report including the:

- Apache northern goshawk;
- Trelease agave;
- Goodding onion;
- Swainson's hawk;
- Weeping Muhly;
- Lowland Leopard Frog; 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.

Eight percent of the priority streams within the County are found within the Tortolita Fan 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 Tortolita Fan 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 Tortolita Fan subarea is discussed in pages 117 through 128 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 Tortolita Fan subarea

REGION WITHIN THE SUBAREA	GRAZING	WILDCAT SUBDIVISION	PLANNED SUBDIVISION	COPPER MINE	SAND & GRAVEL MINE	PUMPING	AGRI CULTURE	REC
S. Cruz River		yes	yes		yes	yes	yes	
Tortolita Fan	yes	yes	yes			yes		
Oro Valley			yes		potential	yes		
Catalina		yes	yes			yes		
Public Lands	yes							yes

Potential options for reducing stress on watercourses within the Tortolita Fan 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
S. Cruz River	potential	potential	potential				
Tortolita Fan	potential	potential	potential		potential	potential	
Oro Valley	potential	potential	potential		potential	potential	
Catalina	potential	potential	potential		potential	potential	
Public Lands							potential

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

- If the Tortolita Fan is developed, what flood precautions should be taken in light of its distributary flow?
- To what extent should roads with dip crossings be converted to all weather roads with culverts or bridges?
- What roads are needed in the area? Which roads should be expanded?
- Using effluent, what efforts if any should be made to improve the habitat value of the river? Turf use?
- How should the loss of overbank storage are along the CDO be addressed?

United States Army Corps of Engineers 1996 Study of the Tortolita Fan

In 1996 the United States Army Corps of Engineers completed a reconnaissance study entitled *Tortolita Drainage Area, Arizona, Reconnaissance Study, Flood Control and Related Purposes*. Cost estimates from the 1996 report were updated by the Department of Transportation and Flood Control District, and summarized in a May 19, 2000 memorandum which made these points:

- "Because this area is classified by the Federal Emergency Management Agency (FEMA) as an alluvial fan, a type of geological formation characterized by unpredictable changes in natural drainage patterns, FEMA will not approve development of this area before structural drainage improvements are constructed to control the drainage patterns."
- "Adjusting the construction cost estimates to account for inflation since the report by the Corps of Engineers was completed, our review indicates that the current cost for construction of the structural drainage improvements alone is approximately \$80 million."
- "These cost estimates include only the cost of the structural drainage improvements and do not include any costs for mitigation that would likely be required to obtain Section 404 permits for the construction of either the drainage improvements or any proposed residential development, or mitigation that may be required to address Endangered Species Act concerns."

IV. Ranch Conservation Element

Ranching in the Tortolita Fan Area

Attachment 3 includes a descriptive summary of Ranching in the Tortolita Fan area, 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 Tortolita Fan; general archeological site and survey locations; and archaeological sites in relation to land ownership.

VII. Land Use Considerations

Land Use in the Tortolita Fan

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.

VIII. Conclusion

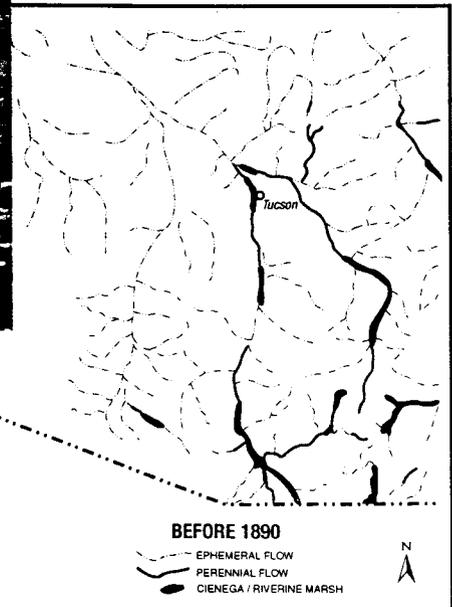
After subarea meetings are held, additional contributions and comments are received, discrepancies are eliminated in the data of individual reports and resource reports are perfected, a synthesizing subarea evaluation will be drafted that includes landowner goals and suggestions for conservation strategies.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

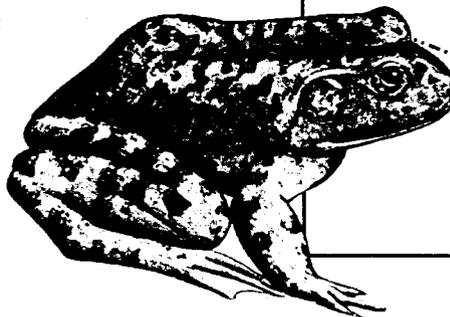
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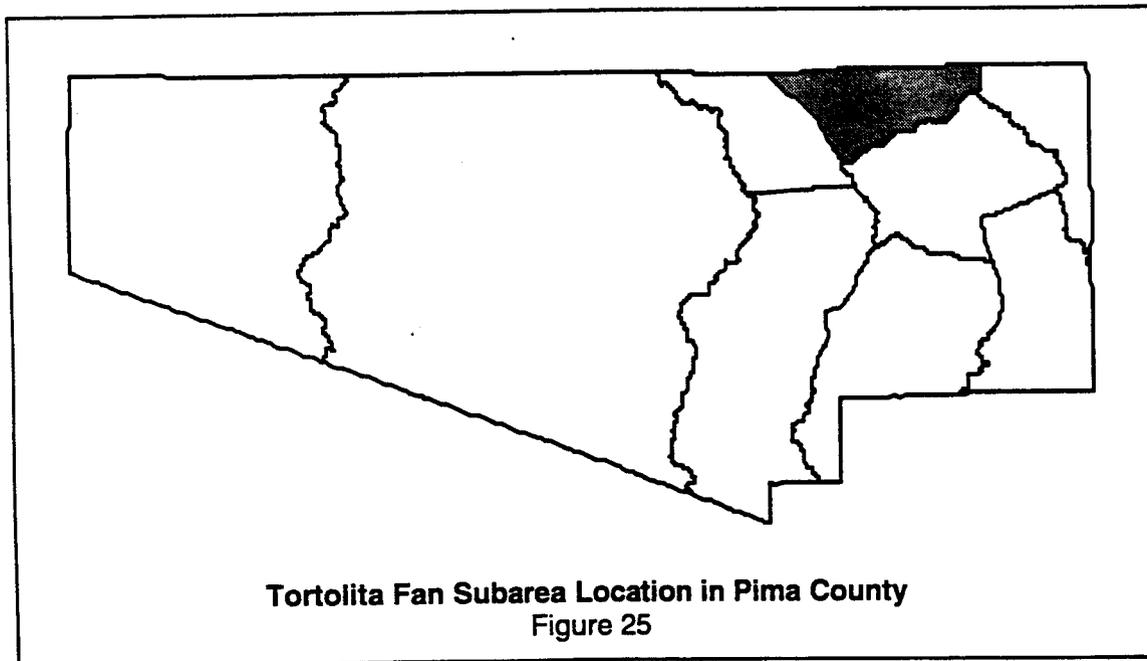
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County Administrator
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VII. Tortolita Fan (Subarea 5)

The Tortolita Fan Subarea includes all the watersheds that drain the Tortolitas, as well as the communities of Tortolita, Catalina, Oro Valley, and portions of Marana east of the Santa Cruz River (Figure 25). It encompasses the far western portion of the Catalina Mountains, the southern portion of the Tortolita Mountains and the alluvial fan, and is largely contained to the east and north by federally and state-owned or protected mountain preserves.



A. Potential Threats and Stressors

1. Land Use and Landscape Character

The landscape character has drastically changed during the last 20 years, from an area of rural homesites separated by large areas of undisturbed undeveloped land, to one with numerous subdivisions, lot-split areas, master-planned communities, and commercial developments (Figure 26).

a. Town of Marana

The Marana General Plan (Town of Marana 1997) indicates the future Town Center, neighborhood commercial anchor, and community commercial development areas as economic development zones shown to occur west of I-10, north and south of Tangerine Road. This is within the area of high-density ironwood forest and designated Critical Habitat for the CFPO. If built as planned, the development of this area, coupled with the recent development of residential subdivisions and golf courses in the Tortolita foothills

poses a potential stress not only to the CFPO but also to other species dependent on the ironwood forest and wash habitats. An additional 9,159 homes may be built on 5,600 acres in the Dove Mountain area at the base of the Tortolita foothills.

Marana's lack of a strong Native Plant Protection Ordinance and riparian protection ordinance raises valid concerns, particularly relating to vegetative communities of known special significance such as ironwood forests and riparian areas.

On the west side of I-10 Marana has seen and fostered the conversion of cultivated fields and agricultural lands to residential subdivisions. Recent rezonings reflect this conversion of land use. To a great extent this has been made possible by the County's bank protection along the Santa Cruz River. Damage to agricultural fields and residential properties after major floods in 1983 and 1993 triggered this ongoing bank protection effort. The urbanization of the area between Orange Grove Road and Avra Valley Road, is reflective of their three-tiered "crescent concept" of having most of the urbanized area on the east side of the Silverbell Road and the river, and having the area west of the river and north of Twin Peaks Road set aside for ranches, farms, and other large-scale agribusiness uses. While the lack of bank protection on most of the west bank of the Santa Cruz raises concerns for increased flooding of that western area, it opens up a range of opportunities for riparian restoration projects supported by effluent.

Primary threats to biological resources in Marana include habitat loss and fragmentation, conversion of agricultural lands to higher intensity uses, and the decline in groundwater levels. At this time the primary constraint to quality growth within Marana is the lack of wastewater treatment capacity. Except for a very small area, they rely on the County's treatment plant at Ina Road or individual septic tanks. Marana currently has no plans to build a treatment plant, but Pima County has plans to expand their capacity at Ina Road (Pima County-Wastewater 2000).

b. Town of Oro Valley

The General Plan for Oro Valley (Town of Oro Valley 1996) reflects a tremendous growth in population in recent years, and establishes an intent to annex additional lands for future anticipated growth. The population in 1990 was 6,670; the land use plan provides for an increase to approximately 125,000 by 2020. Much of the development has been and will continue to be built out within the constraints of planned area developments, such as Ranch Vistoso. These master plans have resulted in the setting aside of significant amounts of natural open space. There is increasing pressure to develop the land adjacent to the portion of Honey Bee Canyon that is within the town boundary. A resort is planned for the Stone Canyon area, just west of Honey Bee Canyon. Both of these drainages have well-developed riparian habitat and extend between the Tortolita Mountain Park and Big Wash.

The General Plan establishes an "urban growth boundary" along its northern and western boundaries. This encroaches somewhat on an area outside their boundaries that is identified as a master planned community on the west side of Big Wash. The plan identifies the protection of the Sonoran Desert environment as a cornerstone and presents guidelines and strategies to ensure sensitive development. For example, development around Tortolita Park is limited to a minimum of one house per five acres. One of their strategic implementation actions is to lobby the Governor's Office to

establish preserve status for the State Land area adjacent to Tortolita Mountain Park. The town has adopted strict standards and ordinances for hillside development, native plant preservation, and riparian protection.

The Canada del Oro wash, the primary watercourse, has been channelized and bank protected along most of its length for flood control purposes. This brought the adjacent lands out of the floodplain and resulted in numerous medium to high density residential subdivisions and golf courses along its length.

Primary threats to biological resources in Oro Valley include habitat loss, habitat fragmentation and groundwater pumping to support the growing population. Principal constraints to development are the rough terrain and wide, natural washes. Also, they rely on the County's wastewater treatment plant at Ina Road or individual septic tanks.

c. Proposed Towns of Tortolita and Casas Adobes

These communities have been engaged in a struggle for legal status for the last several years, in a desire to incorporate as separate towns. Tortolita is located between Oro Valley and Marana and is characterized by large lot homesites derived from lot-splitting. The residents are committed to maintaining the rural, undeveloped character of the area. Casas Adobes has been developed over the years along the Oracle Road corridor. It is characterized by older subdivisions, large lot homesites, and commercial development along Oracle and Ina Roads. Infill of commercial projects and residential development continues.

d. Community of Catalina

Like all the communities in the subarea, Catalina has experienced significant growth in population, particularly in the last 30 years. Except for commercial development along the Oracle Road corridor the area is predominantly low density (Pima County 1996). There are several subdivisions but lot-splitting and wildcat subdividing has been the prevalent method of residential development. This unregulated development of much of Catalina has resulted in densities higher than 12 of 13 similar lot-split areas studied by Pima County in 1998. Catalina development has encroached on floodplains and destroyed riparian areas (Pima County 1998). The primary effect on biological resources has been significant habitat loss, fragmentation, and introduction of exotic species.

e. Ranching

Ranching has been an inherent part of the Tortolita Subarea for over 100 years. Several ranches continue to operate in the vicinity of Tortolita Mountain Park, along the west and east sides of the mountains (Pima County-Mt. Parks 2000). Increased pressure from urban growth and development in this part of Pima County and in southern Pinal County raise concerns regarding the potential for conversion of these ranch lands to higher intensity land uses.

2. Effects of Population Growth

During the last 20 years there has been rapid population growth and associated residential development within the Tortolita Subarea. Population forecasts for the next

20 years project a three- to four-fold increase (USDI-BOR 2000). Much of the growth has been in and is planned for the area now designated as Critical Habitat for the CFPO, Map Unit 4. As such, it has occurred within areas of ironwood forests and relatively dense saguaros, palo verdes, and mesquite bosques. Development has relied extensively on the channelization of many small intermittent watercourses that drain the Tortolita and Catalina Mountains and the alluvial bajada of the Tortolitas. The result has and continues to be a significant loss of vegetation and habitat, both in upland and riparian areas.

The heavily dissected alluvial bajada is an area of sheet flow. Once disturbed, these landscape types are very erosive. When land disturbance triggers erosion it can quickly accelerate and affect upstream and downstream conditions. 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 the Tortolita Fan area and elsewhere in other subareas (e.g., Sahuarita area).

The increasing population growth places a tremendous burden on groundwater—the area's traditional water supply. As in other parts of the county, groundwater levels have been declining because the rate of groundwater withdrawal has exceeded the rate of natural recharge to the aquifer. According to the Southern Arizona Regional Water Management Plan Feasibility Report (SARWMS) being drafted by the BOR, seven future golf courses are planned for the Tortolita Subarea: four in Marana and three in Oro Valley. The future water delivery requirements to meet the demands of these seven golf courses and the existing seven golf courses will be over 6,000 acre-feet per year for normal requirements and over 16,000 acre-feet per year for peak requirements (USDI-BOR 2000). (See related discussion under Water Use.)

Marana's CAP allotment is relatively small at 47 acre-feet per year. Even if they receive an additional CAP allocation from Tucson (or other sources) and acquire effluent rights for turf irrigation, the projected explosive growth of Marana will require a tremendous increase in groundwater mining (USDI-BOR 2000). Past rates of groundwater pumping have significantly altered the biologically rich Santa Cruz River, including the loss of endangered and other native fish and plants (Pima County-Water Resources 2000). Increased groundwater pumping would continue this deterioration. The groundwater elevation is estimated to have dropped up to 100 feet in the last 50 years in portions of the Marana area, mostly due to groundwater use for irrigated crops. Perennial flows in segments of the Santa Cruz River are supported by effluent discharged from the County's Ina Road Wastewater Treatment Plant.

Currently, the water companies of Oro Valley, Marana, and the Metropolitan Domestic Water Improvement District use a total of over 15,000 acre-feet per year and are projected by population forecasts to use over 47,000 by the year 2018. If the amount of CAP allocations and effluent utilized in the future was maximized, their groundwater use could be reduced to under 6,000 acre-feet per year (BOR 2000). A final finding of "jeopardy" by the U.S. Fish and Wildlife Service on CAP use in the Santa Cruz River basin would be a significant impediment to the viability of using CAP water to reduce groundwater dependence, and would consequently be a significant threat to the biological resources of the Tortolita Subarea. Likewise, the lack of existing infrastructure

to deliver CAP and effluent poses similar concerns. (See discussion under Water Uses, below.)

Direct stress on biological resources due to declining groundwater levels include a deterioration in the health and vitality of vegetation, particularly in riparian habitat areas, which support the highest diversity of wildlife species.

3. Transportation

The road network in the Tortolita Subarea is well developed and fragments much of the subarea, particularly in the southern and western portions (Figure 27). However, significant areas in the north and east portion of the subarea are still relatively unfragmented by highways and roads.

a. Tangerine Road Proposed Widening

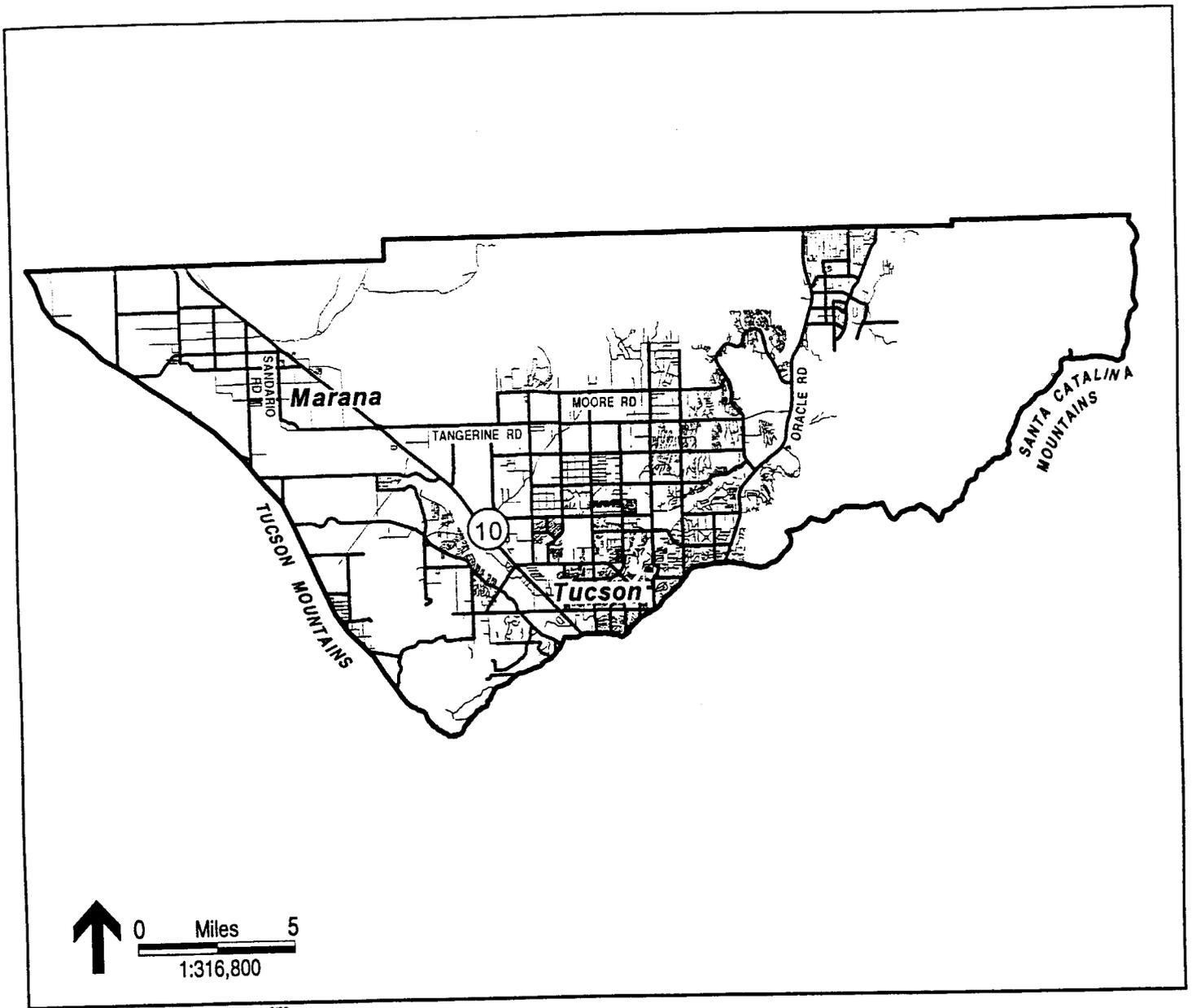
Tangerine Road is a state route with a planned right-of-way of 300 feet and eventual widening to four to six lanes between I-10 and Oracle Road. It crosses multiple watercourses, small and large. Its eventual widening raises concerns for wildlife movement and the protection of adjacent riparian vegetation. A key feature of the County's Long Range Transportation Plan (Pima County 1986) is the extension of Tangerine Road to the southwest to Sandario Road, and connecting to San Joaquin Road further south. It would involve the complexities and impacts associated with crossing the Santa Cruz River and the CAP canal, bank protection issues, and would be tied to a proposal to expand the Avra Valley Airport—all elements that pose stresses on the biological resources of the area. Habitat loss and fragmentation would be direct results.

b. Marana's Loop Road

Another major roadway reflected by the Marana General Plan (but not the County's Plan or the Metropolitan Transportation Plan) is a future loop road extending west from the Dove Mountain area of the Tortolitas west and northwest to I-10 near the County line. If built, this would cross the CAP canal, at least two large watercourses (Derrio and Cottonwood Washes), many smaller watercourses and would require the removal and displacement of a significant amount of ironwood forest and riparian vegetation and associated wildlife, all within Critical Habitat for the CFPO. This loop road is also reflected on the County's Comprehensive Plan for the Avra Valley/Tortolita Subregion (Pima County 1997).

4. Water Uses

Areas of naturally occurring streams and shallow groundwater occur in several portions of the subarea, in addition to the Santa Cruz River (Figure 28 and Table 18). Water is a key issue in this subarea, and a number of infrastructure projects will have an effect on the availability of water for habitat and wildlife uses.



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Road Network in the Tortolita Fan Subarea

-  Highway or Major Road
-  Local Road

Figure 27

TABLE 18
STREAM CHARACTERISTICS OF THE TORTOLITA FAN SUBAREA

Stream Name	Miles of		Miles of Intermittent Flow	Acres of Hydro-mes riparian Habitat		Acres of Class A Riparian Habitat		Acres of Shallow Groundwater		Pygmy-Owl Habitat	Fish Species	Leopard Frogs
	Perennial Flow	Flow		Habitat	Habitat	Habitat	Habitat	Habitat				
Santa Cruz River	6.8	15.7	3500	N/A	N/A	N/A	N/A	N/A	Yes	N/A	N/A	N/A
Wild Burro Canyon	0.7	0	N/A	N/A	N/A	N/A	N/A	N/A	No	N/A	N/A	N/A
Honey Bee Canyon	0.2	0	N/A	N/A	N/A	N/A	N/A	N/A	No	N/A	N/A	N/A
Canada Agua	0	0.0069	N/A	N/A	N/A	N/A	N/A	N/A	No	N/A	N/A	N/A
Ruelas Canyon	0.1	0	N/A	N/A	N/A	N/A	N/A	N/A	No	N/A	N/A	N/A
Twentyseven Wash	0	0	0	51	51	51	N/A	N/A	No	0	N/A	N/A
Sutherland Wash	0	6.5	N/A	121	121	121	483	483	No	N/A	N/A	N/A
Cargodera Canyon	0	0.2	N/A	N/A	N/A	N/A	N/A	N/A	No	N/A	N/A	N/A
Canada del Oro	4.2	1.2	303	N/A	N/A	N/A	N/A	N/A	No	2a	N/A	N/A
Paisade Canyon Creek	0	4.5	N/A	N/A	N/A	N/A	N/A	N/A	No	N/A	N/A	N/A
Lemmon Creek	2.7	0	N/A	N/A	N/A	N/A	N/A	N/A	No	1b	N/A	N/A
La Milagrosa Canyon	0	0.9	N/A	N/A	N/A	N/A	N/A	N/A	No	N/A	N/A	N/A

N/A = not applicable.

a. Proposed CAP Terminal Storage Facility

The BOR is considering and analyzing the possibility of building a Direct Delivery system to serve the northwest Tucson region. It would be composed of a surface reservoir, water treatment plant, and distribution system. The turnout, reservoir, and a treatment facility would be located east of I-10, approximately one mile north of Tangerine Road, with the conveyance pipeline following the alignment of Moore Road extending east to Rancho Vistoso. (A majority of the golf courses are located north of and parallel to Moore Road.) To the extent possible the distribution system would follow existing roadway rights-of-way, but a portion would be constructed in undisturbed habitats. Altogether the project is estimated to result in the loss of over 300 acres of designated Critical Habitat for the CFPO. The full impact on vegetated areas is unknown at this time, in part because the recreational component has not been defined. Elements and features such as picnic sites, campgrounds, and trails would result in additional acres of direct disturbance and habitat loss. Once treated, the water would be used for potable distribution, greatly reducing the amount of groundwater pumping by the water companies of Oro Valley, Marana, and the Metropolitan Domestic Water Improvement District. The storage reservoir would be sized at over 100 acres and would include a recreational component (i.e., swimming, fishing, camping, and boating).

b. Proposed CAP Recharge and Recovery System

As a separate but related project, the BOR is also considering a plan that would construct a turnout at the CAP canal at Moore Road as described above, and build conveyance systems to two recharge basins and direct discharge points: one at the confluence of Big Wash and Honey Bee Canyon Wash and one west of the Canyon del Oro Wash near Overton Road. The turnout and a treatment facility would be located near I-10 and Moore Road with the conveyance pipeline following the alignment of Moore Road extending east to Rancho Vistosa. A spur pipeline would be built to serve the Dove Mountain area and there would be other subsidiary lines between there and its terminus at Big Wash. The four basins at Big Wash would total approximately 15 acres; the eight basins at the Oasis site near the CDO wash would total 40 acres. Direct impacts to vegetation include loss of 55 acres of desert wash habitat for recharge basins, 145 acres of saguaro-ironwood habitat for pipeline construction, and additional loss of desert wash habitat for dikes at the recharge sites. Impacts to wildlife include loss of habitat, temporary disturbance due to construction noise and activities, and potential impacts to sensitive species such as desert tortoise, lesser long-nosed bat, CFPO, and other species.

c. Lower Santa Cruz Replenishment Project

This is associated with a larger Pima County Flood Control Project that includes a levee and bank protection system along the Santa Cruz River, extending north from the community of Rillito to the County line. A series of basins will be excavated outside the primary incised river channel but within the 100-year floodplain. Excavated material from the basins will be used to construct the flood control levee. This project is under construction.

d. Draft Biological Opinion on CAP

Directly affecting these and other uses 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. It is unclear to what extent the ongoing Section 7 consultation will impact CAP delivery and recharge projects within the Tortolita Subarea and elsewhere throughout the Santa Cruz basin.

e. Lower Santa Cruz Replenishment Project (LSCR)

This is associated with a larger Pima County Flood Control Project that includes a levee and bank protection system along the Santa Cruz River, extending north from the community of Rillito to the County line. The LSCR is being constructed to recharge CAP water through the use of eight excavated basins outside the primary incised river channel but within the 100-year flood plain. Excavated material from the basins will be used to construct the flood control levee. This project is under construction.

f. Effluent Discharge

Perennial flows along the Santa Cruz River result from effluent discharged from the Ina and Roger Road treatment plants. This effluent-dominated stream flow supports areas of hydromesic riparian woodland vegetation (consisting of mesquite, saltcedar and Goodding willow). These areas of hydromesic vegetation constitute a large percentage of the total for the entire Tucson Basin (BOR 2000) and would not exist in the absence of the effluent discharge (Malcolm Pirnie 1995). (See additional discussion under Middle Santa Cruz Subarea.)

g. Avra Valley Recharge Project (AVRP)

The Avra Valley Recharge Project recharges CAP water into four basins along the west side of the Santa Cruz River, south of Tangerine Road. The area once served as a sand and gravel extraction pit.

h. Effluent Distribution System

Currently, reclaimed water pipelines extend to the Dove Mountain area in the Tortolita Mountain Foothills and to Arthur Pack Regional Park. An additional pipeline is proposed to bring effluent to the Canada del Oro basin. A significant portion of the effluent would be used to serve golf courses along the Canada del Oro that are currently using groundwater and to support riparian restoration projects.

Effluent flows into the subarea and use of CAP water play a major role in recharging the aquifer. Both the BOR projects and increased effluent distribution would benefit the Tortolita Subarea by allowing the CAP and reclaimed water to be used in lieu of pumped groundwater for irrigation of golf courses and other turf areas. Additionally it would

provide a critical water source for riparian restoration projects within the Canada del Oro basin.

5. Recreation

Coronado National Forest, including the Pusch Ridge Wilderness, and the Catalina State Park provide important and popular recreational opportunities for the subarea. Tortolita Park receives less use, primarily by hikers. At the rate of development along the northwestern boundaries of the Catalinas, the State Park in coming years may hold the few areas of public access to the northwestern slopes of the mountains (Arizona State Parks Board 1991). Although the Wilderness area is somewhat insulated and protected by the proximity of the State Park, it has been a victim to human overuse. It receives so much use by hikers that it is questionable whether the potential for a "wilderness experience" still exists here (USFS 2000—Senn). Protection of a small herd of bighorn sheep in the wilderness area has been primary concern, and the high degree of use the trails receive is thought to be a factor in the lack of recent sightings (AG&FD 2000). Recreational opportunities include hiking, camping, horseback riding, picnicking, and mountain biking. In some areas trail use has resulted in erosion problems. The major issue relating to biological resources is human overuse associated with the rapid urbanization of the surrounding area. A small number of Bighorn sheep occupy the Pusch Ridge Wilderness. Their numbers have declined over the years and wildlife biologists studying the situation believe this may be in part due to increased numbers of people using the wilderness trails (AG&FD 2000).

B. Biological Resources

1. Vegetation and Land Cover

Habitat within the Tortolita Fan Subarea consists primarily of palo verde-mixed cacti habitat. The western portion of the subarea supports heavy agricultural development interspersed with creosote-bursage and mixed scrub habitat within drainages. The city of Tucson occupies the center of the subareas' southern edge. The eastern portion of the subarea contains areas of higher elevation and supports mixed grass scrub, mixed evergreen sclerophyll, oak, pine, and douglas-fir-mixed-conifer forest habitats (Figure 29).

2. Critical Habitat

As discussed above, much of the Tortolita subarea has been designated Critical Habitat for the CFPO Map Unit 4. It consists of private, state, and county lands. It contains stands of ironwood, acacia, saguaro, mesquite bosques, several washes, and is considered to be of the highest quality pygmy-owl habitat known. Activities that pose a threat to the Critical Habitat for the CFPO include removing or destroying vegetation; water diversion, impoundment or groundwater pumping that alters water quality or quantity to an extent that riparian vegetation is significantly affected; and recreational activities that appreciably degrade vegetation (USDI-USFWS 1999).

3. Incidental Take Permit

In 1998 USFWS approved a Habitat Conservation Plan for the Lazy K Bar Guest Ranch, located at the northern end of the Tucson Mountains. The ranch owners wanted to construct new buildings and has committed to restoring 32 acres of CFPO habitat. The permit included an agreement to stop construction if one or more CFPO were harmed or killed.

4. Species at Risk

A total of 11 Status 1 and 2 Vulnerable Species occur within the subarea (Table 19).

C. Existing and Proposed Preserves

Both Catalina State Park and Tortolita Mountain Park are located within this subarea and have adjacent areas that have been identified for expansion by the Open Space Acquisition Master Plan (Pima County-Open Space 2000). The Tortolita East Biological Corridor is a 3,441-acre proposed addition consisting almost entirely of State Trust Land. This would adjoin the eastern expansion boundary of the park and link it with the proposed expansion area of Catalina State Park. In doing this a connection between the Catalina and Tortolita Mountains would be created, thereby protecting segments of significant wash corridors: Upper Honeybee, Big Wash, Sutherland Wash, and Twenty-Seven Wash, and facilitating wildlife movement between the areas. Additionally, a 14,000-acre area of natural open space located west and south of Tortolita Park is proposed for acquisition. This area is almost entirely State Land and has been designated CFPO Critical Habitat, Map Unit 4. A total of 16,185 acres of State Land were covered by an Arizona Preserve Initiative application to reclassify these lands for purposes of conservation. That application is under review by Arizona State Lands Department.

A recent proposal by the Town of Oro Valley would annex 4,620 acres of State Land in the area of the Tortolita East Biological Corridor. Their General Plan designates this area as open space but that could be changed by Plan amendment (*Tucson Citizen* 2000).

The presence of much privately held and State Land adjacent to the existing preserves presents the possibility of these lands being developed at much higher intensities and conversion from open space and ranch lands to subdivisions and master planned communities. In some cases the rugged terrain is a constraint to development.

D. Summary of Potential Stressors to Biological Resources

The primary biological stressors of the Tortolita Subarea are habitat loss, habitat fragmentation, conversion of vegetative cover, competition by non-native species/human use, and overuse and decline in groundwater levels. The current ownership and management pattern of the Tortolita Subarea is fragmented, with the landscape dominated by urban uses of the Tucson metropolitan area (Figure 30). Although there are significant areas of status 4a and 3b status lands, they are generally fragmented by more intensive uses.

TABLE 19
STATUS 1 AND 2 VULNERABLE SPECIES OCCURRING IN THE TORTOLITA FAN 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. Lemmon quad 1993, USFS	
<i>Agave schottii</i> var. <i>treleasei</i> Trelease agave	1	S1	FSC FSS ANP	Narrow endemic. Direct site impacts by road building and recreational development may impact local populations.	Oro Valley quad, Pusch Ridge, 1994 USFS Tucson North quad, Finger Rock Canyon, 1987 USFS	Occurs in isolated, relatively secure locations.
<i>Allium gooddingii</i> Goodding onion	2	S3S4	FSS ANP-HS	Livestock grazing, logging/timber management, organized recreational and sports use	Mt. Lemmon quad 1986 USFS	
<i>Buteo swainsoni</i> Swainson's hawk	2	S3	FSS	Migratory species in this area. No specific threats likely to apply here.	West of Marana quad 1993 private	
<i>Glaucidium brasilianum cactorum</i>	1	S1	FE FSS	Habitat destruction and alteration, historic and present. Groundwater	Multiple records: Desert Peak quad 3 Private.	Most of the known records for this species are from this

TABLE 19
 STATUS 1 AND 2 VULNERABLE SPECIES OCCURRING IN THE TORTOLITA FAN SUBAREA
 (continued)

Scientific Name/Common Name	Pima County Status	State Rank	Listing Status	Potential Threats and Stressors	HDMS Records	Notes
<i>Cactus ferruginous pygmy-owl</i>			WSC	pumping, channelization, urbanization, historic livestock grazing? Farming and agricultural uses? Wood cutting. Disturbance by bird watchers. Small population subject to stochastic events. Possibility of disease, including emerging diseases, and loss of viable food supply as a result of drought and/or climate change.	Tortolita Mountains quad 1 State. Ruelas Canyon quad 34 records, Private. Avra quad 1 Private. Jaynes quad 4 Private. Tucson North quad 1 Private.	planning unit.
<i>Leptonycteris curasoae yerbabuena</i> Lesser long-nosed bat	2	S2	FE FSS WSC	Mining, hiking, organized recreational and sports use: direct impacts to roosts (caves and inactive mines), disturbance of roosting bats. Livestock grazing, new roadways, new utilities, off-road driving, low-level overflights and military training activities: alleged and potential or possible impacts to food plants, roosts, disturbance of roosting bats.	Mt. Lemmon quad Red Ridge 1986 USFS.	
<i>Muhlenbergia xerophila</i> Weeping muhly	1	S1	FSS	Very narrow distribution.	Tucson North quad, Finger Rock Canyon 1999 USFS	
<i>Poecilopsis occidentalis</i> <i>occidentalis</i>	1	S2	FE FSS	Non-native species, competition and predation. Habitat loss by	Oracle quad, Canada del	Possibly washed down from Romero Canyon site? No record

TABLE 19
 STATUS 1 AND 2 VULNERABLE SPECIES OCCURRING IN THE TORTOLITA FAN SUBAREA
 (continued)

Scientific Name/Common Name	Pima County Status	State Rank	Listing Status	Potential Threats and Stressors	HDMS Records	Notes
<i>Gila topminnow</i>			WSC	groundwater pumping and channelization. Flooding. Drought. Dredging. Poor water quality. Livestock grazing (trampling by cattle, watershed changes).	Oro 1982 USFS.	of this site in Weedman et al. 1997.
<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	Oro Valley quad, Canada del Oro Wash 1191 USFS, 1994 Private. Mt. Lemmon quad, Upper Sabino Canyon 1982, USFS	
<i>Strix occidentalis lucida</i> Mexican spotted owl	2	S394	FT WSC FSS	Habitat destruction by logging. Possibly consequences of fire suppression leading to major timber fires. Organized recreational and sports use. Global climate change.	Mt. Lemmon quad, 8 records, 1990-1997 all USFS.	Critical Habitat for this species had been designated in 1995, but rescinded in 1998.. On 3/14/00 a federal judge ordered FWS to determine critical habitat by 1/15/01.

TABLE 19
 STATUS 1 AND 2 VULNERABLE SPECIES OCCURRING IN THE TORTOLITA FAN SUBAREA
 (continued)

Scientific Name/Common Name	Pima County Status	State Rank	Listing Status	Potential Threats and Stressors	HDMS Records	Notes
<i>Tumamoca macdougallii</i> Tumamoc globeberry	2	S3	FSS ANP-SR	Mining, canals (CAP), urbanization (commercial and residential, including lot-splitting/wildcat subdivision), aggregate or fill removal, livestock grazing?, landfills, new roadways and utilities, conversion of desert lands to crop lands, golf courses, parks, off-road driving. Competition with exotics. Consumption by javelina.	West of Marana quad 1993 1986 BLM. Ruelas Canyon quad, 1987, 1985 private Avra quad, multiple records, private, state, BLM, NPS Jaynes quad 1984 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.

NOTE: Other species may occur in this subarea, but are not included in HDMS records. Known with certainty (K. Kingsley, personal observations or available literature) are: song sparrow (*Melospiza melodia*) (1); Abert's towhee (*Pipilo aberti*) (1); burrowing owl (*Athene curvicularia*) (2); Blue silverspot butterfly (*Speyeria nokomis caeruleascens*) (2) (probably extinct in Pima Co.); Le Conte's thrasher (*Toxostoma lecontei*) (2); Bell's vireo (*Vireo bellii*) (2).

Quads: Desert Peak, Tortolita Mts., Oracle Junction, Oracle, West of Marana, Marana, Ruelas Canyon, Oro Valley, Mt. Lemmon, Avra, Jaynes, Tucson North

Activities contributing to biological stress are summarized on Table 20. These can be mostly attributed to the effects of urbanization—including the roadways and infrastructure to support development. During the last 20 years there has been rapid population growth and associated residential development within the Tortolita Subarea. Population forecasts for the next 20 years project a three- to four-fold increase (BOR 2000). Much of the growth has been in and is planned for the area now designated as Critical Habitat for the CFPO, Map Unit 4. As such, it has occurred within areas of Ironwood forests and relatively dense saguaros, palo verdes, and mesquite bosques. Development has relied extensively on the channelization of many small intermittent watercourses that drain the Tortolita and Catalina Mountains and the alluvial bajada of the Tortolitas. The result has and continues to be a significant loss of vegetation and habitat, both in upland and riparian areas. The heavily dissected alluvial bajada is an area of sheet flow. Once disturbed, these landscape types are very erosive. When land disturbance triggers erosion it can quickly accelerate and affect upstream and downstream conditions. Direct modification of the watercourse, downcutting, and loss of xeroriparian and upland vegetation can essentially transform an area of rich biodiversity into one of low biological resource value. This is a serious concern for the Tortolita Fan area and elsewhere in other subareas (e.g., Sahuarita area). Habitats most at risk include Critical Habitat for the CFPO, the remaining ironwood forests, riparian, and xeroriparian areas, stream segments with perennial flows, and areas of shallow groundwater. The private and State Lands adjacent to the existing preserve areas are also at risk of being developed at higher intensity levels. The consequences of lot-splitting are a continued stress to biological resources, particularly in Catalina and Tortolita. The significance of the planned extension of CAP water, whether treated or untreated, cannot be overstated. It will result in large amounts of habitat loss. Conversely, if it is not built the area's demand for water will continue groundwater pumping at an accelerated rate, and expanded opportunities for riparian restoration will be lost. It is unclear to what extent the ongoing Section 7 consultation will impact projects within the Tortolita Fan Subarea and elsewhere throughout the Santa Cruz basin.

TABLE 20
LAND USE ACTIVITIES WITHIN LAND OWNERSHIP/MANAGEMENT CATEGORIES
OF THE TORTOLITA FAN SUBAREA

Ownership or Management Category	Land Uses and Activities										
	Conversion of Agricultural Lands	Conversion of Ranches	Lot-Splitting & Urbanization	Cultivated Land	Groundwater Pumping	Water Diversion & Impoundments	Recreational Uses	Mining	Roadways	Livestock Grazing	Removal of Plants
Coronado National Forest (23,610 acres)	-	x	-	-	*	x	x	x	x	x	x
Pusch Ridge Wilderness (14,350 acres)											
Marana Open Space (877 acres)											
Catalina State Park (5,453 acres)	-	⊕	-	⊕	*	*	x	-	x	⊕	⊕
Tortolita Mountain Park (3,001 acres)	-	⊕	-	-	*	*	x	-	x	⊕	⊕
Saguaro National Park West (5,515 acres)											
Saguaro National Park West Wilderness (2,985 acres)											
Marana Unreserved State Trust Land (8,825 acres)	-	*	*	*	x	x	x	x	x	x	x
Pima County Open Space (5,278 acres)											
Pima County Unreserved – State Trust Land (31,017 acres)	-	*	*	-	x	x	x	x	x	x	x
Oro Valley Unreserved – State Trust Land (881 acres)											
Oro Valley Unreserved – Private Lands (19,018 acres)											
Marana Unreserved – Private Land (33,154 acres)											
Pima County Unreserved – Private Lands (49,511 acres)	x	x	x	x	x	x	x	x	x	x	x

x = occurs

- = does not occur

* = potential to occur

⊕ = historic but not present occurrence

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 8

Subarea 5 - Tortolita Fan

WATERSHED/WATERCOURSE CHARACTERISTICS

The Tortolita Fan Subarea consists primarily of the tributary drainage to the Santa Cruz River which emanates from the Tortolita Mountains and associated foothills/piedmont area along the northern boundary of Eastern Pima County and flows from the Catalina Mountains western flanks. The subarea also includes the Santa Cruz River downstream of the Cañada del Oro Wash Confluence near Ina Road. The subarea is bounded by the Tortolita Mountains to the northeast, the Cañada del Oro Wash to the southeast, the Santa Cruz River floodplain to the southwest and the Pinal County line to the north. The primary physiographic features of the subarea are the Tortolita Piedmont and the Lower Santa Cruz River and its floodplain. Fig. 8-1 shows the subarea. Fig. 8-2 depicts the watershed.

The Tortolita Piedmont

The Tortolita Piedmont consists of a coalescing series of geologically ancient alluvial fan surfaces between Interstate 10 and the Tortolita Mountains. These alluvial surfaces cover a relatively large area extending from near the Cañada del Oro Wash to the Pinal County line. A substantial portion of this area is currently shown on flood insurance maps as alluvial fan flood hazard areas. The Federal Emergency Management Agency (FEMA) treats flood hazards in alluvial fan areas differently from other flood hazard areas in that property cannot be removed from the floodplain simply by elevating the ground above the flood level. In alluvial fan areas, the regulatory presumption is that all portions of the fan are subject to erosion hazards as well. However, intensive study of the area, which has occurred during the last ten years, has cast considerable doubt on the validity of the alluvial fan designation because of the apparent stability of the geology of the area. For this reason it is possible that the area may be designated as non-alluvial fan in the future. Because of the designation of extensive portions of the subarea as alluvial fan, development has been slow to occur in this area.

Romero Creek and the Cañada del Oro are perennial in places as they descend from the National Forest into the State Park. A portion of Honeybee Wash, through the Rancho Vistoso area is also classified as perennial

Santa Cruz River Floodplain

The balance of the subarea is located primarily within the floodplain of the Lower Santa Cruz River through the Town of Marana. This area has long been used primarily for agricultural purposes and has been prone to extensive flooding. The area was hard hit by flooding which covered thousands of acres in both October 1983 and January 1993.

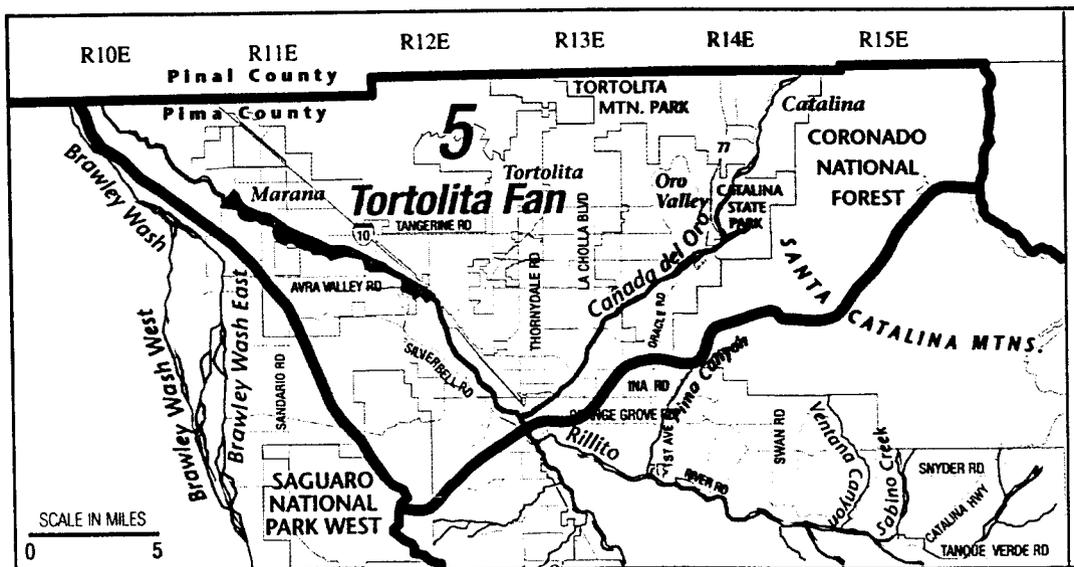


Fig. 8-1. The Tortolita Fan Subarea.

During the 1983 flood, three people died in Marana due to flood-related accidents and residences, businesses, agricultural fields, and public transportation infrastructure suffered extensive damage. During the 1993 floods, approach roads to two bridges in Marana, and several agricultural fields and residences were damaged. The Santa Cruz River in this area is an effluent dominated stream through Marana, with some riparian sections.

Major Wash Characteristics

The two major washes within this subarea are the Cañada del Oro Wash and the Santa Cruz River. The Cañada del Oro Wash has been channelized and stabilized with soil cement bank protection. The only reach which remains somewhat natural is along the ± 1.0 mile reach between La Cholla Blvd. and La Canada Drive.

The Cañada del Oro Wash was excavated through Tucson National Country Club in the 1960's. This excavation along with channelization along downstream reaches initiated severe degradation. This degradation has generally been controlled by installation of grade control structures which occur periodically along the reach between the Santa Cruz River confluence and just downstream of La Cholla Blvd. Degradation is still occurring along the reach upstream of La Cholla Blvd. Floods that occurred in the 1990's resulted in about four to five feet of degradation at the Overton Road dip crossing. It is expected that this degradation will continue to propagate upstream during future floods. This may ultimately pose a threat to existing bank protection that has been constructed east of La Canada Drive (adjoining Oro Valley Country Club Estates).

The reach of the Canada del Oro Wash in the vicinity of the town of Catalina is entrenched a few feet below adjoining overbank elevations, however, the channel capacity is limited and a significant amount of overbank flow occurs during high magnitude floods. The overbank floodplain has gradually developed at low density and there continues to be development pressure because the area is so attractive for rural residence. This reach of the wash has been mapped as a federally delineated floodplain and floodway. The floodway occupies a width of about 1000 feet of the floodplain area. There are several residential structures located within this floodway which were there prior to the federal designation. The restrictions placed on new development by the floodway designation have rendered some parcels unusable and required some new homes to be raised two to four feet above natural grade.

The Santa Cruz River has been channelized through the Continental Ranch development between Cortaro Road and a point about 1.7 miles south of the Avra Valley Road bridge. This channelization contains the 100 year flood within a two tiered channel. The upper tier is inundated with flow only during floods with a return period greater than 10 years. The upper tier may be developed in the future with recreational uses such as a park and/or golf course.

Pima County is presently constructing a levee along the east bank of the Santa Cruz River between the north end of Continental Ranch and Sanders Road (a total distance of approximately six miles). The overbank floodplain area on the west side of the river across from the levee as well as along both overbanks north of Sanders Road presently function to provide overbank storage capacity. This storage capacity acts to decrease downstream flood peaks.

The vertical profile of the Santa Cruz River channel has been experiencing significant aggradation along the reaches north of Trico-Marana Road. This aggradation may be in part due to perineal sewage effluent flows which support phreatophyte vegetation growth and, infiltration of the effluent which attenuates the flow and drops sediment. Severe aggradation is also occurring at the Trico Road bridge due to the vegetation and due to a narrow bridge opening which blocks the flow.

The reach of the Santa Cruz River extending south of Trico-Marana Road to Avra Valley Road has generally been stable. No significant aggradation or degradation has been identified along this reach. Some degradation is occurring along the south end of the Continental Ranch reach in the vicinity of Cortaro Road. Recently a five foot drop in the channel was protected from further deterioration by a grade control structure. The degradation is believed to be due to perineal sewage effluent flows which has been gradually and continuously degrading the bed elevation. Some of the degradation may have also been the result of sand and gravel mining that occurred in the vicinity of Ina Road and Cortaro Road during the late 1970's and early 1980's. The flood of 1983 captured a gravel pit just north of Ina Road. This may have disrupted sediment transport and initiated degradation along the near upstream and downstream reach.

Tributary Characteristics

The wash characteristics throughout the subarea are quite diverse. This diversity is related to topography (slope and landform) and geology. The two most notable sub-regions are the Tortolita piedmont and the Tucson Mountain foothills. The Tortolita Mountains are composed of a soft granite which weathers rapidly and lends to high sediment

production. This sediment is delivered via the drainage systems to the piedmont where slopes decrease, deposition occurs, and distributary drainage patterns form.

The soils created by decomposition of granite are coarse grained and non-cohesive. They are easily entrained (carried in suspension) and transported downslope until slope decreases and the sediments are deposited. This deposition eventually fills in a wash, forcing flow to seek and alternate path that creates distributary flow patterns.

Erosion and degradation are a frequently observed consequence of urbanization and man-made modifications to washes in distributary flow areas. Collection of the flow often results in higher velocities which entrains more sediment and initiates the erosion process. The area where this erosion has most frequently been observed is within the Town of Oro Valley along the fringe of the Cañada del Oro Wash. This is an area characterized by steep slopes and loose sandy soils. Development in this area has modified flow conditions by increasing runoff and confining flow to excavated channels. This has frequently resulted in erosion along the wash reaches where the development occurred and deposition along downstream reaches.

The distributary washes which exist on the western flank of the Tortolita piedmont have not been significantly affected by man-made modifications or development. The extent of development within this region is confined to the valley floor adjoining Interstate 10 and to the Dove Mountain master planned community. Land development within the Dove Mountain project has been limited and has been structured to avoid modifications to the washes, except where road crossings (culverts) are necessary. The north boundary of the distributary flow region extends southwesterly from the mountain front until slope decreases enough to initiate sediment deposition. Washes remain well defined between topographical highs for distances of one to three miles from the mountain front. In general, it appears that distributary wash patterns begin to develop when the slope of the piedmont decreases to less than about three percent.

Future development along the valley floor adjoining Interstate 10 will not affect the stability of washes on the piedmont. The most significant challenge will be to define adequate measures for collection and conveyance of floodwaters and sediment to an outfall such as the Santa Cruz River.

The largest tributary to the Cañada del Oro Wash is Big Wash. This watercourse has a 100 year discharge rate of 18,000 cfs. Big Wash remains as a braided channel system which has not been significantly affected by man-made change.

Washes emanating from the Tucson Mountains are well defined throughout most of the foothills area flanking the east side of the mountains. Distributary wash patterns develop within some small areas near the north end of the mountains. The distributary wash patterns are confined to areas where surface slopes decrease below three percent. The Tucson Mountains are composed primarily of igneous (volcanic) rock which is much less erodible than the granite of the Tortolita Mountains. The soil yielded by these mountains is also more conducive to cohesion which is another factor increasing erosion resistance.

HUMAN IMPACTS ON THE WATERCOURSES

FLOOD MANAGEMENT STUDIES, PLANS AND ACTIVITIES

Pima County studies and projects

Because of the complex flood problems in this area, there are quite a few studies and management plans. The largest project in the area is construction of a 7.36 mile levee along the north/east bank of the Santa Cruz River starting south of Avra Valley Road and proceeding downstream through Marana. The river side of the levee will be reinforced with soil cement to protect the levee from being undermined. The project will satisfy FEMA requirements, allowing additional development near the river in Marana. It is expected to remove approximately 4,468 acres from flood hazard or floodplain status. This was in response to a series of past flooding problems, especially the 1993 flood in which bridges, agricultural fields and residences were damaged. The project is funded jointly by Pima County, The Arizona Department of Water Resources, U.S. Bureau of Reclamation, and benefitting properties.

Pima County completed an area-wide study of the Tortolita Fan in 1987 and included interim floodplain management policies which were adopted by the Board of Supervisors. In 1991 the second phase was completed. This had an analysis of watersheds impacting the Tangerine Road, including Ruelas Canyon, Prospect Canyon, Canada Agua, North Ranch and portions of Wild Burro Wash. The recommendations included both structural and non-structural alternatives. A 1996 study by the U.S. Army Corps of Engineers examined a variety of structural flood control measures to channelize washes to maximize development potential. This project was not implemented because the Corps found that the costs far outweighed the benefits and the program was not environmentally sound. The report

states that if the growth rate in the area exceeded 7 percent, another economic evaluation should be made. The current approach is not to channelize the washes, but to require that any development not be placed so as to require major structural controls.

The Cañada del Oro River Management Plan dealt with the floodplains between Catalina State Park and the Santa Cruz River confluence. A combination of structural and non-structural policies were proposed including acquisition, bank stabilization, floodplain rezoning, and financing. Much of the bank stabilization was completed and acquisition continues, and about 24 acres have been purchased.

A very different problem occurred along Highland Wash in Oro Valley. The pre-development drainage in this area was about 3,000 cfs and the existing channel and culvert under Lambert Lane were undersized for that amount of water. Upstream development has increased that flood flow to about 5,000 cfs, far too much for the drainage system to handle. An agreement calls for upstream developers to install on-site retention basins as development occurs. In addition, a developer was supposed to do floodplain improvements, but this did not occur. The recommended solution included dedication of the wash to the county with continued improvements to the drainage system, including retention basins.

A study of the Cañada del Oro Wash at Catalina was completed in 1991 with recommendations to acquire floodprone land. About 7 acres were acquired under this program.

Pima County bond funds are earmarked for several locations in Oro Valley in the Rancho Feliz subdivision, areas along La Canada Drive between Naranja and Lambert Lane, parts of Lambert Lane, and Linda Vista Boulevard. These are primarily improving road crossings and correcting drainage problems that contribute to flows that affect traffic.

Pima County has acquired 27 acres of flood prone land along the Cañada del Oro in the Catalina area to reduce flood damage.

A network of flow and precipitation sensors have been installed to provide early warning of flood potential in the Cañada del Oro drainage.

The Town of Oro Valley has begun an intensive study of flooding problems in the city.

Balanced and critical basins

Most of the Tortolita Fan area outside Oro Valley has been declared a critical basin because of widespread overbank flooding from natural channels originating on the fan; unpredictable flow paths for major floods originating at the fan apex; a potential for flooding across watershed boundaries; rapid and unpredictable erosion and deposition along streams; flooding due to inadequate culvert drainage capacity under the railroad and impassable dip crossings. The Loma de Oro Wash is declared critical because the existing channel is inadequate. In the town of Catalina the basin to the east of Twenty-seven mile wash was declared balanced because further development would increase drainage problems as was the drainages flowing east in the Cañada del Oro because of severe erosion potential. (See Chapter 3 for an explanation of critical basins).

TRANSPORTATION

Interstate 10 runs along the western boundary of the subarea and Highway 77 along the eastern side of the valley along the foot of the mountains. Numerous streets and roads run through the area, with Tangerine being the farthest north paved road that connects I-10 and Highway 77. There is a small airport for private planes west of Oro Valley.

EXISTING PUBLIC LAND USES

Pima County's Tortolita Mountain Park occupies 3,446 acres in the Tortolita Mountains at the northern end of the subarea. This park is kept natural and recreational use is very low. There are no facilities such as picnic areas or paved roads.

Catalina State Park occupies 5,493 acres along the Sutherland Wash and Cañada del Oro Wash (which join in the Park) and adjoins the western part of the Coronado National Forest. The park has horseback trails and facilities, picnic and camping areas, and trails that lead to the higher elevations of the Catalina Mountains. The Cañada del Oro is left natural and public roads do not cross it or Sutherland Wash within the park.

The Pusch Ridge Wilderness Area occupies 55,992 acres within the upper elevations of the Coronado National Forest, traditional bighorn sheep winter habitat in this and in the Middle Santa Cruz Subarea. The Pima Canyon Trail leads into this area with limits on visitation to protect the few remaining sheep. The Pusch Ridge Estates in this area was designed with provisions to protect the sheep, such as not allowing dogs, but the sheep have continued to decline for a variety of reasons.

Parts of the northern end of the Tucson Mountains are within the Saguaro National Park boundary. The northernmost tip is State Trust Land.

WATER AND WASTEWATER- RELATED LAND USES

Water Supply

Private water companies serve much of the area and there are many private domestic and irrigation wells. The Town of Oro Valley's water utility serves much of the Oro Valley area. The Metropolitan Domestic Water Improvement District (Metro) serves the southeastern part of the area and Marana has its own company. In addition, there are some smaller private water providers and the City of Tucson provides water to some areas. Oro Valley and Metro have CAP allocations, although there are currently no facilities to provide CAP water to their customers.

Wastewater

Because Marana is downstream of the Ina Road Treatment Plant the community has had problems deciding how deal with wastewater. Pima County operates one facility in Marana, the School District has its own facility and the remainder are private facilities to serve specific subdivisions. A regional facility is planned at the Pinal County line at some future date when increased population growth warrants it.

Dove Mountain and most of the Tortolita Fan, Catalina, and Oro Valley are at a higher elevation than the Ina Road Treatment Plant, so they can more easily be incorporated in that system. The area, including Dove Mountain is already connected to Ina Road Treatment Plant by pipeline. Four small plants in the area were closed when the connection was made.

Recharge and habitat

Depth to water ranges from 50 feet along the upper sections of the Cañada del Oro to more than 450 feet in the Tortolita foothills, with some surface flows in the mountains and upper foothills. Wells are located throughout the area for agricultural, municipal and domestic purposes. Much concern has been expressed about the impacts that pumping in the Rancho Vistoso area could have on Honeybee Wash.

The water table in the Marana area has remained high in spite of extensive agricultural pumping. This is largely because of the steady flow of effluent that serves to recharge the basin near the river. Recently farmers in the Marana area started to use CAP water for agriculture, lessening their pumping.

Pima County is currently developing recharge projects along the Santa Cruz River in the Marana area which would have wildlife habitat potential. A facility permit has been issued for the Lower Santa Cruz Replenishment Project, which would have a capacity of 12,000 to 13,000 acre feet in its first phase. Later phases would increase this potential. While this location has a lot of benefits, it is in an area of already relatively high groundwater levels downstream of the main wells from which groundwater is withdrawn for municipal use in the Tucson basin.

Oro Valley is studying the potential for a CAP recharge and recovery project along the Cañada del Oro. The Bureau of Reclamation is examining the possibility of a CAP turnout from the canal on the west side of the Tortolita Mountains and a pipeline extending into the Oro Valley area for this purpose. There has also been discussion of a treatment facility so the CAP water could be used for municipal purposes.

EXISTING PRIVATE LAND USES

Marana is the largest town in the area in terms of acreage, but Oro Valley is the largest in terms of population. The small town of Catalina at the northern part of the area is unincorporated. The towns of Tortolita and Casas Adobes were formed by residents, but the formation was challenged in court and their status is as yet undetermined. Pima County continues to perform the appropriate governmental functions, such as sheriff's service, in these areas until the matter is finally resolved. Saddlebrooke, a resort community designed largely for retired people is in this vicinity in the Catalina Mountains foothills and has experienced continual growth.

The western part of the Marana area has long been used for agriculture in this and the adjoining Avra Valley, with most of the agriculture on the west side of the river. Agriculture in this area has depended mostly on cotton, alfalfa, and some vegetable crops such as lettuce. Agricultural activities are discussed in more detail in the Avra Valley Subarea chapter.

Since Marana began annexing large areas to the south and east of its traditional area, extensive urban lands are now also included in the town. An industrial area parallels I-10. Marana's population grew from a few thousand people in the 1980s to 14,700 in 2000 and is projected to increase to 52,328 by 2015.

The eastern side of the subarea, on the other hand, is largely residential and commercial in character. The burgeoning town of Oro Valley has experienced rapid population growth in the past fifteen years, with much of that happening in the planned resort community of Rancho Vistoso. From a 1997 population of 37,800 the population is projected to increase to 51,200 by 2015. The Oro Valley Land Use Plan provides for an increase to 125,000 people by 2020. Most of the housing in the Oro Valley area is within the higher cost range of housing in Pima County, with some homes selling in the million dollar range. Commercial activity is common along Highway 77 which has a series of shopping centers from Ina Road through Oro Valley. There is a state juvenile detention center south of Catalina. Development in Catalina has largely been through wildcat subdividing and lot-splitting which has in places.

Most of the land between Oro Valley and I-10 is as yet only lightly populated, except for the Dove Mountain subdivision, which is in the Town of Marana. This area is planned for 9,159 homes on 5,600 acres. The entire area contains ancient ironwood trees with their special habitat as described in the SDCP report, Desert Ironwood Primer. Rapid growth was projected in this part of the subarea and a new highschool planned to accommodate past and projected growth, but possible designation as critical habitat for the pygmy owl has slowed rezonings and subdivision starts drastically. As indicated above, the flooding problems of this area require that if the lot is developed it be done carefully.

There are many golf courses in the subarea, most of which use groundwater, although the County's Arthur Pack Golf Course and the Heritage Highlands Golf Course use effluent.

PROJECTED LAND USES

The Pima County Comprehensive Plan calls for the Tortolita Mountains and the floodplains of major washes coming from those mountains to be left as Resource Conservation Areas. The more remote parts of the area are planned for rural and low density uses, while the towns of Marana and Oro Valley are zoned for low to high density and commercial uses. The plan calls for commercial activity centers along Highway 77.

Private land development

Large portions of this area have been designated as potential habitat for the endangered cactus-ferruginous pygmy owl. This is discouraging development of the area, although much of the land is already zoned for residential and commercial purposes in Marana and Oro Valley. However, there has already been development of some areas along the mountain fronts along the south portion of the subarea. The Dove Mountain project is a 5,600-acre master planned golf-resort community located near the mouth of Ruelas Canyon in the Tortolita Mountains. Pressure to develop in this area will likely continue as this area represents a relatively large open area that is primarily under state land ownership and is uphill from existing wastewater treatment facilities at Ina Road and proposed facilities in Marana.

The Marana area is also experiencing development pressure. The Continental Ranch development has resulted in construction of hundreds of homes within the geologic floodplain south of the river just north of Cortaro Road. The homes are protected by channelization and bank stabilization along the Santa Cruz River. Currently, the Pima County Flood Control District is constructing a flood control levee along the northeast side of the Santa Cruz River between Avra Valley Road and Sanders Road. Just over seven miles of new earthen levee will be constructed along the north bank of the Santa Cruz River, and the side of the levee that faces the river will be stabilized with soil cement. The design includes protection from 100-year Santa Cruz River flooding, eight feet of toedown below the channel invert to protect the levee from being undermined by scour, and three feet of freeboard above the 100-year water surface elevation to satisfy federal floodplain regulations. Once completed the project will remove thousands of acres of property from the floodplain thereby enabling development of the area.

Potential impacts of development in the subarea are numerous. Proper development of the Tortolita Piedmont area will require careful planning of through drainage improvements to insure that individual development projects do not result in wholesale alteration of drainage patterns on the ancient alluvial fans. This may need to be accomplished by establishing flood/drainage corridors such as the desert brown belt approach currently being pursued in similar areas in Scottsdale, Arizona. Other approaches may include large scale stormwater detention basin, however, such basins must be carefully designed and sited so as to avoid creating downstream erosion problems along major channels. Development of the area will also be complicated somewhat by the existence of the Central Arizona Project canal which traverses the piedmont. The CAP forms a virtual dam across the piedmont which drainage must collect against until reaching one of the through cross-drainage structures along the canal. Planning of regional-scale flood control facilities will need to take the location of these crossings into account. Proper development of the Lower Santa Cruz

River floodplain behind the planned flood control levee will also require careful planning. The areas behind these levees will still be subject to inundation from the Tortolita Piedmont flow sources even after completion of the levee. Proper through drainage of the piedmont flow sources into the Santa Cruz River must be provided to insure safe construction in the area.

Proposed water delivery projects

The Bureau of Reclamation is studying alternative ways to bring CAP water to the Oro Valley-eastern Marana area. Total annual water use in the area is about 15,500 acre feet, with turf accounting for about 6,500 of that amount. This usage is projected to reach 47,600 acre feet by 2018. One alternative would bring unprocessed CAP water for use on turf in Marana and Oro Valley and for recharge projects. The 30" pipeline would travel along the Moore Road alignment from the CAP canal to Big Wash. Two pumping stations would be needed - at the canal and in the vicinity of Blue Bonnet Road. Two storage tanks would be located along the system. At Big Wash the water would be recharged in four basins and in the wash. A gravity pipeline would transport the water to its intended use downstream. The amounts of water under discussion range from 17,400 acre feet to 30,000 acre feet. The amount not used on turf would be recharged. The Bureau estimates total construction costs at more than \$43 million.

Preservation Proposals

The state's Growing Smarter Initiative (See Chapter 3) would designate parts of the Canada del Oro in the Catalina Area, parts of Big Wash and parts of the Tortolita Mountains as State Trust Lands that should be preserved. Pima County has a proposed mesquite bosque restoration project along the Santa Cruz River near Cortaro Road.

ISSUES FOR DISCUSSION

Development of the Tortolita Fan

Should the Tortolita fan be developed for urban uses or left a rural open space? If the Tortolita fan is developed, what flood precautions should be taken in light of its characteristics described above? Should they be largely non-structural (e.g., keep structures away from the floodways) or should the washes be channelized to maximize development potential? How should the flows be conveyed to the Santa Cruz River.

Roads and Bridges

To what extent should the roads with dip crossings be converted to all weather roads with culverts or bridges? Should Tangerine Road, in particular, be expanded or designed for all-weather travel? Are other roads needed in the area?

Options for the Effluent-dominated Stream

If flows continue to the Santa Cruz River from the wastewater treatment plants, what efforts if any should be made to improve the habitat and/or recreational value of the river?

Loss of overbank storage along Cañada del Oro

How should the problem of loss of overbank storage area along the Cañada del Oro be addressed - through structural or non-structural approaches, including land acquisition?

Use of CAP in area - including instream recharge

Should CAP water be brought into the area? If so, how should it be used? Should it be treated for municipal use? Used for golf courses? Used for recharge projects? Used to riparian uses along the Cañada del Oro or other watercourses? What precautions are needed in infrastructure construction through the alluvial fan area, if that is the chosen route?

Use of Wastewater

Should a program be developed for use of wastewater on golf course or for other purposes? Should a treatment facility be built in the Marana or Oro Valley areas? Should the use of septic systems be discouraged in all or parts of the area?

Region Within the Subarea	Grazing	Wildcat Subdivision	Planned Subdivision	Copper Mine	Sand & Gravel Mine	Pumping	Agriculture	Recreation
Santa Cruz River		X	X		X+	X-	X-	
Tortolita Fan	X-	X	X			X+-		
Oro Valley			X		P	X-		
Catalina		X	X			X+		
Public Lands	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. 8-3. Generalized Matrix of Potential and Existing Impacts on Watercourses in the Tortolita 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	X	X	X				
Tortolita Fan	X	X	X		X	X	
Oro Valley	X	X	X		X	X	
Catalina	X	X	X		X	X	
Public Lands							X

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

Fig. 8-4. Generalized Matrix of Potential Options for Reducing Stress on Watercourses in the Tortolita Fan Subarea

Ranching in the Tortolita Fan: Descriptive Summary

Introduction:

The Tortolita Fan, located to the northwest of Tucson metropolitan area, is formed by the bajada slopes of the Tortolita Mountains to the north and further defined by two major streams, the Santa Cruz River and the Canada del Oro Wash. The Tortolita Fan adjoins the Avra Valley to the west and is separated from the Avra Valley by a low ridgeline between the Santa Cruz River and Los Robles Wash. In the western portion of the Tortolita Fan, the Santa Cruz River flows north to the Pinal County line. To the east the Tortolita Fan adjoins the Middle Santa Cruz Valley and the San Pedro Valley, both of which are defined by the ridgelines of the Santa Catalina Mountains. Along its eastern edge, the Canada del Oro Wash flows southwest to its confluence with the Santa Cruz River.

The eastern portion of the Tortolita Fan comprises the incorporated town of Oro Valley, which is rapidly being subdivided and defines the urbanizing edge of the Tucson metropolitan area. The western portion of the Tortolita Fan comprises a portion of the incorporated town of Marana. Portions of Marana remain rural and in agricultural use, and other areas, such as "Dove Mountain" are being subdivided and developed. The southerly and eastern portions of the Fan area are either urbanizing or in intensive agricultural use as croplands. The remaining expanses of natural open space are located in the northern and western portions of the Fan, and are comprised principally of State Trust lands, and in Catalina State Park and the Coronado National Forest.

Historical Background:

It is possible that the initial occupation of the Tucson Basin dates to the prehistoric Paleoindian period perhaps as early as 10,000 B.C., but no sites of this age have been recorded in the Tortolita Fan area. Whether Paleoindian people actually occupied the Tortolita Fan is not known, but it seems likely that these early hunters could have pursued big game animals in the region.

With the extinction of the large Pleistocene mammals, the Paleoindian tradition was eventually followed by a mixed foraging and hunting economy called the Archaic tradition, which dates roughly from 7500 B.C. to about A.D. 300. Sites from this time period exhibit assemblages of chipped stone tools and smaller projectile points, as well as simple ground stone tools that suggest milling or grinding of plant seeds.

With the adoption of agriculture and ceramic technology, the Hohokam occupied villages and smaller hamlets from about A.D. 300 to 1450 along the Santa Cruz River and Canada del Oro floodplains. Some of the principal Hohokam villages here include the Marana Community, Honey Bee Village, the Badger Hole Ranch Site, and the Romero Ruin, all located along major streams. In addition, extensive areas of "dry-farming" fields, exhibiting rock piles, check dams, and bordered gardens have been documented on the western face of the Tortolita Fan in non-riverine areas. In the foothills of the adjacent mountains, there are numerous rock art sites and smaller, perhaps seasonal campsites that were repeatedly occupied for gathering and processing of wild plant foods.

Following the Hohokam collapse that occurred about A.D. 1450, little is known of the area until the Spanish missionaries and explorers entered the region in the 1690s and encountered Piman peoples who are likely to be the descendants of the Hohokam. The region was known during Spanish Colonial and Mexican periods as "Pimeria Alta." Arriving about the same time as the Spanish, the Apache, too, frequented this region to search for seasonally available foods and often to raid O'odham settlements for their stores of cultivated foods.

With the acquisition of this region by the United States following the 1854 Gadsden Purchase, and the military presence after 1870, some of the first Americans to enter the area were prospective miners in search of gold and silver. Mining sites are known in the surrounding mountain ranges, including the lost and legendary "Iron Door Mine" located somewhere along the Canada del Oro in the Santa Catalina Mountains. Other legends like the "the Lost Mission of Ciru" focused on tales of buried Spanish gold. Ranching here did not begin in earnest until the 1870s because of the threat of Apache raiding. Despite living in a fortified compound on a hilltop above the Sutherland Wash, even the pioneer rancher Francisco Romero discussed below found he could not endure the constant raiding, and in 1870 moved to Tucson.

Today, the Fan's principal residential and commercial areas are relatively recent and include Marana, Oro Valley, the proposed towns of Casa Adobes and Tortolita, and Catalina. Portions of the area continue in ranching and agricultural use, while experiencing significant growth and urbanization. One of the smaller Pima County subareas, the Tortolita Fan is comprised of approximately 203,546 acres (ca. 318 square miles).

Land & Environmental Setting:

Located to the northwest of the urban Tucson Basin, the Tortolita Fan is defined by the Santa Cruz River and the Canada del Oro Wash, and the natural divides formed by the Santa Catalina Mountains, the Tucson Mountains, and a ridge between the Los Robles Wash and the Santa Cruz River. Unlike the urbanized Tucson area or the largely rural Altar Valley, the Tortolita Fan area is split -- agricultural and undeveloped in its western and northern reaches and urbanizing to the east and south. Suburban areas are a mix of platted subdivisions and lot-split subdivisions. These developing areas occur within Oro Valley and Marana and along the I-10 corridor and along Oracle Road.

The Tortolita Fan is bounded by the City of Tucson urban area on the south, the Catalina Mountains on the east, the Pinal County line on the north, and the Avra Valley and Tucson Mountains on the west. The Tortolita Fan watershed reflects a range in elevation from 1889 to 8,998 feet. Except for the high elevations of the Catalina Mountains, the Tortolita Fan is one of the lower elevation subareas in eastern Pima County.

As with much of the Basin and Range province of the greater Southwest, the rugged mountain terrain and river valleys support a variety of environmental zones and vegetation types, ranging from the Santa Cruz River and Canada del Oro floodplains to the higher elevation mountain ranges that define the subarea. The foothills of the Catalina and Tortolita Mountains are the only upland areas where grasslands occur. Much of the subarea is characterized by Sonoran desert scrub creosote, bursage, paloverde, and ironwood.

Table 1. Major Vegetation Zones in the Tortolita Fan Watershed in Pima County

▶ Agriculture	22,341 *	acres	11.0 percent
▶ Urban	30,848		15.2
▶ Mining	700		0.0
▶ Water surface	10		0.0
▶ Cottonwood-Willow	12		0.0
▶ Paloverde Scrub	28,032		13.8
▶ Creosote-Bursage	67,227		33.0
▶ Scrub Grassland	21,852		10.7
▶ Mixed Evergreen	4,764		2.3
▶ Manzanita	400		0.0
▶ Pine Forest	4,534		2.2
▶ Douglas Fir	345		0.0
▶ Evergreen Forest	21,109		10.4
▶ Mixed Broadleaf	<u>1,372</u>		<u>0.7</u>
	TOTAL	203,548 acres	99.3 percent

* Assessor records indicate only 13,821 currently in agricultural production.

Because of the predominantly lower elevation of the Tortolita Fan, rainfall is generally lower here than other valleys. However, because of the greater range in elevation, rainfall also has a greater range from an estimated 9 inches annually at the lowest elevations to an estimated 37 inches at the highest mountain uplands. Most of the rainfall in this watershed is estimated to average about 9-17 inches annually. This amount of rainfall covers nearly 82 percent of the subarea acreage.

Water is very limited in this lower elevation subarea. There are only 12 natural springs identified in the Catalina Mountains, with no springs on the fan itself or in the Tortolita Mountains. The Santa Cruz River and Canada del Oro washes and their tributaries run for some 42 miles through the valley. Shallow ground water has been identified in the upper reaches of the Sutherland Wash. Historically, numerous stock tanks and wells have been constructed to provide water sources for livestock and domestic use. About 223 stock tanks and a total of 1401 wells are recorded with the Arizona Department of Water Resources. Approximately 900 wells may be currently in use as domestic sources of water.

Table 2. Natural & Constructed Water Sources in the Tortolita Fan Watershed in Pima County

<u>Springs</u>	<u>Intermit-Streams</u>	<u>Stock Tanks</u>	<u>Shallow Grnd-Water</u>	<u>Wells</u>
12	ca. 42 mi.	223 *	483 acres	1401

* GIS data suggest only 64 stock tanks remain in use today.

Despite its lower elevation and limited surface water sources, stock tanks and wells located principally on State lands allow ranching in the northern and western reaches of the Tortolita Fan to continue.

Land Base & Land Uses:

The Tortolita Fan is comprised of the incorporated towns of Oro Valley (17,906 acres), Marana (43,115 acres), and the balance is unincorporated Pima County. Like much of Pima County, the Tortolita Fan is comprised of a mosaic of land ownership including federal, state, and private lands. The only significant areas of natural open space that remain are State Trust, Forest, and BLM grazing lands, with some parcels of private land still in ranching use in the northern portion of the subarea. Approximate acreages are provided below for each kind of ownership.

Table 3. Land Ownership & Jurisdictions in the Tortolita Fan

BLM	1,183 acres	0.5 percent
State Lands	44,706	22.0
Private Lands	102,681	50.4
National Parks	8,501	4.2
County Park	3,124	1.5
State Park	5,471	2.7
National Forest	37,799	18.6
Military	40	0.0
Unknown	<u>41</u>	<u>0.0</u>
TOTAL	203,546 acres	99.9 percent

Marana, Oro Valley, Catalina, and subdivided lands north of the Tucson metropolitan area are the principal urbanizing areas in the Tortolita Fan area, and the total population is currently estimated at 65,238 people. Private lands, comprising some 50.4 percent of the land base, are located principally in the southeastern and western portions of the Tortolita Fan along the Santa Cruz River floodplain and I-10 corridor, while public lands are predominant in the northern and far-western portions. Only some 18 percent of these private lands, or 18,606 acres, are classified as used for ranching or agricultural purposes, some 82 percent of all private lands, or 84,075 acres, are categorized as non-agricultural lands.

A significant area of these non-ranching private lands characterizes much of the eastern, southeastern, and central portions of the subarea. These areas, which include Oro Valley and a portion of Marana, essentially mark where the transition from ranching and agricultural land use to residential development is occurring.

While there may have been as many as 22,343 acres along the Santa Cruz and Canada del Oro floodplains used historically for food and fiber crops, today there are only 13,821 acres still in cultivation, a reduction of more than 60 percent. More than 1,500 acres of agricultural land have been purchased by the City of Tucson for water rights and are currently vacant, but most of these former agricultural lands are platted subdivisions or lot-split subdivision areas. Elsewhere in the Tortolita Fan, clusters of private lands that are not used for ranching are

found in the vicinity of the Twin Buttes mine, in Catalina, and in the central portion of the fan between Marana and Oro Valley town limits. Throughout the Tortolita Fan, there are 602 platted subdivisions comprised of 19,649 acres; however, there are approximately 48,863 separate parcels recorded with the Pima County Assessor's Office.

Ranches:

As noted earlier, much of the Tortolita Fan was part of the homeland of the Piman-speaking Tohono O'odham. Although initially explored by Spanish missionaries including Fr. Kino, no Spanish missions or settlements were established here. Instead, Spanish settlement focused on the Piman communities in the Middle Santa Cruz valley where permanent water was available and where the Tucson Presidio afforded some protection. However, most of the region remained uninhabited from about 1750 to the 1870s because of Apache raiding. After, the Gadsden Purchase of 1854, southern Arizona experienced its first significant wave of immigrants who were largely American mining prospectors in search of gold and silver.

With the establishment of transcontinental mail routes and local mines in the Tucson and Catalina mountains, a number of freight and stagecoach lines were created that followed the old Spanish Colonial route that went north to the Gila River or east to the San Pedro River. On the east side of the Santa Cruz the route to Fort Grant and the San Pedro River followed the Canada del Oro drainage and went to the north of the Catalina Mountains to Oracle. These original freight and stage line roads that opened the region to settlement and homesteading remain the principal routes of access today -- the I-10 corridor and Oracle Road.

While stage lines and freighting and some mining occurred on the Tortolita Fan, only a few brave pioneers attempted to establish ranches in the area in the mid-1800s because of Apache raiding and the lack of permanent water. One of the most notable ranching pioneers was Franciso Romero and his wife Victoriana, who established perhaps the very earliest ranch to the north of Tucson in 1844, which was then Apache territory. With 30 head of cattle, they staked a claim of 160 acres in the Canada del Oro Valley, along a major raiding and travel route of the Pinal Apaches. To protect his family and livestock, Romero reconstructed a stone compound wall on a Hohokam ruin located at the confluence of Canada del Oro and the Sutherland Wash known as "Pueblo Viejo." In 1870, the Romero family was finally forced out of their fortified Canada del Oro ranch after his entire stock of cattle, horses, and mules was lost in less than one year. The Romero Ranch remained abandoned until 1889 when their son Fabian Romero returned, built a new ranch house, and proceeded to expand the Romero Ranch to about 4800 acres.

As the population of Arizona Territory grew after the Civil War, settlers asked the federal government for military protection. An 1871 Tucson petition to the President of the United States listed 301 people killed in southern Arizona by Apaches in a seven year period, and it is estimated this was about ten percent of the Anglo-American population of Arizona at that time. The government responded by establishing more forts such as Fort Bowie and Fort Lowell, which created a greater demand for beef, grain, and produce, and farmers and ranchers met the increased demand by cultivating more land and by expanding their cattle herds. It was perhaps as early as 1870 that Frank Treat established his "Terrible Cattle Company" in the Tortolita Mountains. Another early rancher in the area was George Pusch who

established a ranch together with John Zellweger along the route to Fort Grant in 1874. They installed the first steam pump well in the territory, and it eventually became known as the Steam Pump Ranch, a frequent stop for travelers. Pusch also built a ranch house and stone corrals in upper Honey Bee Canyon shown as Pusch's Ranch. Pusch Ridge is also named for this early settler.

Also in the Canada del Oro Valley, William Henry Sutherland began ranching in 1893, which gave rise to the name of Sutherland Wash named after this ranching family. Sometime before 1940, the Fuller and McAyers families purchased 4100 acres of these other Canada del Oro ranches, which became known later as Rancho Romero, and today includes the site of Catalina State Park.

Some notable early ranches in the Santa Cruz Valley include the Francisco Ruelas Ranch located at the old Point of the Mountain Butterfield Stage Station, and the 1878 Borjorquez Ranch located to the south near what is today the intersection of Silverbell Road and Cortaro Farms Road.

Today, despite significant development in the Tortolita Fan area, some nine ranches continue in operation in this subarea, utilizing private lands, 10 State Trust Land grazing leases, 2 Forest Service leases, 2 BLM leases, and 2 State Special Land Use Permits.

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 by name 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 Tortolita Fan 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>
U Circle Ranch*				X
BKW*	X	X	X	
Catalina South		X		
Rail X Ranch	X	X	X	
Vaquero	X	X		
Wong		X		
Smyth		X		
Post	X	X		
Twin Peaks*		X		

* Indicates ranches that extend into adjacent watersheds

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

Despite some continued grazing leases, significant portions of the Tortolita Fan are not used

for ranching or agricultural uses. Unlike many of the other rural subareas, the Tortolita Fan watershed is rapidly developing, and private lands comprise the largest percentage of land in the Tortolita Fan at about 50 percent. Also unlike many of the other subareas, only about 40 percent of the area is comprised of ranch or agricultural lands. As is typical, most of these lands are public lands used for grazing.

Lands not used in ranching or agriculture comprise some 119,000 acres or about 60 percent of the Tortolita Fan watershed. As noted elsewhere, much of the non ranch lands comprise the townsites of Oro Valley, Marana, platted and wildcat subdivision areas, Saguaro National Park, and Catalina State.

Table 5. Agricultural and Non-Agricultural Lands in the Tortolita Fan in Pima County

<u>Land Owner</u>	<u>Ranch/Ag. Use</u>	<u>Non-Ranch/Ag. Use</u>	<u>Total</u>
State Trust Land	42,306	2,400	44,706
BLM Lands	1,183	0	1,183
National Forest	22,700	15,099	37,799
Saguaro National Park	0	8,501	8,501
Tucson Mt. Park	0	3,124	3,124
State Park	0	5,471	5,471
Military	0	40	40
Private Owners	18,606*	84,075	102,681
Unclassified	_____	<u>41?</u>	<u>41</u>
	TOTAL 84,795 ac	118,751 ac	203,546 ac

* Approximately 13,821 acres are croplands and 4,785 acres are used in ranching.

Of all private lands in the Tortolita Fan totaling 102,681 acres, approximately 4,785 acres are used in ranching, 13,821 acres are used as croplands, and the balance of about 82 percent, have been developed or have other uses. It should be noted that 1549 acres of former agricultural land owned by the City of Tucson are included in this total of non-agricultural lands. A total of 44,706 acres of State Trust lands appear to be used in grazing and much of the BLM lands only totaling 1,183 acres. There are about 22,700 acres of National Forest lands in the Tortolita Fan used for grazing.

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. Most of these improvements have not been quantified for this report, but water sources that are critical to the success of ranching and for maintaining wildlife have been researched. It has been noted above in Table 2 that natural water sources are virtually non-existent in the Tortolita Fan, and only 12 springs are noted in the Santa Catalina Mountains. To provide adequate water sources, approximately 223 stock tanks have been constructed over time, but only 64 remain in use due.

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 Forest Service, 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 poor range health, 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 Tortolita Fan watershed ranges generally from 1 to 9 animals per square mile depending on the terrain, location of the lease, the health of the range, seasonal forage availability, rainfall, and how it is used. Only one State grazing permit allows 16 animals per square mile. At the present time, the various grazing leases allow for a maximum of 666 animals to be grazed in the entire Tortolita Fan watershed in Pima County. When this number is considered together with the total acreage of 84,795 acres or 132 square miles, dedicated to ranching and agriculture, the maximum average number of animals allowed to be grazed is approximately 5 animals per square mile.

Grazing capacity in the Tortolita Fan is relatively low compared to some other higher elevation grassland valleys; however, winter and spring annuals and grasses, jojoba bush leaves and beans, salt bush, mesquite beans, paloverde beans, cholla buds, prickly pear cactus, and crop stubble provide seasonally available forage for livestock in the lower elevation environment of the Tortolita Fan. Portions of the Tortolita and Catalina mountains provide a grasslands environment that is typical of the higher elevation valleys.

Table 6. Animal Units Allowed to be Grazed in the Avra Watershed 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>
1 - 9*	84,795 ac. or 132 Sq.Mi.	666	5.0

* One State lease allows 16 Aus.

In addition to grazing, federal and state public lands may be used for hunting, fishing, hiking, riding, and other recreational uses. Recreational use of Catalina State Park and other public lands in the Tortolita Fan watershed is very high due to its close proximity to the Tucson metropolitan area and its easy access. Data provided by Catalina State Park indicate that between 145,000 to 155,000 paid visitors used the park in 1999. If unpaid visitors are considered, park personnel estimate there may be as many as 185,000 people who use the park annually.

Current Farms:

At the present time, there are considerably fewer areas where food or fiber crops are being commercially grown in the Tortolita Fan watershed when compared to earlier efforts of agricultural production. Cotton became particularly important to Arizona's economy during and after World War I, when significant acreage in the lower Santa Cruz floodplain in the Marana area and the Tortolita Fan areas came under cultivation. This area on the west side of the subarea near the confluence of Los Robles Wash and the lower Santa Cruz River was ideally suited for agriculture. Marana, "tangle" in Spanish, was known historically for its thick stand of mesquite and desert growth in this area, and later after the coming of the railroad, it became a "flag station" in 1890, known as Marana.

While a few homesteaders and ranchers settled in the area, agriculture was very limited until the extensive "Post Farms" project began in 1920, using irrigation pumps and extensive canal networks to irrigate cultivated fields of cotton and other seasonal crops. The settlement and extensive field systems became known as Postvale, distinct from the railroad stop of Marana. A post office for Postvale was established in 1920, but later consolidated with Marana in 1925, when the name reverted to Marana.

Today, available GIS data indicate there are some 13,821 acres of land currently irrigated for crops and pasture in the Tortolita Fan. However, there are nearly 22,343 acres of the Tortolita Fan that were once under cultivation, and much of this land is considered "prime farmland" by the US Department of Agriculture (USDA). Prime farmland is one of several kinds of important farmland defined by the USDA, considered to be of major importance in meeting the nation's short and long-term needs for food and fiber. Because the supply of high-quality farmland is limited, the USDA encourages the "wise use" of our nation's farmland, and has mapped these areas based on deep, loamy soils, an adequate and dependable supply of water for irrigation, little slope, soils that are not conducive to erosion, and sufficient growing season. Consequently, with the right combination of soil qualities, growing season, and moisture supply, prime farmland produces the highest yields with minimal expenditure of energy and economic resources, and farming it results in the least damage to the environment.

In all of eastern Pima County in the area surveyed by the USDA, a considerable portion of the prime irrigated farmland acreage occurs in the Marana area of the Tortolita Fan along the Santa Cruz River floodplain. Within the Tortolita Fan, there are more than 21,000 acres designated as prime farmland, and much of this includes areas once under cultivation as well as the remaining cultivated lands. These prime farmlands tend to occur both to the east and west of the Santa Cruz River floodplain. In the southern area of the Tortolita Fan, much of this prime farmland has been developed into suburban residential areas. Today, the principal area of remaining prime farmlands is located between I-10 on the east and the Santa Cruz River channel on the west where a variety of crops are grown. Future conversion of these prime agricultural lands to residential and commercial development may now be possible due to recent flood control improvements on the east side of the river.

The City of Tucson currently owns 53 parcels of land comprising a total of some 1,549 acres that were purchased for their water rights. These areas that were once irrigated farmland tend to be located in the western portion of the Tortolita Fan. Approximate acreages for current and historically irrigated agricultural lands are provided below.

Table 7. Current Farms or Irrigated Pasture in the Tortolita Fan Watershed in Pima County

<u>Acres Ever in Agriculture</u>	<u>Current Croplands</u>	<u>COT Parcels</u>	<u>Developed/Vacant Farmland</u>
22,343 acres	13,821	1,549	6,973

Development Pressure & Threats to Ranching:

Development pressure in the Tortolita Fan watershed in Pima County is significant due to the rapid development in Oro Valley and Marana and along the major transportation corridors. Its proximity to the urbanizing Tucson area and its road and services infrastructure creates an incentive for development due to rising real estate values. As noted above, growth and urbanization is occurring in the southern and eastern portions of this watershed. Here, ranching and agriculture are no longer viable, and the transition of agricultural lands to real estate is increasing along the I-10 corridor from south to north. In fact, there are only a few small state grazing leases in the area, and the "urban boundary" here may be defined by the boundary of the remaining ranches to the north and west that utilize both private land and public land grazing leases in their operations. Moreover, due to its proximity to the Tucson metropolitan area and the Oro Valley and Marana townsites, there is an increasing and high probability that additional private lands and State Trust lands in the Tortolita Fan will be sold for development.

Using contiguous ranch lands and grazing leases to define natural open space and define the urban boundary, nearly one-third of the Tortolita Fan may be considered to be urbanizing. Should development intensify in this subarea, Saguaro National Park, the Tortolita Mountains, and Catalina will become surrounded by urbanizing metropolitan area.

At the present time, there are 602 platted subdivisions comprising some 19,649 acres in the entire Tortolita Fan watershed in Pima County, and there are approximately 48,863 recorded parcels of land. Approximately 30,848 acres have been characterized by GIS vegetation analysis as urbanized area in the Tortolita Fan.

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 84,000 acres of private lands are currently not used in ranching or agriculture and may be developed. When reviewed on a map, these areas of non-ranch private land holdings cluster in the urbanizing southern and eastern portions of the watershed near Marana, Oro Valley, in the Catalina area, near Saguaro National Park, and near the I-10 corridor. Only the northern and western portions of the Tortolita Fan along the Pinal County line remain as largely unfragmented ranchlands and natural open space.

At the present time, large areas committed for planned development include Dove Mountain in Marana and Rancho Vistoso in Oro Valley, and portions of these future development areas may be considered "rent-a-cow" operations where ranch land designation by the Assessor's Office is used to lower property taxes while waiting for the opportune time to develop.

In addition to private lands being converted for development, the Arizona State Land

Department (ASLD) has identified two Special Land Use Permits (SLUP) located in the area between Interstate 10 and the CAP canal. This area comprises some 11,100 acres of State land and adjacent private lands. These SLUPs are currently 5-year grazing permits on lands that have been classified by ASLD for commercial use. Although a 5 year permit, the permit can be canceled at any time by the ASLD. Because of their location along I-10, there is a reasonably high probability that the ASLD parcels identified for commercial use will be developed. There are currently no BLM lands identified for sale, lease, or exchange.

In summary, the development pressure in the Tortolita Fan watershed in Pima County is significant at the current time and splits the subarea from south to north. In the eastern and southern portions of the Tortolita Fan, development pressure is very high due to the predominance of private land and expanding urbanization. To the west and north, much of the landscape remains as natural open space due to the predominance of public grazing lands.

The principal threat to the stability of ranching and agriculture in the Tortolita Fan is likely to be due in the future to the continued transition of private ranch lands and agricultural lands and State grazing leases to real estate development. While a land value analysis has not been completed, land values appear to be increasing significantly so that much of the private land on the Tortolita Fan is likely to be sold for development rather than retained for agricultural or ranching use.

Ranchland Conservation Potential:

While the natural open space of ranchlands would further enhance the protection of the existing park preserves and National Forest lands, it appears that ranching and ranchland conservation is threatened in this subarea due to significant development pressure. Agricultural lands along the Santa Cruz River will also become increasingly susceptible to development once removed from "flood-prone" status. Available information suggests that the potential for ranchland conservation is possible only in the western portions of the Tortolita Fan and in some areas of the National Forest. Other portions of the Tortolita Fan, however, will continue to be susceptible to fragmentation and development as discussed above.

Summary & Conclusions:

To conclude, only the western reaches of the Tortolita Fan and portions of the National Forest continue to support stable and sustainable ranching operations because of the contiguity of predominantly public lands used for ranching. Open space currently accounts for about half of the subarea.

Elsewhere, land in the Tortolita Fan is rapidly urbanizing, and significantly, some 119,000 acres, approximately 60 percent of the land in the subarea, are not used in ranching and agriculture. Fewer than 5,000 of private lands are classified as in ranching use, and nearly 14,000 acres of agricultural croplands could be converted for development in the near future. Private lands of nearly 103,000 acres comprise 50 percent of the subarea, and much of this has been subdivided for development.

Pima County Ranches

SDCP PLANNING UNIT 5

- Planning Unit Boundary
- Ranch Boundaries
- Major Washes
- BLM
- COUNTY PARK
- GOLDWATER GUNNERY RANGE
- 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

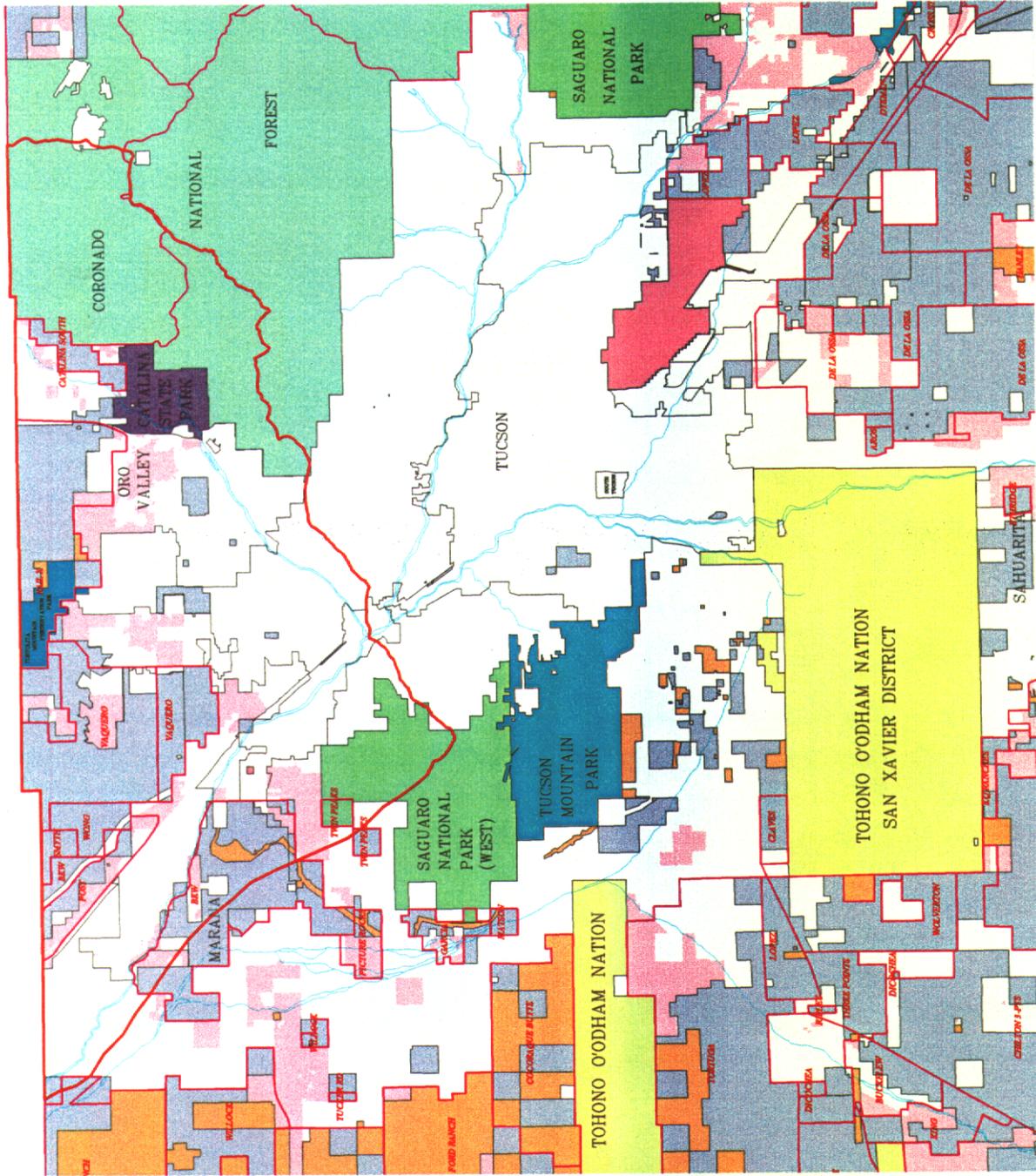


Scale 1:80,000

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8/18/09



Ranch Lands and Grazing Allotments

SDCP PLANNING UNIT 5

- Planning Unit Boundary
- Grazing Allotments
- Major Washes
- BLM
- COUNTY PARK
- COLDWATER GUNNERY RANGE
- 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 5

BLM	1,183 AC
COUNTY PARK	3,124 AC
NATIONAL FOREST LANDS	37,798 AC
NATIONAL PARKS AND MONUMENTS	8,503 AC
STATE LANDS	44,479 AC
PRIVATE LANDS	18,606 AC
PRIVATE LANDS NON-RANCH USE	84,075 AC

Pinna County Index Map

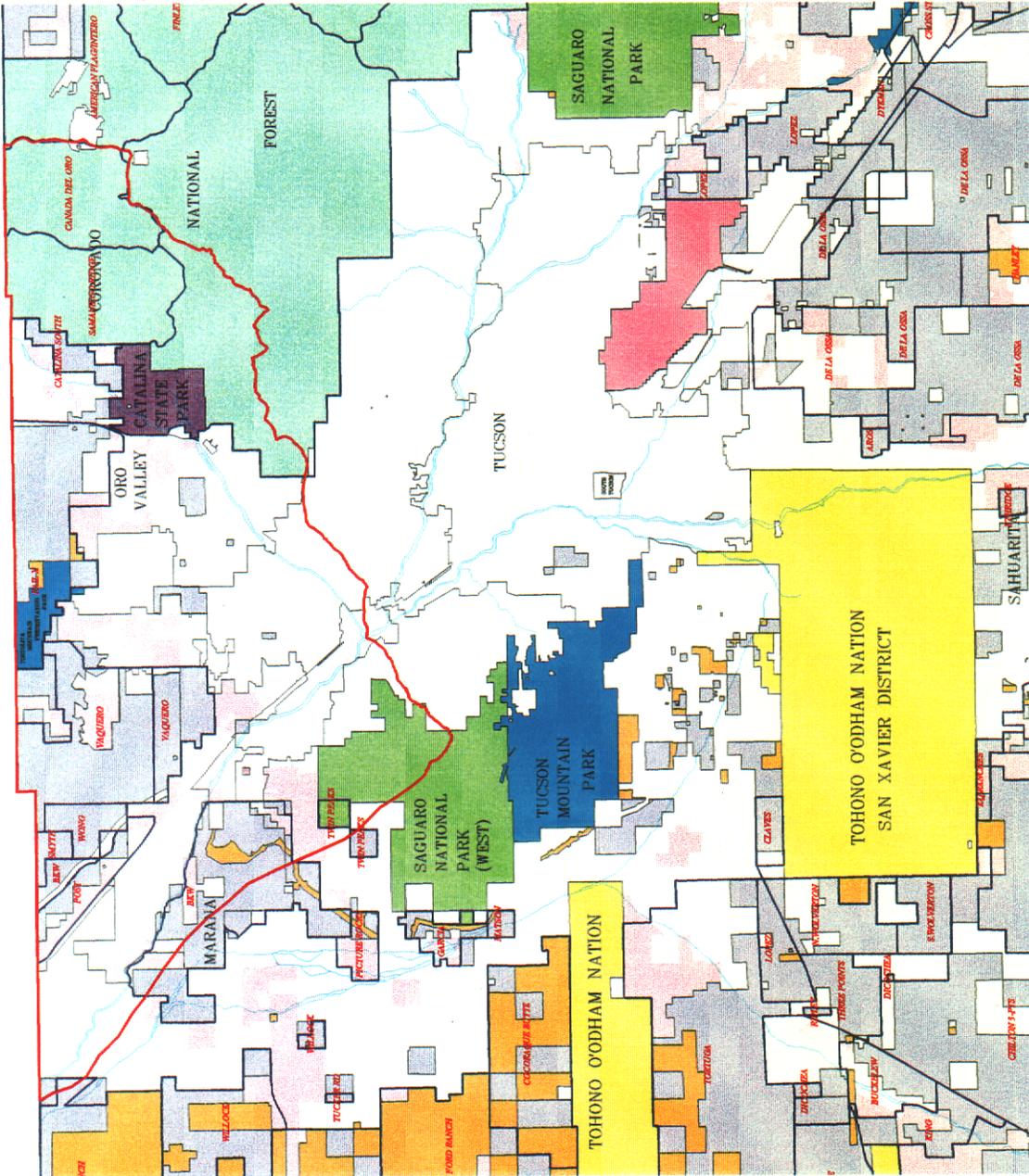


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THE OTHER DIVISIONS OF THE BUREAU OF LAND MANAGEMENT ARE: COUNTY PARKS, NATIONAL FOREST LANDS, NATIONAL PARKS AND MONUMENTS, STATE LANDS, PRIVATE LANDS, NATIONAL WILDLIFE REFUGE, MILITARY RESERVATIONS, COLDWATER GUNNERY RANGE, INDIAN LANDS, COUNTY PARK, BLM, RANCH USE, PRIVATE LANDS NON-RANCH USE.

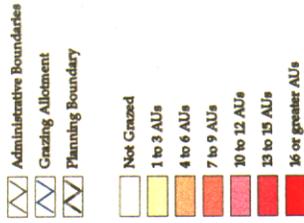


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Carrying Capacity per Square Mile by Grazing Allotment

SDCP PLANNING UNIT 5



Pima County Index Map



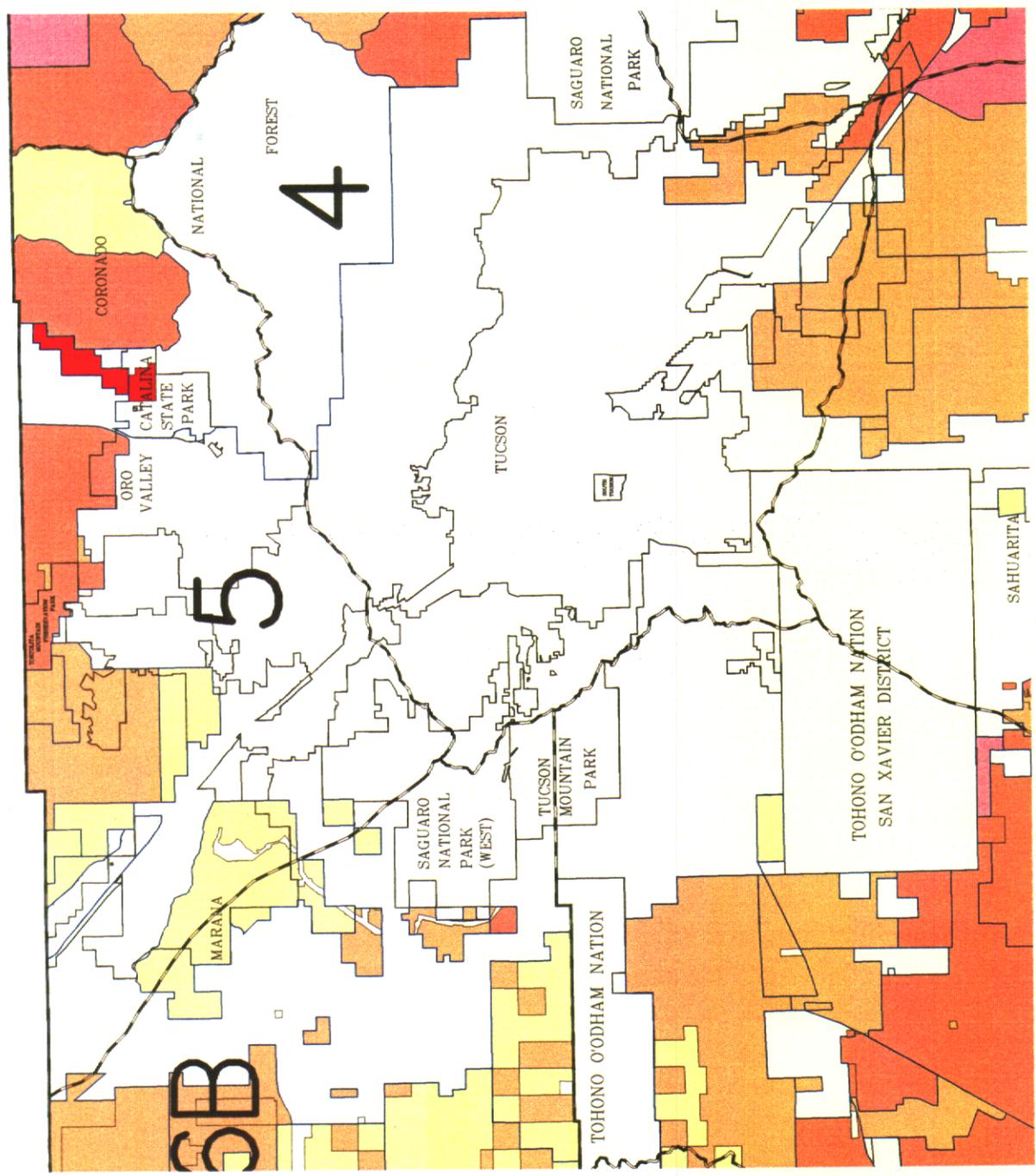
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Agricultural Lands

SDCP PLANNING UNIT 5

-  Planning Unit Boundary
-  Major Washes
-  Agricultural Lands
-  BLM
-  County Park
-  Goldwater Gunny Range
-  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 5
ACRES OF AGRICULTURAL LAND: 13,821

Pima County Index Map



Scale 1:80,000



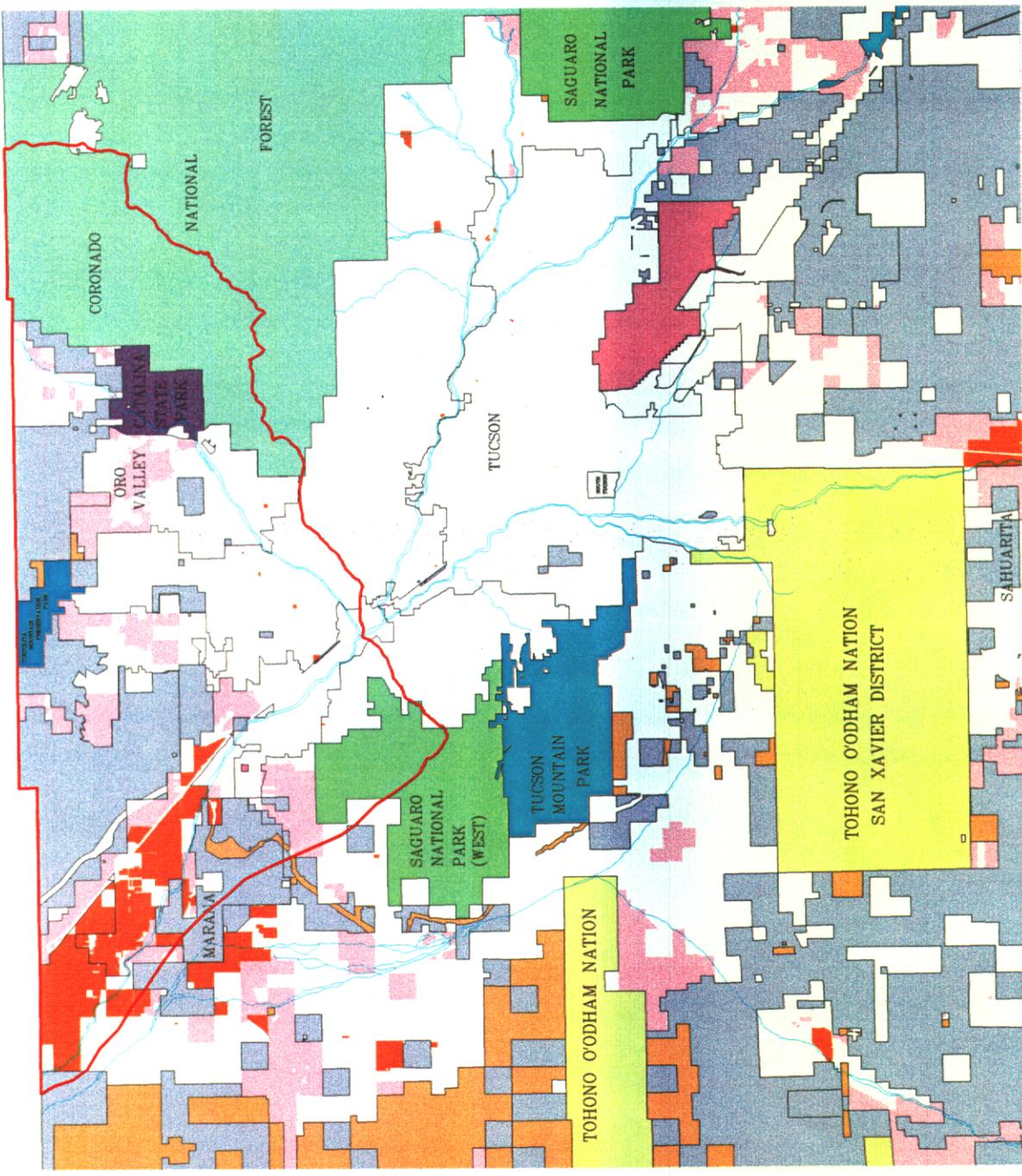
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Approved for Release by NSA on 05-08-2014 pursuant to E.O. 13526



Disposable Lands for BLM and State of Arizona

SDCP PLANNING UNIT 5

-  Planning Unit Boundary
-  Major Washes
-  DISPOSABLE BLM LAND
-  DISPOSABLE STATE LAND
-  BLM
-  COUNTY PARK
-  GOLDWATER GUNNERY RANGE
-  INDIAN LANDS
-  MILITARY RESERVATIONS
-  NATIONAL FOREST LANDS
-  NATIONAL PARKS AND MONUMENTS
-  NATIONAL WILDLIFE REFUGE
-  PRIVATE LANDS
-  STATE PARK
-  RANCH USE

STATISTICS FOR UNIT 5
 DISPOSABLE BLM LAND: 0 AC
 DISPOSABLE STATE LAND: 11,101 AC.

Pima County Index Map



Scale 1: 80,000

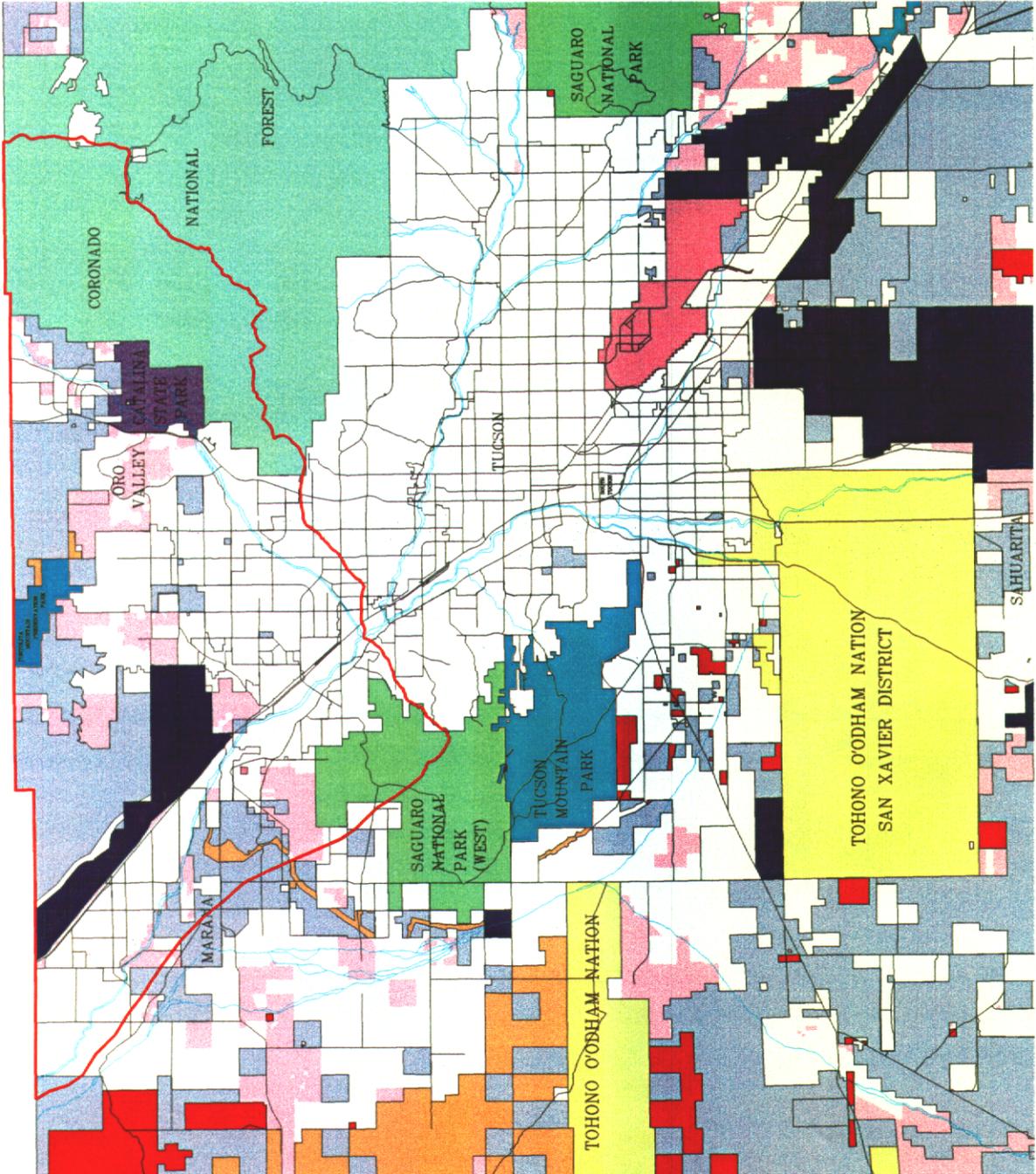
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Scale 1: 80,000



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

SDCP PLANNING UNIT 5

- Urban Boundary
- Major Roads And Streets
- Major Water
- Grazing Allotments
- Bonanza Desert Conservation Planning Unit Boundaries
- BLM
- COUNTY PARK
- GOLDWATER GUNNERY RANGE
- INDIAN LANDS
- MILITARY RESERVATIONS
- NATIONAL FOREST LANDS
- NATIONAL PARKS AND MONUMENTS
- NATIONAL WILDLIFE REFUGE
- PRIVATE LANDS
- STATE PARK
- RANCH USE
- AGRICULTURAL USE
- Urban Boundary
- ASLD / SLUP's

STATISTICS FOR UNIT 5
ACRES OF ASLD/SLUP'S 11,100

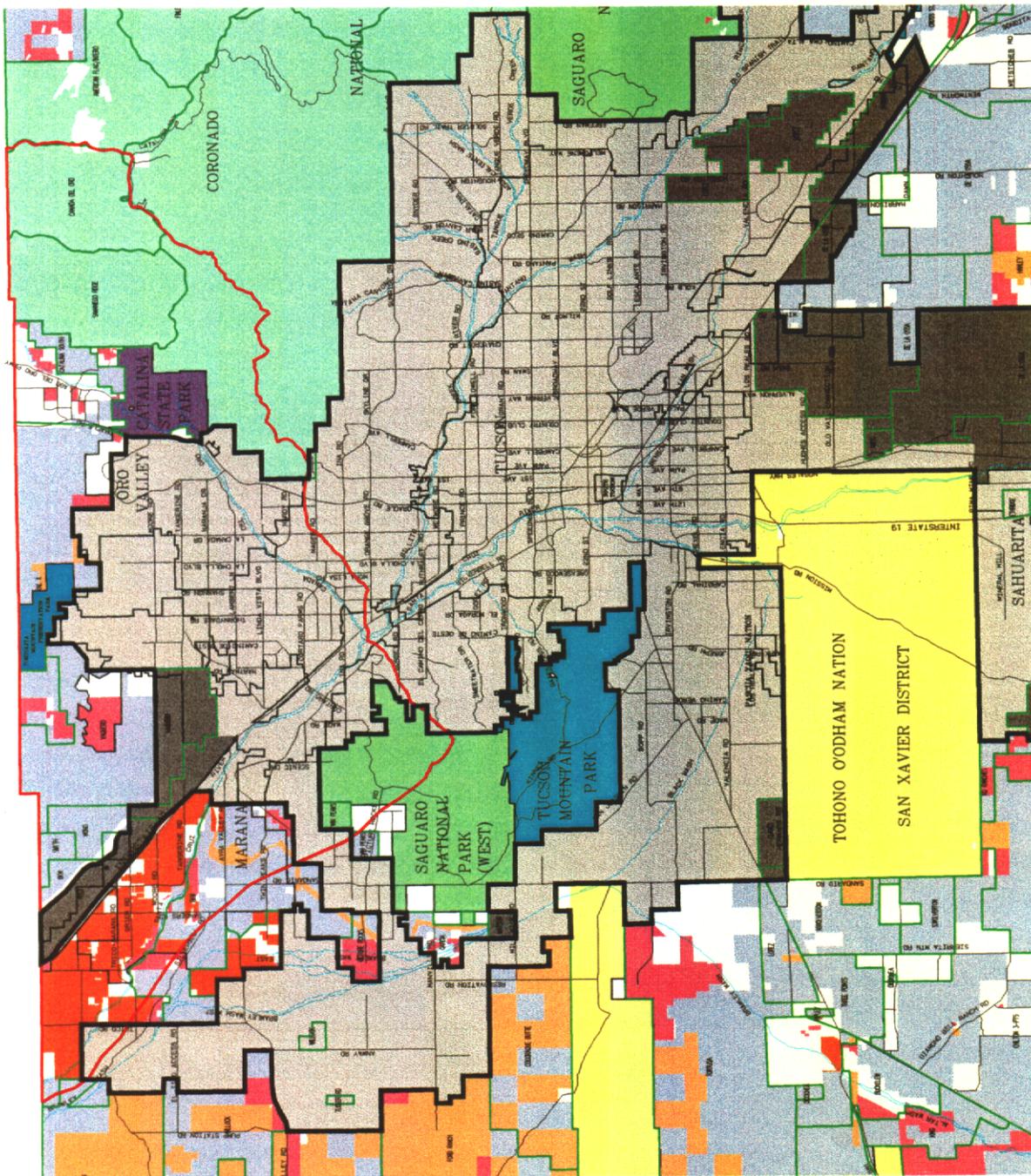


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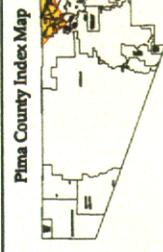


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GAP Vegetation and Grazing Allotments SDCP PLANNING UNIT 5

- Watered Planning Unit Boundary
- Grazing Allotments
- Administrative Boundaries
- Washes
- Agriculture
- Urban
- Mining
- Chihuahuan Desertscrub (Crosotabush-Terbush)
- Chihuahuan Desertscrub (Mixed Scrub)
- Chihuahuan Desertscrub (Whitebark)
- Madrean Evergreen Forest (Biscuit)
- Madrean Evergreen Forest (Oak-Pine)
- Madrean Montane Conifer Forest (Douglas-Fir-Mixed Conifer)
- Madrean Montane Conifer Forest (Pine)
- Mogollon Chaparral Scrubland (Amarantids)
- Mogollon Chaparral Scrubland (Mixed Evergreen Sclerophyll)
- Mogollon Deciduous Swampforest (Cottonwood-Willow)
- Mogollon Deciduous Swampforest (Mixed Broadleaf)
- Playa
- Scrub Grassland (Mixed Grass-Scrub)
- Scrub Grassland (Succum-Scrub)
- Sonoran Deciduous Swamp and Riparian Scrub (Mixed Scrub)
- Sonoran Desertscrub (Crosotabush-Buragee)
- Sonoran Desertscrub (Paloverde-Mixed Oak)
- Sonoran Desertscrub (Saltbush)
- Sonoran Interior Mesquidland (Catalin)
- Sonoran Riparian and Oasis Forest (Cottonwood-Willow)
- Unclassified/Mixed
- Water



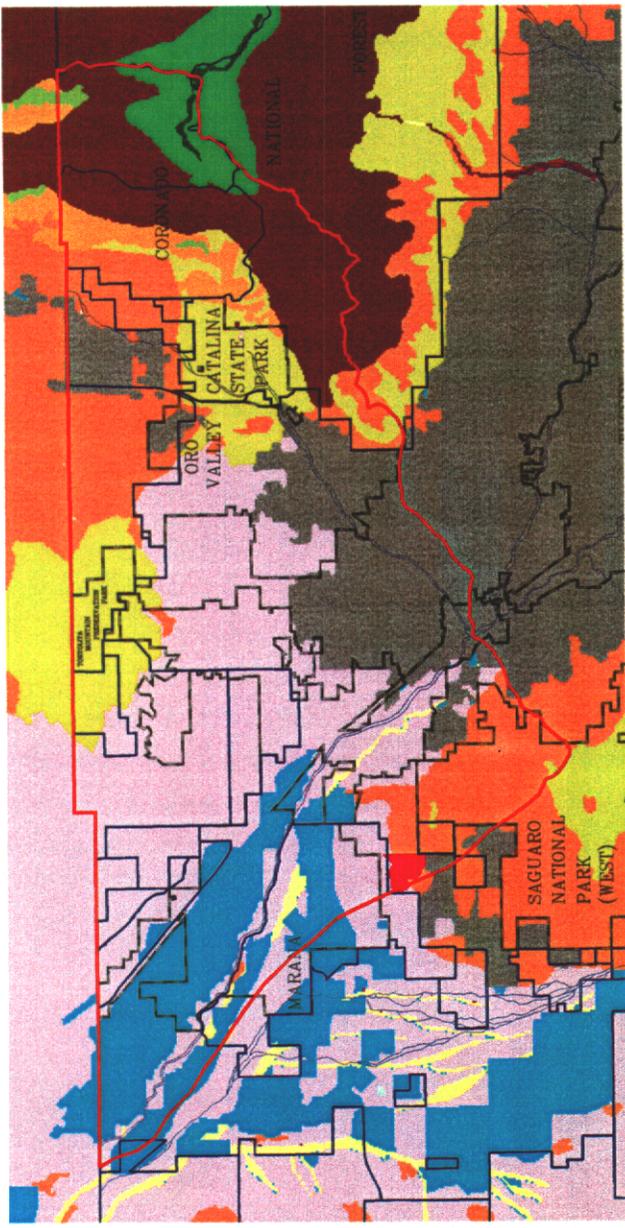
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Minimum Elevation 1,890
 Maximum Elevation 8,999

ACRES	BIOME (SERIES)
22,343	Agri-Culture
0	Chihuahuan Desertscrub (Crosotabush-Terbush)
0	Chihuahuan Desertscrub (Mixed Scrub)
21,109	Madrean Evergreen Forest
0	Mesquidland (Oak-Pine)
345	Madrean Montane Conifer Forest
4,534	Madrean Montane Conifer Forest (Pine)
700	Mogollon Chaparral Scrubland
400	Mogollon Chaparral Scrubland (Amarantids)
4,784	Mogollon Chaparral Scrubland
0	Mogollon Deciduous Swampforest
1,372	Mogollon Deciduous Swampforest (Mixed Broadleaf)
21,852	Scrub Grassland
0	Mixed Grassland
0	Scrub Grassland (Succum-Scrub)
0	Sonoran Deciduous Swamp and Riparian Scrub
67,227	Sonoran Desertscrub
28,032	(Crosotabush-Buragee)
12	(Paloverde-Mixed Cacti)
30,848	Sonoran Riparian and Oasis Forest
10	(Cottonwood-Willow)
	Water

**Sonoran Desert Conservation Plan
Tortolita Fan Subarea
Cultural and Historical Resources Inventory Report
May 24, 2000**

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 Tortolita Fan subarea: archaeological sites, historic resources, and traditional cultural places, each of which is defined below. This report is intended to provide baseline information needed to consider cultural resources in the Sonoran Desert Conservation Planning process.

II. SUBAREA: The subarea defines the watersheds formed by the Tortolita Mountains on the north, the Catalina mountains on the east and the Tucson Mountains to the south and west and drains the Santa Cruz River and its tributary the Canada del Oro, the subarea’s primary watercourses. The northern boundary of the planning unit is marked by the Pima County/Pinal County line and its eastern limit follows the Pusch Ridge in the Catalina Mountains. The western boundary follows the top of the Tucson Mountain and runs west of the Santa Cruz River as indicated on the map entitled, “**Modern Communities, Transportation, and Ownership.**” This area encompasses approximately 318 square miles. The Tortolita Fan subarea contains approximately 203,504 acres, within which land status is broken down as presented in the table below. Unlike most of eastern Pima County where state trust land makes up the majority of the land base, private lands rank first, followed by state trust lands, then federal parks, state parks and county parks in descending order as indicated in the table below.

Table 1. Tortolita Fan Land Ownership by Acreage and Percent		
Ownership	Acres	Percentage
Bureau of Land Management	1,182	.6
County Park	3,124	1.5
Military Reservations	40	<.1
National Forest Lands	37,798	18.5
National Parks/Monuments	8,501	4.2
State Lands	44,706	22.0
State Parks	5,471	2.6
Private Lands	102,681	50.4
Total	203,504	100

The year 2000 population estimate for the Totolita Fan subarea is 65, 238 making it second only to the Middle Santa Cruz subarea in population size. This area includes the town of Oro Valley and the communities of Casas Adobe and Tortolita on the east side of the Santa Cruz River, as well as Marana and Rillito, two historic communities located west of the River. Catalina, located to the north of Oro Valley against the County line is a smaller unincorporated community that began in the 1950s. In all, the subarea encompasses the burgeoning Norwest Tucson Metropolitan area, which is characterized by rapid private development and public infrastructure construction. Additional population is distributed within the subarea on private land holdings. Historically, the subarea has depended upon a mixture of farming and ranching. Both economic activities continue today. Approximately 13,800 acres are currently under cultivation along the Santa Cruz flood plain. Ranchers continue to use a combination of state land leases and private holdings principally in the northern portion of the subarea adjacent to the Tortolita Mountains. These more traditional economic activities have been augmented by booming residential development and a growing service sector.

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 detailed information about the use of one limited spatial area during one or more use episodes. Archaeologist use survey information in conjunction with site excavation information to build regional time lines over broad areas such as a river valley.

Previous Research

Historically, archaeological research within the Tortolita subarea has been limited up until the 1960s. Early pioneers such as Jesse Walter Fewkes (1908) and Ellsworth Huntington (1910) documented several large sites along the west side of the Santa Cruz River including the Los Morteros and Huntington ruins. Los Morteros, was subsequently visited by Frank Midvale of the Gila Pueblo Foundation in 1929 and formally recorded by the Arizona State Museum in 1962. This large Hohokam village site located at the northern end of the Tucson Mountains contains a "ball court," numerous trash mounds, and hundreds of pit house features within an area roughly a mile and a half long and a quarter mile wide. The site was occupied continuously for 450 years from A.D. 850 to A.D. 1300. Testing and excavation was conducted on Los Morteros in the mid to late in 1980s in advance of the construction of the Continental Ranch subdivision. The nearby sites of Redtail and Lonetree predate the occupation of Los Morteros. These sites were also investigated in the mid 1980s and revealed critical information on the time prior to the emergence of the Hohokam culture in the Tucson Basin.

Also beginning in the 1980s, the Arizona State Museum launched its Northern Tucson Basin Survey, an ambitious, large-scale multi year survey conducted for the expressed purpose of recording the archaeology of prehistoric land use patterns in advance of intensive development pressure. Between the years of 1980 and 1983 over 100 square miles were intensively surveyed from the Canada del Oro to the Tortolita Mountains and west along both sides of the Santa Cruz River. Included in this initial phase of work was a large area east of the Picacho Mountains. Subsequent sample survey was conducted in the northern Avra Valley and in a large area stretching north from the Tortolita Mountains, east of the Picachos and west of Black Mountain. A five year testing and excavation program at the Marana Mound village, one of the most important sites discovered during survey, was initiated in 1989. Hundreds of archaeological sites were recorded as a result of this project ranging in time from the Archaic Period through the Hohokam sequence covering many thousands of years of human history. The large scale nature of the survey enabled a more comprehensive view of ancient land use patterning than is typical of archaeological research and resulted in the identification of distinct elevational zones that were used by the Hohokam people and demonstrated the intentional cultivation of agave as a food source in prehistory. Almost all subsequent research in the Tortolita Fan Subarea has been, and continues to be, influenced by the Northern Tucson Basin Survey.

In the Canada del Oro area, most research has focused on the areas being impacted by development in the fast growing Northwest portion of Tucson. Numerous surveys have been conducted by the Arizona State Museum along the Wash from its confluence with the Santa Cruz north to Sutherland Wash. Beginning in the late 1970s, Pima Community College also conducted multiple surveys and follow up site excavations in the eastern Tortolita foothills. In 1984, the BLM surveyed a 480 acre parcel in Honey Bee Canyon and this was followed in 1987 by a large scale survey and mapping project within Catalina State Park. The Institute for American Research (now Desert Archaeology, Inc.) investigated approximately 1700 acres and recorded more than three dozen sites including the Romero Ruin, a large Hohokam village site that was continuously occupied between A.D. 550 and A.D. 1450. This site was also the location of a ranching homestead owned by Francisco Romero who built his house within the walls of a late prehistoric residential compound sometime before 1850 when the region was under constant Apache attack. For many years, locals mistook the compound and its ruins as the site of the fabled Spanish Mission of Ciru said to have contained a fortune in buried Spanish gold.

To the west in Oro Valley, the Rancho Vistoso subdivision has been the focus of large scale intensive survey and excavation beginning in the mid 1980. Approximately 7700 acres were surveyed between highway 89 and the Tortolita Mountains and 54 archaeological sites were recorded in the process, all but three of which dated to the Hohokam period. The sites of Honey Bee Village and Sleeping Snake Village were, both large "ball court" Hohokam village sites, were recorded during this project. This portion of the subarea appears to have been occupied between approximately A.D. 850 and AD. 1300, although several sites were also found dating to the period following the collapse of the Hohokam culture in A.D. 1450. The Rancho Vistoso project enabled development of a regional model of prehistoric interaction between the Tucson Basin and the Phoenix Basin Hohokam populations.

Development projects along the east side of the Santa Cruz River in the vicinity of Cortaro Farms Road and I-10 have also produced additional information on prehistoric occupation within the river's flood plain. The most notable of these sites is the Dairy site, a large prehistoric village first recorded during the Northern Tucson Basic Survey. Portions of the site were excavated in 1994 and again in 1995 in advance of subdivision construction uncovering dozens of features dating from late in the Archaic Period to the terminal phases of the Hohokam sequence. Recent excavation in the vicinity of the Dairy site has found evidence of ancient irrigation canals that are approximately 2600 years old. This information adds to a body of data

that has accumulated in recent years from archaeology done in advance of road work along I-10 that clearly demonstrates pre-ceramic populations were settling in villages along the Santa Cruz flood plain and practicing irrigation agriculture a thousand years before the Hohokam. These findings are revolutionizing not only theories about the origins of the Hohokam Indians but also the origins of agriculture in the desert Southwest.

The latest example of research directed towards the secrets of this early agricultural period is the excavation project conducted in 1999 at the Ina Road waste water treatment facility sponsored by Pima County government. Expansion of the facility prompted archaeological testing in accordance with Pima County's cultural resources policies. Archaeologists had reason to believe that Archaic Period deposits might be found having been discovered in a similar flood plain setting at the Santa Cruz Bend site some miles to south. Testing revealed multiple layers of cultural occupation down to a level of 14 feet below the surface dating from the Late Archaic time period (1500 B.C. - A.D. 200). The subsequent excavation project required clearing 25,000 cubic meters of dirt from the top of the earliest cultural layer exposing an area the size of a football field 14 feet in depth. This revealed a portion of an ancient village site complete with a dozen pit houses and over 1000 other kinds of features including irrigation canals dating to between 2400 and 2800 years ago. The field work on this huge effort finished late last year and analysis is underway.

Survey data

There are two kinds of surveys that archaeologists perform: Linear and block. 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. The map demonstrates that survey has focused primarily on the private and state lands in the west half of the subarea; this area was part of the Northern Tucson Basin Survey project. Presented below is a breakdown of survey data by acreage and survey type including the percentage of the subarea that has been investigated.

Table 2. Tortolita Fan Subarea Survey Acreage by Survey Type			
Survey	Number	Acreage	Percent of Subarea
Linear	68	2178	1.1
Block	390	69,269	34.0
Total	458	71,447	35.1

The total acreage figures indicate that more than 35 percent of the area has been formally investigated, making the Tortolita Fan subarea the most heavily surveyed of all the subareas in Pima County. Even so, approximately 65 percent has not been investigated. This means that research conclusions about the past within the subarea can be arrived at with a relatively high degree of confidence based. Nonetheless, the majority of the subarea has not been investigated.

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. These data represent the latest information on site counts per time period. The following description of the archaeology of the subarea provided by Dr. Paul Fish of the Arizona State Museum.

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	17	706	42	765

Although no sites dating to Paleoindian times (ca. 10,000 to 8,000 B.C.) have been discovered, one located nearby in the Tucson Mountains suggests that the former grassland environments of the Tortolita slopes were used in these very early times by hunters of extinct horse, mammoth, and camel. Evidence of later hunters and gatherers of the Archaic Period is likewise rare on the basin slopes. Spear point styles typical of the time between 7,000 and 4,000 years ago have been found occasionally as isolated artifacts on the surface of the Tortolita Fan. As no campsites have been identified, Archaic use of this area appears to have been limited to hunting and gathering forays from base camps outside the planning unit.

By early agricultural times (2000 B.C. to A.D. 700), more permanent settlements and intensive land use are indicated within two Tortolita Fan zones that provided sustained water for domestic and agricultural purposes. One of these zones skirts the edge of the Tortolita Mountains where shallow bedrock insures high water tables. A second zone is along the Santa Cruz River, particularly near the end of the Tucson Mountains where surface flow in the river was available for canal irrigation during much of the year. Farmers in settlement paralleling the river used an additional technique to supply water to crops. They diverted storm flood waters from drainages crossing the basin slopes onto fields just above the Santa Cruz flood plain. During the many centuries of the early agricultural period, Tucson Basin farmers came to occupy locations favored by later intensive cultivators and to practice the full variety of methods for raising corn, beans, and squash. It is not yet clear how much these early farmers relied on crops in addition to game and wild plant foods and whether they lived in villages year-round or moved seasonally.

In the Hohokam Preclassic era between A.D. 700 and 1150, two loose clusters of settlements can be recognized in the Tortolita Fan subunit. One cluster centers on the Santa Cruz flood plain and lower basin slopes near the end of the Tucson Basin. A second upland cluster is located along the base of the Tortolitas between Guild, Derrio, and Cottonwood washes. A ball court, consisting of a level playing field enclosed by earthen banks, was constructed at one large site in each cluster. Ball courts are thought to be communal structures and facilities for competitive sports. When families from distant homes came together to attend ball court events, they also had opportunities to trade food, raw materials and craft items, meet potential mates, and observe ceremonies.

The two Preclassic settlement clusters, each with a larger site containing a ball court as a public construction, are called "communities" by Hohokam archaeologists. Both the multi-site community on the upper Tortolita slopes and the community along the river had substantial settlements of varying size in locations suitable for more than one kind of farming technique. Artifact collections from the settlements of both communities also include a similar mix of domestic implements such as grinding stones for food processing, imported

materials such as shell for jewelry and obsidian for chipped stone tools, and objects used in ritual. Dense accumulations of broken and discarded artifacts suggest long term residence in both community zones.

A change in settlement layout and location, together with population growth, takes place in the Classic period after A.D. 1150 on the Tortolita Fan, as it does throughout southern Arizona. The two earlier Preclassic settlement clusters or communities combined into a single larger Classic community covering 56 square miles. Platform mounds rather than ball courts are the typical kind of public facilities in central sites of this later period, and a mound was constructed at newly settled large site just up slope from the Santa Cruz flood plain near the present town of Marana. To supply water to this new Marana community center, a canal had to be completed over six miles from its intake on the river. Six zones with different combinations of residential sites and farming techniques can be defined within the Classic community stretching across all basin environments from the Tortolita to the Tucson Mountains. In addition to moisture dependent crops such as corn, residents of some zones also planted the desert succulent agave or century plant on large areas of drier slopes.

The community center, the Marana Mound site, covers over 350 acres and had an estimated population between 400 and 700 people. Families lived in adobe rooms enclosed by compound walls of the same material. Four elevated rooms were built on top of the adobe and earthen platform mound, and other specialized rooms were also enclosed within the massive adobe wall which surrounded it. The mound precinct was the scene of public events and rituals performed for the entire community and probably served as the residence of community leaders.

By A.D. 1350, community residents had abandoned the entire Tortolita Fan area, a part of the northern Tucson Basin continuously inhabited by farmers for at least 2000 years. The people probably joined other Hohokam communities to the north and south that continued beyond this time. Archaeological evidence has not yet revealed an overriding cause for this widespread departure such as prolonged drought or devastating warfare; however, there is a general recognition that by A.D.1450 the Hohokam culture system had collapsed.

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 and 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.

When Father Kino first visited the area in 1697, he encountered a small O'odham farming village of 20 houses in former Marana community territory near the north end of the Tucson Mountains. This settlement, which he El Valle de Correa, has not been conclusively located, although a few pieces of pottery dating to this time have been found. Several sites dating to this time period are known in the Tucson area to the south, the San Pedro River region to the east, and on lands within the Tohono O'odham reservation to the west.

Table 4. Tortolita Fan Subarea Historic Archaeological Site Data				
Euro-American	Mexican	Tohono O'odham	Unknown	Total
35	12	8	11	66

Table 4 presents archaeological data on the Historic Period, spanning the years between A.D. 1540 and 1950. The history of the Tortolita Fan Subarea can be viewed in terms of the settlement of the Tucson Basin.

Kino's trips into the Pimera Alta at the end of the 18th century ushered in an era of exploration and colonization in the Santa Cruz Valley that included the Tortolita Fan subarea. In 1700 construction was started on the mission church at the village of San Xavier del Bac located to the south of Tucson. Uprising by the Piman Indians in 1751 followed a long period of native discontent and destabilized the region. In 1752 the presidio at Tubac was constructed to provide protection to Spanish colonists; however it was the Apaches who became the common enemy to both Spanish and Piman populations. The frequency and ferocity of Apache attacks was such that by the 1760s the Sobaipuri Indians abandoned the San Pedro Valley en masse in favor of the Middle Santa Cruz where greater protection was afforded by joining the Tohono O'odham. Seeing the need for a greater military presence in the area, the Spanish moved the presidio at Tubac to "Tjukshon" in 1775 thereby creating the security needed to foster colonization. In the same year, Captain Juan Bautista de Anza journeyed down the Santa Cruz passing through the subarea along the west side of the river on his way to the Pacific Coast where he founded a Spanish colony in San Francisco Bay.

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.

During these early years little settlement occurred within the Tortolita Fan subarea. The difficulties of the environment and the dangers of Apache attack discouraged permanent occupation and as a result most of the Euro-American population was clustered within the main settlement in Tucson. Piman Indians are said to have continued to use the Catalina Mountains for harvesting agave and the route to Camp Grant, first established in the San Pedro Valley in 1859, followed the Canada del Oro where it passes out of the Tucson Basin between the Catalina and Tortolita Mountains.

Settlement within the subarea did eventually occur. On the east side of the subarea, Francisco Romero settled in the foothills of the Catalina Mountain around 1844 building a ranch at a place then called "Pueblo Viejo" after the remains of a large Hohokam village site. Romero acquired ranch land in the Canada del Oro Valley and successfully ranched in the area until his death in 1910. Today the ruins of the Romero home are located within Catalina State Park on top of the old prehistoric village site that bears his name. Another cattleman who ranched along the foothills of the Catalina Mountains was William Henry Sutherland who acquired the Canada del Oro ranch sometime after 1893. Sutherland Wash, the main tributary to the Canada del Oro, is named

after the Sutherland family. A third prominent name associated with ranching in the subarea originates with Mr. George Pusch, a young German immigrant who in 1874 started the Steam Pump Ranch with his partner John Zellweger. Its location along the Camp Grant-Tucson Road and Pusch's hospitality made the ranch a popular stopping place for stagecoach passengers for many years. Pusch died in 1921 but the old ranch house is still standing. Pusch Ridge in the Catalina Mountains is named after this man.

Along the Santa Cruz River itself, the Butterfield Overland Mail Company route passed through the subarea during its operations between 1858 and 1861. This was one of the first long distance mail carriers to be established linking the southwestern territories with the rest of the United States. Contracted by the federal government, the company offered mail service between Saint Louis, Missouri and San Francisco, California along a route that included stations spaced every 20 miles on average. The stations were to provide food, grain, water, ammunition, and equipment for mending coaches and shoeing mules and horses. One such station, was the Pointer Mountain stage stop believed to have been the home of Francisco Ruelas, the remains of which are located at north end of the Continental Ranch Subdivision on the west side of the Santa Cruz River. The outbreak of the civil war led to the abandonment of the Butterfield line; however, the roads it followed continued to be used for many decades. Surveyors for the Southern Pacific Railroad used the old stage route to shoot in the location of the rail line that when completed in 1880 linked Tucson to the world.

On the west side of the subarea, ranching and homesteading characterized settlement during the later half of the 19th and early part of the 20th centuries. Apache attacks continued to be a major impediment to Euro-American settlement until the surrender of Geronimo in 1886. Nonetheless, a few hardy souls did venture beyond the limits of the main settlements. Around 1878, Juan and Maria Bojorquez built a home on the west side of the Santa Cruz River along what is today Silverbell Road just south of the intersection of Cortaro Farms Road. This small family run operation was believed to have as many as 200 head of cattle and 50 horses. It was sold in 1898 to two men, Leandro Ruiz and Feliberto Aguirre and shortly thereafter was purchased by a Mr. Felipe Aguilar who continued to ranch in the area for some years. The remains of the old ranch have recently been excavated in advance of residential development in the area.

The coming of the railroad in 1880 coupled with the cessation of hostilities with the Indians resulted in an increase in ranching and homesteading in the subarea during the 1890s. Five successful homestead claims were made during this time period each based on a 160 acre allotment. All were within a mile of the Santa Cruz River and may have engaged in either irrigation or direct flood water farming. Early attempts at the turn of the century to build water pumps for agricultural uses demonstrated the utility of using ground water for irrigation, culminating in the Post Project, an ambitious plan developed by Edwin R. Post to build water wells and irrigation canals from the confluence of the Rillito Wash and the Santa Cruz River to what is now the town of Marana. The demand for cotton during the First World War prompted investors like Post to utilize the Santa Cruz Valley for cotton production and efforts were made to entice farmers from across the country to move to the Tucson area for this purpose. Despite a drop in cotton prices in the 1920s, this project laid the ground work for subsequent expansion of agricultural lands within the Santa Cruz flood plain much of which was used to grow Pima Cotton. The town of Marana, first known as Postvale, became established as an agricultural settlement with its first post office opening in 1924. Pima Farms and later Cortaro Farms are two of the best known large agricultural enterprises that flourished in the Marana area during the 1920s and 1930s.

Since the end of the Second World War, the traditional forces of farming and ranching have continued within the subarea; however, dramatic population expansion in the Tucson area led to increased demand for land for residential purposes. The present rate of residential growth is an outcome of these forces that began in the subarea in the 1960s and 1970s.

A total of 66 Historic Period sites have been identified in the subarea by the Arizona State Museum, 35 of which are Euro-American, 13 are Mexican in ethnic origin, there are eight sites attributed to the Tohono O'odham 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 Tucson area, 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.

Table 5. Tortolita Fan Subarea Archaeological Site Data Time Period by Site Function					
PERIOD	Prehistoric	Historic	Both	Unknown	Total
FUNCTION					
Agriculture	22	4	1	1	28
Art	46	3	0	0	49
Defense	0	1	1	1	3
Disposal	2	3	0	1	6
Government	0	2	0	0	2
Habitation	92	24	3	5	124
Resource Processing	54	0	0	1	55
Resource Procurement	14	7	0	2	23
Religion	7	2	1	0	10
Storage	1	0	0	0	1
Transportation	0	2	0	0	1
Unknown	481	18	52	70	621
Total	765	66	58	81	970

The site counts presented in Table 5 show that prehistoric sites outnumber the historic by more than 11 to one and that in 58 instances, occupations from both major time periods are present on the same site. The prehistoric site counts are dominated by Habitation (residential) and Resource Processing (food and non food resources) as the most common of the identifiable functions. Art, meaning rock art, is third with 46

sites, followed by Agriculture (i.e. fields, water control features), with 22 sites. Fourteen sites are typed as having been used for Resource Procurement (food and non food resources) and seven sites, such as shrines, have religious functions. Disposal (trash) and Storage appear in only trace numbers. It is interesting to note the high number of rock art sites representing 16.2 % of the total number of sites with identifiable functions. This figure is proportionally second only to the count for rock art sites in the Avra Valley to the west. 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 over all other, with Habitation being the primary functional category represented with 24 sites. Sites classifiable with Resource Procurement functions are second in order with 7 sites, followed by Agriculture (i.e. windmill) with 4 sites, and Art and Disposal at 3 sites each. Minor counts of sites with function identified as Government (civic functions), Religion (church or cemetery), Transportation (roads), and Defense (fortification) follow. Note the complete lack of sites in the Resource Processing category during the Historic Period, which is second in number in the prehistoric site column. It may be that this reflects the economic differences between the Native American and Euro-American populations that settled in this area.

Six of the Fifty-eight sites with both prehistoric and historic occupations on them can be functionally identified as having uses associated with Habitation (3), Agriculture (1), Religion (1), and Defense (1). There are also 81 sites where function can be determined but age cannot, with Habitation (15) and Resource Procurement (2) being the number one and two site types, and Agriculture, Defense and Government following with one site each.

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 Habitation uses at 124 sites. Resources Processing needs are the second highest site function by count (55), followed in order by Art (49), Agriculture (22), Resource Procurement (23) and Religion (10). Smaller number of sites identified as having disposal functions (6), Defense (3), Government (2), Storage (1) and Transportation (1) follow last. Not surprisingly, the vast majority of those sites that could be functionally identified relate to housing and processing food and non food resources. Again, it is interesting see how well represented art is the listing of functional site types. Most of these sites are prehistoric in origin, meaning petoglyphs, which modern native Americans view as sacred. If the seven sites with religious functions are added to the art totals, then places with sacred or religious uses become all but equal to resource processing in terms of their representation in Figure 5. Despite the biases inherent in the data base, this high count may still reflect the importance of sacred places in aboriginal life in the past.

To sum the information on archaeological sites, the Tortolita Fan subarea has witnessed intensive archaeological survey and site excavation that makes it the best known of all subareas in Pima County. Still only a about a third 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, and that like the other subareas in Pima County, experienced 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 and Canada del Oro Wash where surface water has been available; and, 3) the predominant use of the landscape relates to housing and processing both food and non food resources, patterns that can be expected of all people living in the subarea.

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 Tortolita Fan subarea has several places of historic importance including occupied historic communities, places that have been recognized for their historic value and registered on the National Register of Historic Places, and two historic trails. These are represented on the attached map entitled, **Tortolita Fan Subarea Historic Resources**.

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

- Catalina. Located on the west side of the mountains of the same name, the community of Catalina started out in 1949 when Mr. A.B. Garner opened a mercantile store and began subdividing lots. The community began to grow in the 1950s and continues to expand through unregulated development of individual lots.
- Marana. Established in 1890 as a railroad station, the name of this community means "jungle or tangle" in Spanish, probably a reference to the dense Mesquit/cat claw forest that formerly covered the flood plain of the nearby Santa Cruz River. In 1920, the community began to grow following the construction a water pumping plant used to irrigate nearby agricultural fields. Growing cotton, particularly Pima Cotton became a mainstay of the local economy and continues as an important agricultural activity to this day. The first post office opened in 1924.
- Rillito. This small community also was established as a rail stop on the Southern Pacific Railroad, 17 miles west of Tucson near the Santa Cruz River. The first post office opened in 1905. For a time the community was known as Langhorne after the first postmistress but changed to Rillito in 1916.

National Register Properties:

The National Register of Historic Places was 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 historic 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. The following descriptions are excerpted from the individual National Register nomination forms available at the State Historic Preservation Office in Phoenix, Arizona.

- Sutherland Wash Archaeological District. This 2,578 acre district is located adjacent to Sutherland Wash in the foothills of the Santa Catalina Mountains 14 miles north of Tucson, Arizona. Thirty-eight archaeological sites, spanning approximately 2000 years of time are included and represent the remains of an entire prehistoric community occupied by Hohokam Indians between approximately A.D. 550 and A.D. 1450. The settlement centered on a main village known as Romero Ruin that was surrounded by 13 smaller hamlets, 16 activity areas, six temporary houses and several very large agricultural fields. The Romero Ruin also contains the remains of the 19th century ranch house owned by Francisco Romero who built his home within the ancient walls of the old Hohokam village site. The district was listed to the National Register of historic Places in 1988 for its importance to the study of prehistory and history of the northern Tucson Basin. The District is fully contained within Catalina State Park and Romero Ruin is open to the public.
- Sutherland Wash Rock Art District. This National Register District encompasses 12 prehistoric rock art sites within a 35 acre area located on U.S. Forest Service land on the west slopes of the Santa Catalina Mountains. The 1500 plus petroglyphs is one of the largest concentration of rock art ever recorded in the Tucson Basin and includes examples of both Hohokam "Gila Petroglyph" style, dating to between A.D. 600 and A.D. 1450, and earlier Western Archaic Period elements. The district was listed to the National Register in 1993 for its association with prehistoric Native American petroglyphs.

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

- Anza Trail. This is the route taken by Juan Bautista 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, Tucquison (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 and portions of Interstate 10 follow the original route down the Santa Cruz Valley. In the Subarea, the Anza Trail followed the west side of the Santa Cruz River.
- Butterfield Stage Line. The Butterfield Overland Company was one of the first continental mail carriers. It opened in 1858 connecting St. Louis, Missouri and San Francisco, California; however, by 1861 it had ceased operations. In Arizona, the company used parts of existing trails to forge a route some 437 miles in length. In 1869, Wells Fargo operated over the old Butterfield stage lines and in the 1870s, the Southern Pacific railroad surveyed along the approximate route. In the Tortolita Fan Subarea, the trail is believed to have followed the west side of the Santa Cruz River in close proximity to the Anza trail crossing the Santa Cruz River north of the Point of the Mountains and south through Tucson along Main Street; however, the exact route has yet to be determined.

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. Other examples might include the intact remains of a prehistoric community and the surrounding lands that supported it.

- **The Marana Mound Complex.** Discovered during the Northern Tucson Basin Survey, this assemblage of temporally and spatially related archaeological sites located between the Santa Cruz River and the uplands of the Tortolita Mountains represents an intact prehistoric community in its original ecological setting. The main village site, occupied between A.D. 1150 and A.D. 1300, represents the pinnacle of organizational complexity and is the culmination of almost 2000 years of settlement history. It was supported by numerous secondary habitations and related sites used for food production and resource processing. Research has demonstrated that the Hohokam Indians utilized different elevational zones to maximize exploitation of the land for food production. The Marana Mound complex represents an example of a rural historic landscape of prehistoric origin.

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 from prehistoric settlements in foothills of the Catalina and Mountains, to 18th and 19th century travel routes, to historic communities that grew up along the Southern Pacific Railroad and on the fertile plain of the Santa Cruz River where cotton farming became an important economic force in 20th century Arizona.

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. Forty-six sites within the subarea are identified as prehistoric rock art localities, and in addition, ninety-two 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 Tortolita Fan subarea.

IV. THREAT ASSESSMENT: The next map, entitled “**Archaeological Sites and Land Ownership**” shows the distribution of sites in relation to land status. The data presented in this figure represent information that the Arizona State Museum had in their data files as of last year. The site counts are considerably less than those presented in previous tables, which represented fully updated information on the subarea. For the purposes of the present analysis, the older data will be used until the necessary update to Pima County’s data files can be made.

It is apparent that most of the 361 sites plotted are located on private lands in Oro Valley and along the Santa Cruz River. 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 to 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. Tortolita Fan Subarea Archaeological Sites by landownership and legal protection		
Jurisdiction	No. of Archaeological Sites	Protection Status/Level
BLM	1	Protected/high
National Forest Lands	10	Protected/high
National Parks/Monuments	25	Protected/high
State Lands (Trust)	43	Protected/moderate
State Park Lands	113	Protected/moderate
Private Lands	169	Unprotected/low
Total	361	

A total of 36 of the 361 sites have high protection status, reflecting the low percentage of federal lands in the subarea (23.3%). One hundred and fifty-six sites are moderately protected from public and private

actions, 113 of which are within Catalina State Park. The remaining 169 sites or 46.8% have low protection status since they are located on private property. Since state trust lands can be sold for development, and private lands are subject only to local zoning, 212 of the 361 known archaeological sites may be affected by future development in the subarea. While the new site data cannot be added into this analysis, it is known that most of the sites that have been recorded in the subarea follow the same trend in this analysis in that they are located on private and state trust lands with very few exceptions.

Since the majority of the land base in the subarea has never been archaeologically surveyed, potentially hundreds, even thousands of sites that exist but have never been recorded could be affected. One way to estimate this number is to divide the number of square miles surveyed in the subarea (111.6) by the number of reported archaeological sites (970 - using the new data presented in Table 5) to get an estimate of 8.69 archaeological components per square mile. With a total of 317.9 square miles in the subarea, this produces a total estimate of 2,763 sites for the subarea, the majority of which will be on state trust and private lands, which combined make up 72.4% of the subarea. Thus, as many as 2000 archaeological sites, including the 970 already recorded, may be vulnerable to future development pressures 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 eight to nine sites per square mile in some places and higher in others. Since private lands concentrate along valley bottom adjacent to the Santa Cruz River and along the Canada del Oro, and since proximity to water is a reasonable predictor of where human beings 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. Uneven survey coverage and bias in 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 Tortolita Fan subarea can be summarized as follows.

Resource Loss:

There are two principal sources of cultural resource loss in the subarea: farming and urbanization as depicted on the map entitled, **GAP Vegetation with Archaeology Site Locations**. Residential and infrastructure development along the Canada del Oro and west of the Catalina Mountains has disturbed approximately 19,500 acres in platted subdivisions alone. Unplatted development within the subarea is about equal to this number. In all, the area that is currently undergoing "urbanization" can be defined as those lands that have been developed, are being developed, and are private non-ranching lands adjacent to these developed areas. Using this definition, more than 68,000 acres in the Tortolita Fan subarea are urbanizing. Agriculture uses of the flood plain along the Santa Cruz River has resulted in additional loss of resources, particularly archaeological sites. There are currently more than 13,800 acres of land in agricultural use along both sides of the Santa Cruz River, most of which has been modified for use in cotton farming. Historically, a larger area was under cultivation. Thus a total area of approximately 81,800 acres or 127.8 square miles has been impacted or is being impacted now. Another 11,100 acres of state trust lands adjacent to I-10 north of Avra Valley Road has recently been re-classified for sale to private holders for commercial and residential development. These lands will be impacted in the near future.

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 farming and urbanization. At approximately 8 sites per square acre, platted subdivisions along the Canada del Oro has

probably affected around 250 sites. The whole of the urbanizing region (including platted subdivisions) is likely to have affected as many as 850 archaeological sites. Agricultural development has potentially impacted another 170 sites, and those state lands that will be developed along the Santa Cruz River will affect another 140. Between farming and the far more destructive process of urbanization, as many as 1020 sites have been damaged or destroyed in 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 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 currently in the southern and eastern portions of the subarea within the jurisdictions of Marana and Oro Valley respectively. However, the communities of Casas Adobe and Tortolita within unincorporated Pima County are also experiencing growth pressures as people move out ahead of the front of urban expansion in the fast growing Northwest region of Tucson. All of these places will continue to develop in the future and the only question is how fast and by how much.

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 and commercial 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.

Oro Valley has developed basic but limited regulations that require cultural resources investigations prior to development, and Marana imposes cultural resources stipulations on a case by case basis as part of the development review process. Together these regulations and requirements create a patch work of legal protections that are not coordinated in any way limiting the legal effectiveness of cultural resources protection across jurisdictions. It is important to note that without the information collected by the Arizona State Museum through the Northern Tucson Basin Survey, very little would be known about the cultural resources in this area, particularly archaeological sites, and it is only because of that work that it is possible now to discuss past impacts and the possibilities for future resource conservation.

Sensitivity Zone:

Archaeological survey coverage within the subarea is higher at 35.1% than any other subarea in Pima County. Even so, the distribution of cultural resources is not completely understood. 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 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, the Canada del Oro, and a series of springs in the Catalina Mountains. Different buffers widths are used for the sensitivity model. The River and the Wash are 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 shown in green. 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 and the Canada del Oro, both the focus of human habitation in the subarea for millennia. Lack of survey data within the Coronado National Forest in the vicinity of the upland springs prevents assessing if the presence of springs in this area drew human settlement, although information from other subareas within eastern Pima County would suggest this. The model also includes the historic communities of Marana, Rillito and Catalina and suggests that historic period settlements are conditioned to some extent by the same realities of life in the desert that affected prehistoric settlement patterning. It does not include all sites such as those at the base of the Tortolita Mountains. 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.

V. SUMMARY:

The cultural resources of the Tortolita Fan 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 eastern Pima County and can inform and educate future generations about the past. But cultural 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.

Unlike the other subareas that have been studied as part of the Sonoran Desert Conservation Plan, the Tortolita Fan subarea has received a very high level of archaeological research attention over the years. Archaeological survey data indicate that approximately 35.1% of the subarea has been intensively investigated and because of this a fuller picture of past land use is possible. It is apparent that thousands of years of human history is represented in the subarea but that the peak use of the valley occurred during late prehistory when the subarea was occupied by the Hohokam Indians. These people clearly thrived in the desert along the Santa Cruz River and the Canada del Oro Wash and learned to harness the subtleties of their environment to make a living.

The passage of the Spanish along the Anza Trail in the 18th century represents an era of exploration and conquest that forever changed the history of the land. Later, the Butterfield stage line would retrace portions

of the former trail as mail was carried from Saint Louis to San Francisco. The historic communities of Marana and Rillito are products of early late 19th and early 20th century agriculture and transportation technology that linked the Tucson area to markets across the county and around the world. Catalina is only the latest example of a settlement that became established at a fork in the road or a well placed store as people seek a better life beyond the edge of the bigger settlements. The subarea has two places that are listed on the National Register of Historic Places for their importance in understanding the prehistory of the northern Tucson Basin. 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 has a demonstrably rich record of cultural and historical resources with high scientific, educational, and recreational values particularly so because of the extraordinary record of Hohokam archaeology.

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. This is all the more justified in this subarea because of the rapid pace of resource loss due to residential development.

Modern Communities Transportation And Ownership

SDCP PLANNING UNIT 5

- Planning Unit Boundary
- Major Waterways
- Roads
- BLM
- COUNTY PARK
- GOLDWATER GUNNERY RANGE
- INDIAN LANDS
- MILITARY RESERVATIONS
- NATIONAL FOREST LANDS
- NATIONAL PARKS AND MONUMENTS
- NATIONAL WILDLIFE REFUGE
- PRIVATE LANDS
- STATE LANDS
- STATE PARK

LAND OWNERSHIP

BLM	1,183 AC
COUNTY PARK	3,124 AC
MILITARY RESERVATIONS	37,750 AC
NATIONAL PARKS AND MONUMENTS	46,501 AC
STATE LANDS	44,796 AC
PRIVATE LANDS	105,461 AC
TOTAL	203,505 AC

ESTIMATED 2000 POPULATION: 65,238



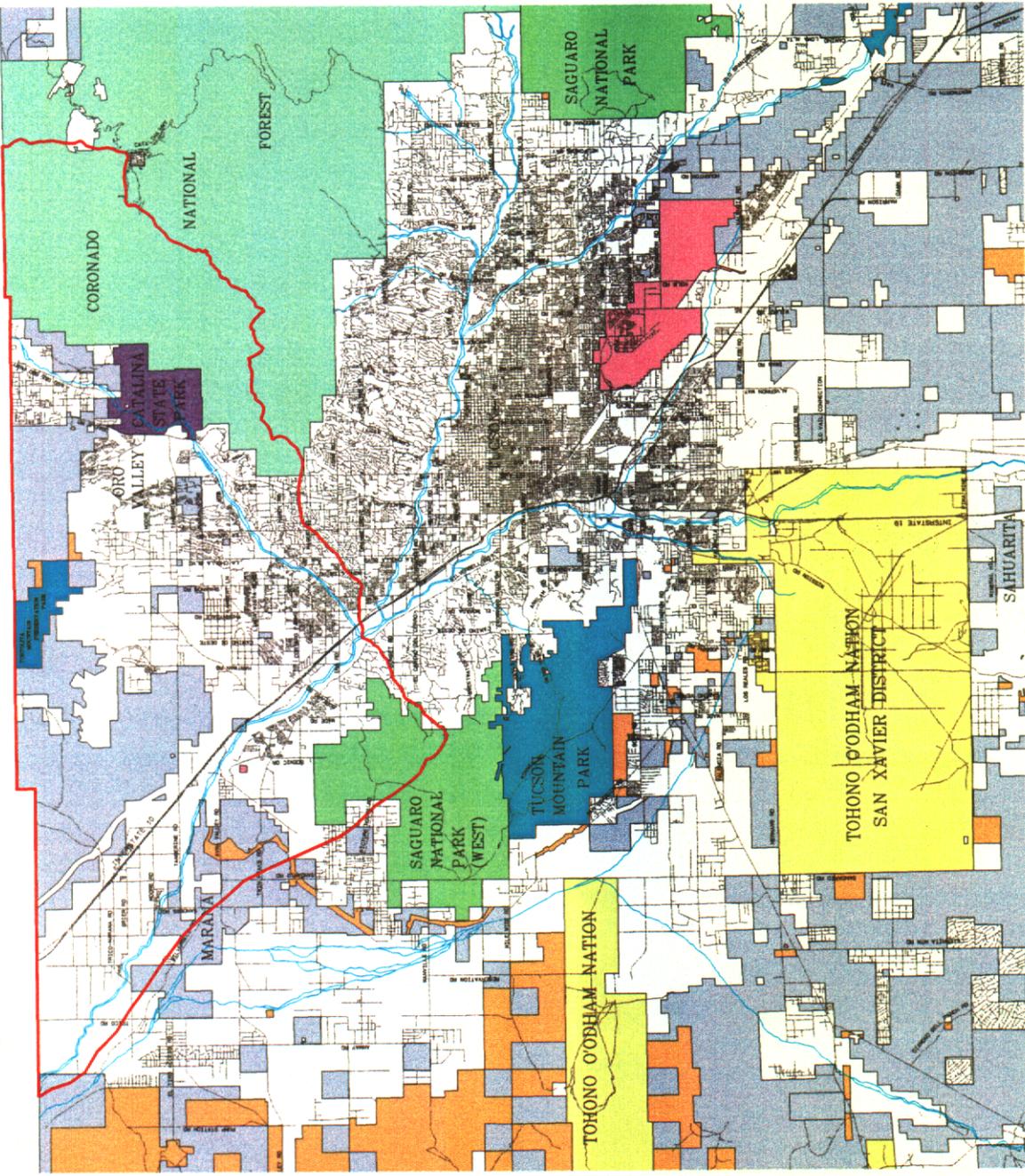
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Scale 1:80,000

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Archaeology Survey Locations

SDCP PLANNING UNIT 5

-  Archaeology Sites
-  Major Washes
-  Linear Archaeology Surveys
-  Polygonal Archaeology Surveys

STATISTICS FOR ARCHAEOLOGY SURVEYS

 AREA FOR POLYGONAL SURVEYS: 69,270 AC
 LENGTH FOR LINEAR SURVEYS: 639,575 MI
 119.61 MI

Pima County Index Map

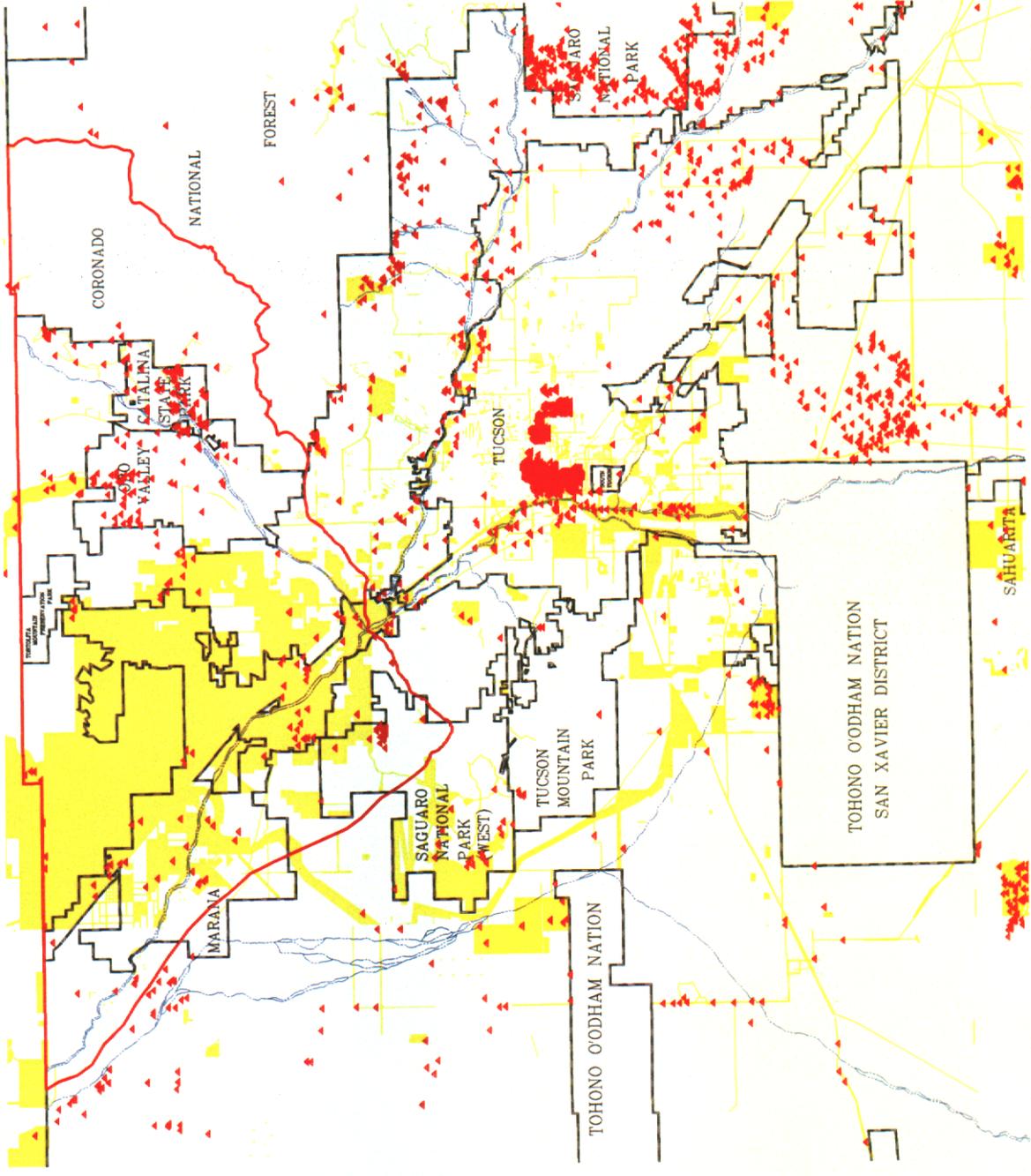


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TORTOLITA FAN SUBAREA HISTORIC RESOURCES

SDCP PLANNING UNIT 5

◆ Historic Community

■ National Register Historic Places

— Trail

1. Marana
2. Rillito
3. Catalina
4. Sutherland Wash Archaeological District
5. Sutherland Wash Rock Art District
6. Anza Trail
7. Butterfield Stage Line

Pima County Graphic Design, MOH 3-24-00

Pima County Index Map



Index Map Scale 1:50,000

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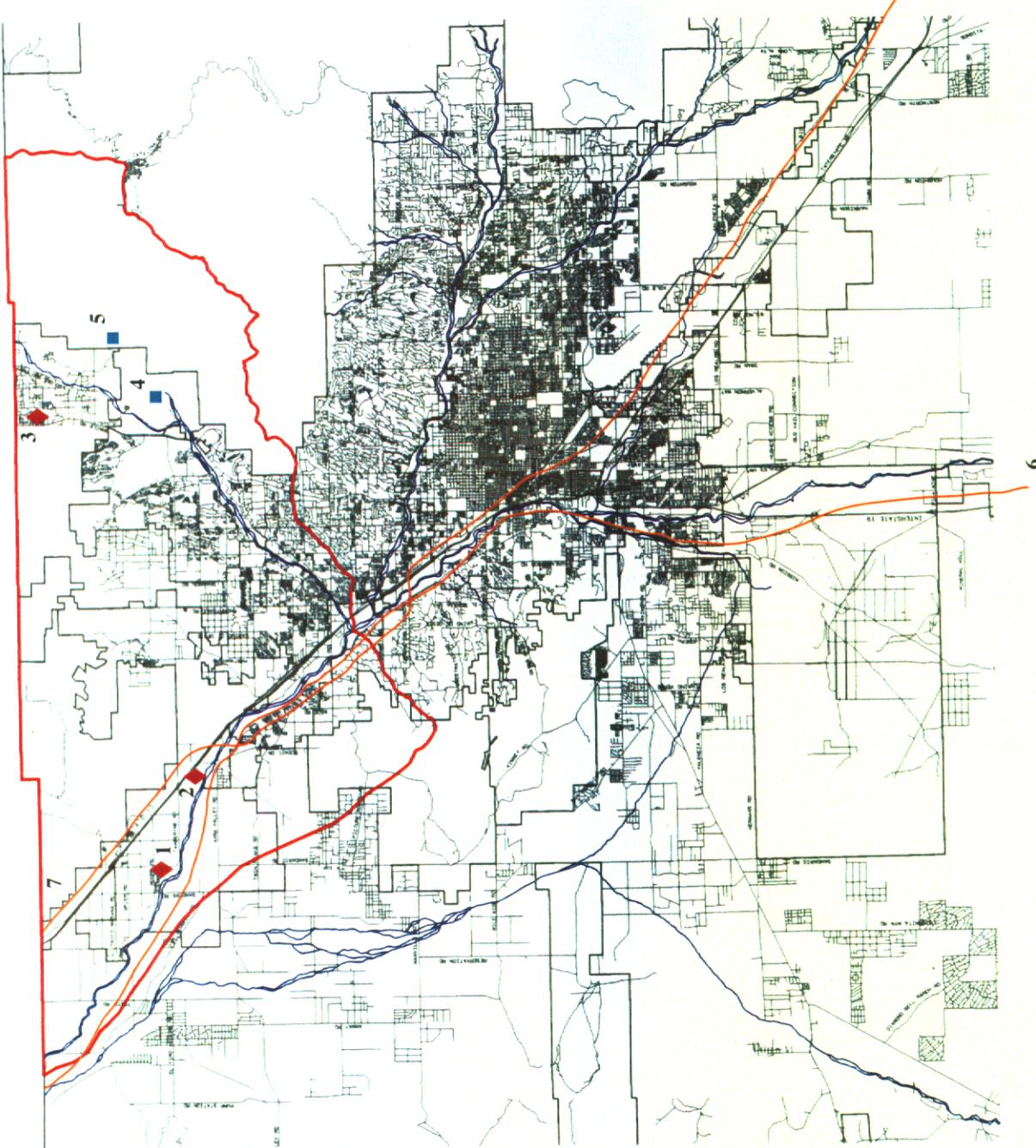
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8/11/00



Archaeological Sites and Land Ownership

SDCP PLANNING UNIT 5

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

STATISTICS FOR ARCHAEOLOGY SITES

JURISDICTION	# OF SITES
BLM	1
COUNTY PARK	0
COUNTY PARKS	0
GOLDWATER GUNNERY RANGE	0
MILITARY RESERVATIONS	10
NATIONAL FOREST LANDS	25
NATIONAL PARKS AND MONUMENTS	0
NATIONAL WILDLIFE REFUGE	499
PRIVATE LANDS	413
STATE LANDS	413
STATE PARKS	413
TOTAL	361

Pima County Index Map



Scale: 1:80,000



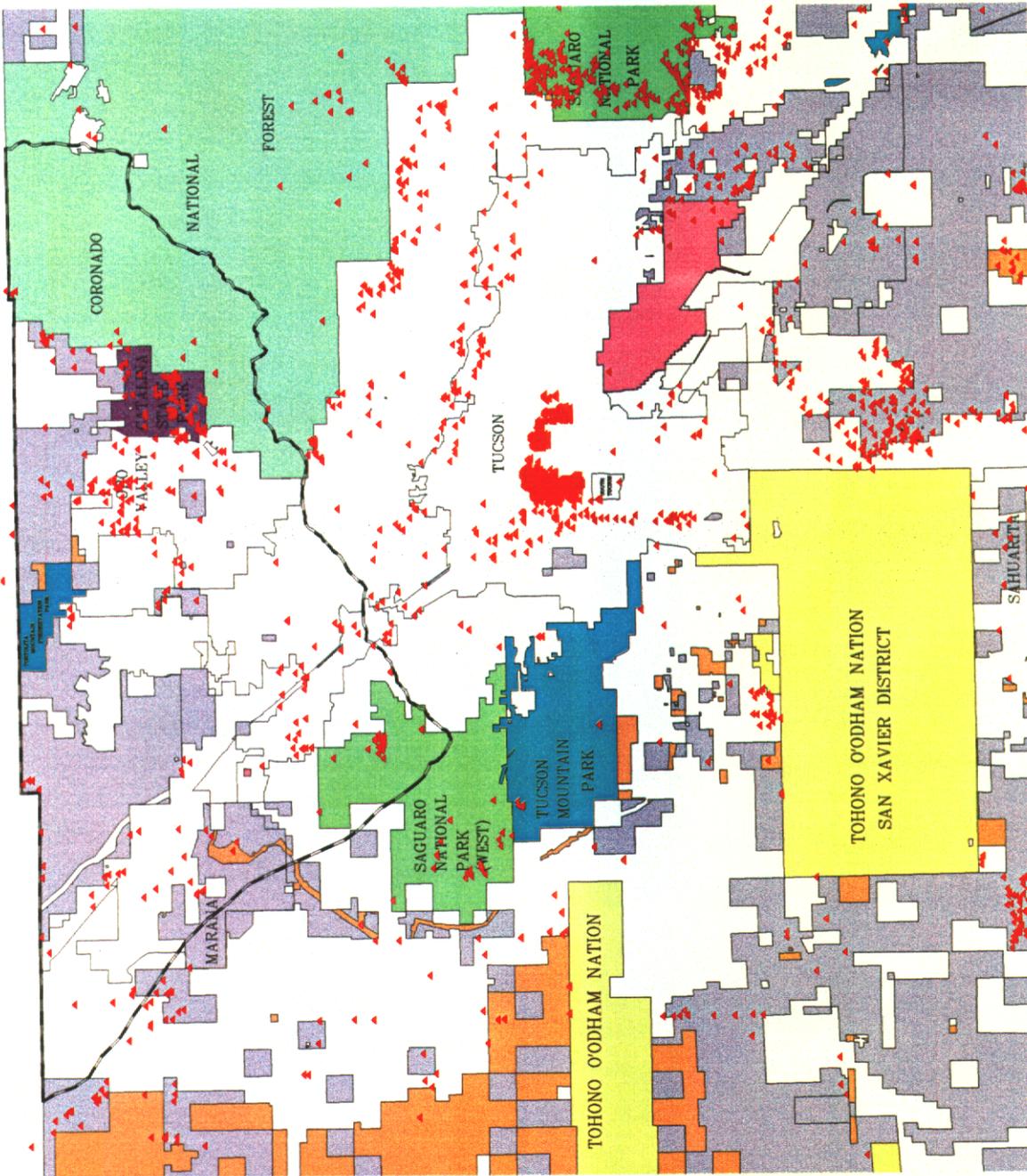
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3/17/00



GAP Vegetation

SDCP PLANNING UNIT 5

- Watershed Planning Unit Boundary
- Administrative Boundary
- Washes
- Springs
- Archeological Sites
- Agriculture
- Urban
- Mining
- Chihuahuan Desertscrub (Crotonobakia-Turkey)
- Chihuahuan Desertscrub (Mixed Scrub)
- Chihuahuan Desertscrub (Whiteflower)
- Madroño Evergreen Forest (Rachal)
- Madroño Evergreen Forest (Oak-Pine)
- Madroño Mountain Oakleaf Forest (Douglas-Pine-Mixed Oakleaf)
- Madroño Mountain Oakleaf Forest (Pine)
- Mogollon Chaparral Scrubland (Mesquite)
- Mogollon Chaparral Scrubland (Mixed Evergreen Sclerophyll)
- Mogollon Deciduous Swampforest (Cottonwood-Willow)
- Mogollon Deciduous Swampforest (Mixed Broadleaf)
- Playa
- Scrub Grassland (Mixed Grass-Scrub)
- Scrub Grassland (Sagebrush-Scrub)
- Sonoran Deciduous Swamp and Riparian Scrub (Mixed Scrub)
- Sonoran Desertscrub (Crotonobakia-Burrotree)
- Sonoran Desertscrub (Paloverde-Mixed Oak)
- Sonoran Desertscrub (Saltbush)
- Sonoran Interior Marshland (Cattail)
- Sonoran Riparian and Oak Forest (Cottonwood-Willow)
- Water



Index Map Scale 1:1,000,000

The information on this map was derived from the following sources:

- 1. Aerial photography and ground truthing.
- 2. The National Wetlands Inventory (NWI) data.
- 3. The National Wetlands Inventory (NWI) data.
- 4. The National Wetlands Inventory (NWI) data.
- 5. The National Wetlands Inventory (NWI) data.

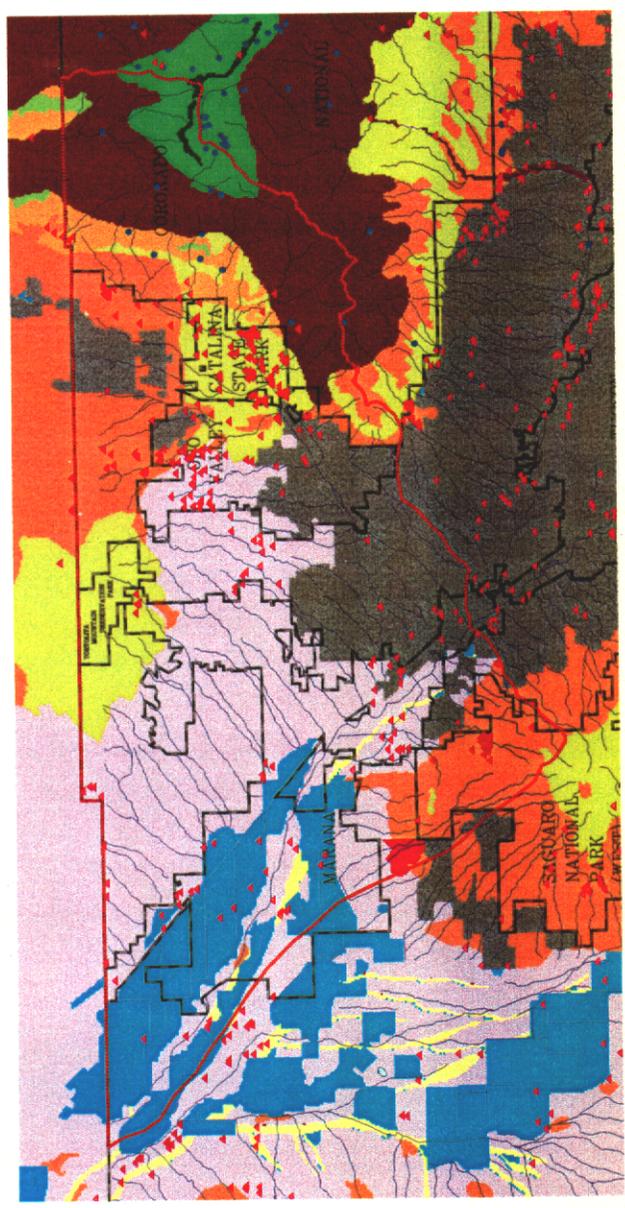
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Cultural Resources High Sensitivity Areas

SDCP PLANNING UNIT 5

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

STATISTICS FOR UNIT 5
ACRES OF BUFFERED WASH SPRINGS
AND SHALLOW GROUND WATER: 107,070 AC.

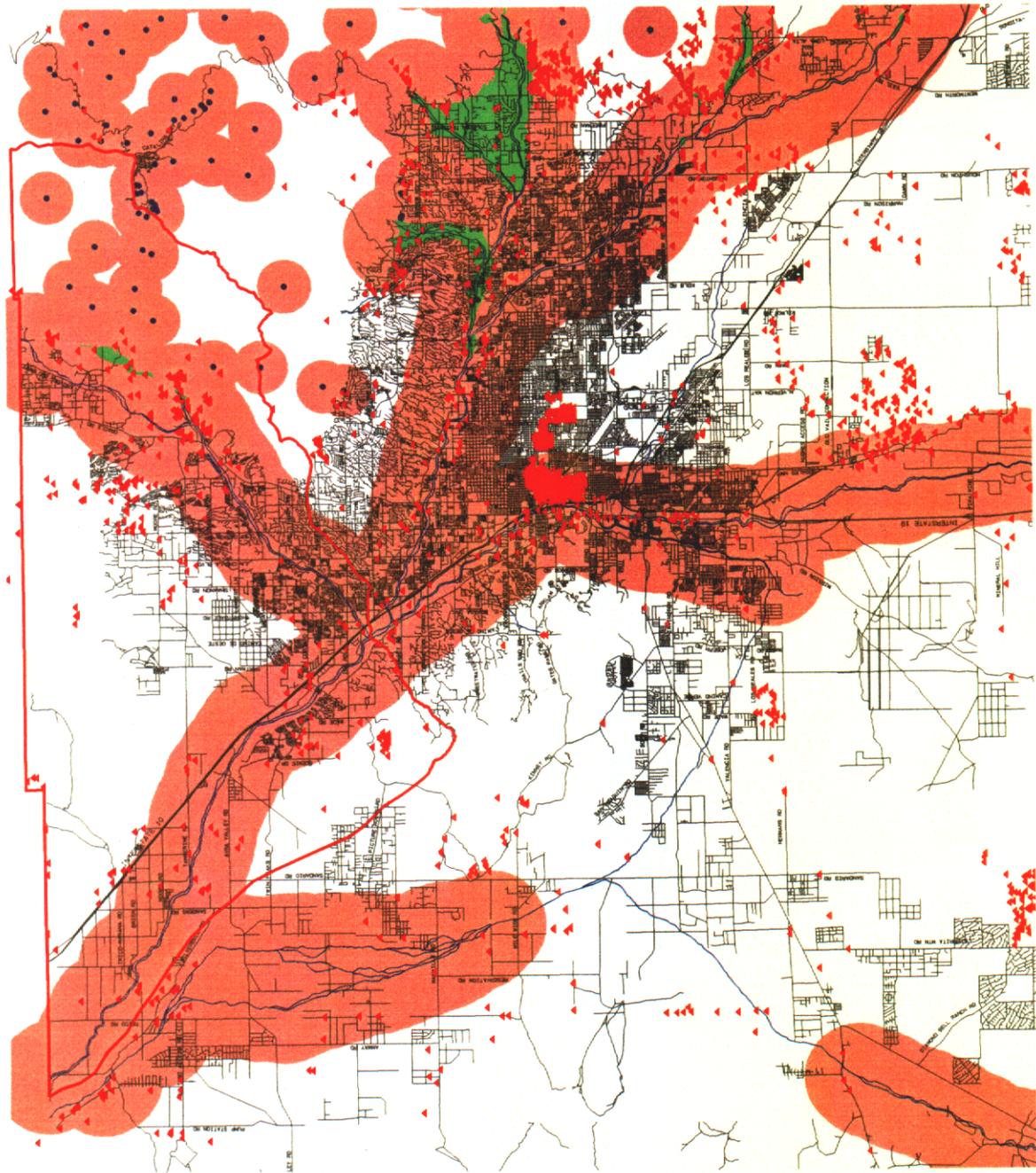
Pinna County Index Map



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1

Sonoran Desert Conservation Plan

Tortolita Fan Watershed Sub-area Report

Pima County

May 2000

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I. SUMMARY

The Tortolita Fan Watershed sub-area lies to the north-west of Tucson, east of Avra Valley, west of the San Pedro watershed and immediately south of Pinal County. It encompasses an area of approximately 203,546 acres. The watershed also includes the towns of Marana and Oro Valley. The land ownership is comprised of State Trust, BLM, National Forest, and private land holdings.

Current land use conditions occur in unincorporated Pima County includes public preserves, vacant land and built areas. The jurisdictions of Marana and Oro Valley contain predominantly private, developable land.

Planned land uses on vacant land in unincorporated Pima County include Urban and Rural residential; Conservation; Industrial and Commercial uses. Marana and Oro Valley's planned land uses are primarily residential.

Zoning on vacant land, in unincorporated Pima County, is mostly RH Rural Homestead. Zoning in Marana and Oro Valley are mostly residential and Specific Plans.

The topography is composed of peaks/ridges (Pusch, Samaniega and Santa Catalina mountains) and a broad basin that lies in the western part of the watershed. Within the watershed, there are five perennial and four intermittent stream reaches. The altitude of the mountain ranges vary between 1,300 and 2,800 meters above the mean sea level (MSL), and the low-lying areas vary between 750 and 1,700 meters above MSL.

The Tortolita Fan watershed's prime viewsheds are the Santa Catalina, Tortolita and Tucson Mountain Ranges.

Interstate 10 and State Highway 77 (Oracle Road) are the major arterial roads. There are 19 water companies; and, sanitary sewers serve development in all three jurisdictions, most of it maintained by Pima County Wasterwater. Three school districts and several parks also serve the watershed.

Catalina State Park, Coronado National Forest and Saguaro National Park (West) lie partially or wholly within the watershed, with a combined total acreage of about 54,781 acres.

The watershed has four of the sixteen urbanizing areas and part of one in Pima County: Casas Adobes (part), Catalina, Marana, Oro Valley and Tortolita.

There are a total of 47 capital improvement projects underway involving \$114,284,717, in Parks and Recreation, Transportation, Flood Control, Facilities Management, Wastewater Management, Cultural Resources and one unfunded project.

Between 1997 and 1999, residential permitting activities were at a peak in 1998 with 1,142 issued. Commercial permits have been consistent, averaging at about 30 a year, during the same time period.

II. SITE INVENTORY AND ANALYSIS

H. Location

The Tortolita Fan Watershed sub-area lies to the north-west of Tucson, east of Avra Valley, west of the San Pedro watershed and immediately south of Pinal County. It encompasses an area of approximately 203,546 acres.¹ The Tortolita Mountains are to its north, the Coronado National Forest (part of which lies within the watershed) to its south-east, and the Saguaro National Park - West (part of which lies in the watershed) to its south-west. The watershed also includes the towns of Marana and Oro Valley.

Town of Marana

The Town of Marana is located in the north-western part of eastern Pima County, approximately 10 miles northwest of downtown Tucson, accessible by Interstate 10. The Santa Cruz River lies on the western part of Town. The Town of Oro Valley is to its east, Avra Valley to its west, Pinal County to its north and the Saguaro National Park (West) is to its south. The corporate limits of the Town is surrounded by unincorporated Pima County.

The Town of Marana was incorporated in 1977 and currently encompasses approximately 74 square miles. Its geographic limits are spread out on both the east and west sides of Interstate 10. Marana is a bedroom community of Tucson, but over the years has established a noticeable commercial and service-industry base. The issues of habitat conservation, in the last couple of years, has shifted its development initiatives to the north-western part of Town.

Over the past few years, the Town has annexed considerable amounts of land in all directions. Annexation in the immediate future may include land immediately north of Tangerine Road, east of I-10 and south of the Dove Mountain development in the Township-Range of T11S-R12E. The current corporate limits have reached the Pima-Pinal County line, due north. There is a good potential for Marana to extend into Pinal County, in the future. The Town lies mostly in the Tortolita Fan Watershed, with parts of it in the Avra Valley and Middle Santa Cruz watersheds.

Town of Oro Valley

The Town of Oro Valley is located in the northern part of eastern Pima County, approximately 10 miles north of downtown Tucson. Its main access into Tucson is Oracle Road. The Catalina State Park and Coronado National Forest are to its immediate east and the Town of Marana is to its west. To its immediate north and west lie portions of unincorporated Pima County.

The Town was incorporated in 1974. Oro Valley is a bedroom community of Tucson, but over the years has effectuated a diversified revenue base including some commercial and service-industry based activities.

I. Ownership

The land ownership is comprised primarily of State Trust, BLM, National Forest, and private land holdings (Marana, Oro Valley and parts of Pima County).

J. Land Use and Zoning

1. Land Use

Current land use conditions occur in two primary geographic areas: 1) unincorporated Pima County and 2) the jurisdictions of Marana and Oro Valley. The land within unincorporated Pima County can be classified under three major categories: public preserves, vacant land and built areas. The jurisdictions of Marana and Oro Valley contain predominantly private, developable lands, with about 25 percent of each municipality's land area currently vacant.

Within the watershed, public preserves account for about 55,000 acres, all of which lie within unincorporated Pima County. The combined vacant land measures approximately 75,500 acres, including State and jurisdictions, of which over 70 percent (53,325 acres) lies within the County.

Roughly 11,300 acres have been developed as single family residential use with densities ranging from 0.2 RAC to 25.0 RAC and above. **Table 1** shows the existing land use.

Industrial land in the watershed accounts for a little over 1,000 acres, half of which is in unincorporated Pima County while the other half is in Marana and Oro Valley. Commercial land accounts for roughly 690 acres, 50 percent (342 acres) of which lies within Marana, and the remainder within unincorporated Pima County (244 acres) and Oro Valley (103 acres).

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 16,654 acres of the total agricultural land (29,803 acres, including Marana and Oro Valley) are devoted to ranching and grazing purposes.

Town of Marana

The Town's predominant land uses, as shown in **Table 1**, are agricultural and vacant land. The development of land in Marana is mostly for residential uses which has occurred by and large through the regulated process. The rate of residential development over the past few years has yielded approximately 2,000 acres of residential land use, varying from 0.2 to 19 residences per acre, including rural residential uses. There are numerous Specific Plans that are currently adopted, which will increase the residential and related commercial land use considerably in the next five years.

Other existing land uses of considerable import include commercial (340 acres), industrial (440 acres), dedicated open spaces (120 acres), institutional (235 acres) and golf courses (330 acres).

Table 1

EXISTING LAND USE--TORTOLITA FAN WATERSHED

LAND USE	JURISDICTION	ACRES	JURISDICTION	ACRES	JURISDICTION	ACRES	TOTAL ACRES
RURAL	PIMA COUNTY	3,703.60	MARANA	865.88	ORO VALLEY	396.00	4,965.48
0.2 TO 0.4 RAC	PIMA COUNTY	3,972.88	MARANA	167.45	ORO VALLEY	402.56	4,542.89
0.4 TO 0.75 RAC	PIMA COUNTY	1,433.12	MARANA	108.45	ORO VALLEY	235.93	1,777.50
0.75 TO 1.25 RAC	PIMA COUNTY	2,947.23	MARANA	145.82	ORO VALLEY	1,243.28	4,336.33
1.25 TO 3.0 RAC	PIMA COUNTY	546.07	MARANA	146.74	ORO VALLEY	284.64	977.45
3.0 TO 6.0 RAC	PIMA COUNTY	1,451.22	MARANA	299.52	ORO VALLEY	935.35	2,686.09
6.0 TO 10.0 RAC	PIMA COUNTY	688.60	MARANA	259.14	ORO VALLEY	515.77	1,463.51
10.0 TO 15.0 RAC	PIMA COUNTY	144.67	MARANA	2.09	ORO VALLEY	72.61	219.37
15.0 TO 25 RAC	PIMA COUNTY	97.00	MARANA	1.13	ORO VALLEY	70.88	169.01
GREATER THAN 25 RAC	PIMA COUNTY	17.92	MARANA	-	ORO VALLEY	19.95	37.87
AGRICULTURAL	PIMA COUNTY	12,265.74	MARANA	14,680.97	ORO VALLEY	2,856.05	29,802.76
COMMERCIAL	PIMA COUNTY	244.22	MARANA	342.21	ORO VALLEY	103.14	689.57
DEDICATED OPEN SPACE	PIMA COUNTY	399.02	MARANA	119.52	ORO VALLEY	1,226.19	1,744.73
GOLF COURSE	PIMA COUNTY	20.87	MARANA	328.33	ORO VALLEY	820.70	1,169.90
INDUSTRIAL	PIMA COUNTY	551.05	MARANA	438.56	ORO VALLEY	24.29	1,013.90
INSTITUTIONAL	PIMA COUNTY	1,040.29	MARANA	233.97	ORO VALLEY	328.94	1,603.20
LODGING	PIMA COUNTY	494.38	MARANA	21.61	ORO VALLEY	-	515.99
MISC GOVERNMENT	PIMA COUNTY	2,193.01	MARANA	248.81	ORO VALLEY	60.39	2,502.21
OFFICE	PIMA COUNTY	80.00	MARANA	10.12	ORO VALLEY	7.50	97.62
OTHER	PIMA COUNTY	243.75	MARANA	88.47	ORO VALLEY	358.67	690.89
PARK	PIMA COUNTY	-	MARANA	-	ORO VALLEY	19.74	19.74
PARTIAL	PIMA COUNTY	6.94					6.94
PRIVATE STREET	PIMA COUNTY	-	MARANA	-	ORO VALLEY	1.67	1.67
PUBLIC PRESERVE	PIMA COUNTY	54,988.02					54,988.02
RESORT	PIMA COUNTY				ORO VALLEY	54.70	
TRANS FACILITIES	PIMA COUNTY	205.18	MARANA	262.32			467.50
UTIL/TELECOMM	PIMA COUNTY	142.76	MARANA	121.73	ORO VALLEY	12.68	277.17
VACANT	PIMA COUNTY	47,656.00	MARANA	14,481.63	ORO VALLEY	4,701.21	66,838.84
VACANT-JUR	PIMA COUNTY	4,520.00	MARANA	1,552.26	ORO VALLEY	354.51	6,426.77
VACANT-STATE	PIMA COUNTY	141.78	MARANA	2,168.15			2,309.93
CHK	PIMA COUNTY	707.50	MARANA	32,171.27	ORO VALLEY	1,310.75	34,189.52
TOTAL		140,902.82		69,266.15		16,418.10	226,532.37

Town of Oro Valley

The Town's predominant land uses, as shown in **Table 1**, are single family residences, agriculture and vacant land. Residential development in the Town has occurred largely through the regulated process, accounting for approximately 3,780 acres of residential land use, varying from 0.2 to over 25 residences per acre. Rural uses in the town account for roughly 400 acres.

Other existing land uses of considerable import include commercial (103 acres), dedicated open spaces (1,226 acres), institutional (329 acres), golf courses (820 acres), resort (55 acres) and industrial (25 acres).

2. Planned Land Use

The planned land uses, on approximately 61,000 acres of vacant land in unincorporated Pima County, are shown in as shown in **Table 2**.

Table 2

**PLANNED LAND USE - TORTOLITA WATERSHED
UNINCORPORATED PIMA COUNTY**

JURISDICTION	PLANNED LAND USE	ACRES
PIMA COUNTY	RC	16,134.11
PIMA COUNTY	RT	7,345.58
PIMA COUNTY	RP	5,183.71
PIMA COUNTY	LIU-0.3	7,505.12
PIMA COUNTY	LIU-0.5	2,210.65
PIMA COUNTY	LIU-1.2	1,617.96
PIMA COUNTY	LIU-3.0	3,396.93
PIMA COUNTY	MIU	4,931.95
PIMA COUNTY	MHIU	1,263.83
PIMA COUNTY	HIU	158.92
PIMA COUNTY	NAC	155.72
PIMA COUNTY	MFC	491.35
PIMA COUNTY	CAC	566.17
PIMA COUNTY	REAC	24.42
PIMA COUNTY	I	268.75
PIMA COUNTY	HI	280.25
PIMA COUNTY	DR	6,664.35
PIMA COUNTY	LIR	2,407.13
PIMA COUNTY	MIR	139.18
PIMA COUNTY	OUTSIDE PLAN AREA	79.63
TOTAL		60,825.71

Planned land uses on vacant land in unincorporated Pima County include Low, Medium, Medium/High and High Intensity Urban residential uses; Low and Medium Intensity Rural

residential uses; Resource Conservation; Resource Protection; Resource Transition; Industrial (Heavy and Urban); Development Review and Activity Centers (Community, Neighborhood, Regional and Multi-functional Corridor).

The two major planned land uses on vacant land, accounting for over 50 percent of the total planned land use, are Resource Conservation and Low Intensity Urban (0.3 - 3.0 RAC). Resource Conservation accounts for over 16,000 acres, in the Silverbell-Tortolita area including the Tortolita Mountain Park. Low Intensity Urban accounts for over 14,700 acres.

Other major planned land uses include Resource Transition on about 7,345 acres (12.1 percent); Resource Production on about 5,183 acres (8.5 percent); Development Reserve on roughly 6,665 acres (11.0 percent); Medium Intensity Urban on approximately 4,930 acres (8.1 percent); Medium/High Intensity Urban about 1,264 acres (2.1 percent) and Low Intensity Rural on roughly 2,400 acres (4.0 percent).

Town of Marana

The Marana General Plan on vacant land calls for approximately 22,500 acres of low density residential uses. Additionally, 3,120 acres are being planned for medium to high density residential uses. The major residential developments on more than 1,000 acres are Dove Mountain and Continental Ranch. Others of considerable significance are Acacia Hills, Anway Farms, Foothills, Forest City, Hartman Hills, Northgate, Pima Farms and Rancho Marana.

Despite its current identity of a bedroom community to Tucson, Marana has aspirations of diversifying its economy to include industrial and service-based employment opportunities. About 2,500 acres are being planned for Industrial/Business park uses. The Town also has plans of developing commercial real estate on over 1,800 acres of land, which will include over 1,500 acres of community commercial and about 300 acres of tourism commercial.

Under the existing land use scenario, the ratio of residential (2,000 acres) to commercial (340 acres) to industrial (440 acres) land uses stands at 5.9 : 1 : 1.3. This indicates that out of roughly 2,800 acres, 72 percent accounts for residential, 16 percent for industrial and 12 percent for commercial. The planned land uses, as shown in **Table 3**, reveal a ratio of 12.5 : 1 : 1.4, with residential (22,500 acres or 84 percent), industrial (2,500 acres or 9.3 percent) and commercial (1,800 acres or 6.7 percent), indicating that residential development will account for a larger percent of total development in the future than it does today.

The current plans for open space on vacant land include Open Space: Agricultural with roughly 25,450 acres and Open Space: Recreational with about 5,980 acres. Other uses include Community Development Zones (24,500 acres), Interstate Development Zones (4,270 acres) and Public Facilities (220 acres).

Table 3

MARANA GENERAL PLAN ON VACANT LAND

WATERSHED	JURISDICTION	PLANNED LAND USE	ACRES
AVRA VALLEY	MARANA	Low Density Residential	577.67
AVRA VALLEY	MARANA	Open Space: Agriculture	1,687.10
AVRA VALLEY	MARANA	Public Facility	11.44
AVRA VALLEY	PIMA COUNTY	Industrial/Business Park	51.87
AVRA VALLEY	PIMA COUNTY	Low Density Residential	2,392.23
AVRA VALLEY	PIMA COUNTY	Open Space: Agriculture	13,307.88
SUB TOTAL			18,028.19
MIDDLE SANTA CRUZ	MARANA	Commercial: Community	6.40
MIDDLE SANTA CRUZ	MARANA	Industrial/Business Park	48.03
MIDDLE SANTA CRUZ	MARANA	Low Density Residential	153.22
MIDDLE SANTA CRUZ	PIMA COUNTY	Commercial: Community	2.84
MIDDLE SANTA CRUZ	PIMA COUNTY	Industrial/Business Park	7.02
MIDDLE SANTA CRUZ	PIMA COUNTY	Low Density Residential	931.05
MIDDLE SANTA CRUZ	PIMA COUNTY	Open Space: Recreational	730.06
MIDDLE SANTA CRUZ	TUCSON	Low Density Residential	81.44
SUB TOTAL			1,960.06
TORTOLITA	MARANA	Commercial: Community	1,407.91
TORTOLITA	MARANA	Commercial: Tourism	284.89
TORTOLITA	MARANA	Community Development Zones	7,737.28
TORTOLITA	MARANA	Industrial/Business Park	1,936.46
TORTOLITA	MARANA	Interstate Development Zones	3,005.39
TORTOLITA	MARANA	Low Density Residential	6,576.13
TORTOLITA	MARANA	Medium to High Density Residential	2,842.27
TORTOLITA	MARANA	Open Space: Agriculture	3,990.58
TORTOLITA	MARANA	Open Space: Recreational	3,733.56
TORTOLITA	MARANA	Public Facility	150.45
TORTOLITA	PIMA COUNTY	Community Development Zones	127.13
TORTOLITA	PIMA COUNTY	Industrial/Business Park	280.58
TORTOLITA	PIMA COUNTY	Interstate Development Zones	1,267.18
TORTOLITA	PIMA COUNTY	Commercial: Community	107.30
TORTOLITA	PIMA COUNTY	Community Development Zones	16,598.99
TORTOLITA	PIMA COUNTY	Industrial/Business Park	182.50
TORTOLITA	PIMA COUNTY	Low Density Residential	11,806.73
TORTOLITA	PIMA COUNTY	Medium to High Density Residential	278.39
TORTOLITA	PIMA COUNTY	Open Space: Agriculture	6,470.00
TORTOLITA	PIMA COUNTY	Open Space: Recreational	1,514.70
TORTOLITA	PIMA COUNTY	Public Facility	57.96
SUB TOTAL			70,356.38
TOTAL			90,344.63

Town of Oro Valley

The planned land use for the Town, is shown in **Table 4**. It reflects the continuation of current trends, with proportionate increases in residential, commercial and open space land uses. There are also proposals for a Commerce Park (950 acres) and considerable increase in Neighborhood Commercial(740 acres). There is however, no provision for additional industrial land uses.

Table 4

WATERSHED	JURISDICTION	PLANNED LAND USE	ACRES
TORTOLITA	ORO VALLEY	COMMERCE PARK	953.48
TORTOLITA	ORO VALLEY	COMMUNITY COMMERCIAL	70.08
TORTOLITA	ORO VALLEY	HIGH DENS RES (10+ DU/ac)	412.48
TORTOLITA	ORO VALLEY	LOW DENS RES (0.4-0.5 DU/ac)	131.16
TORTOLITA	ORO VALLEY	LOW DENS RES (0.6-1.2 DU/ac)	3,851.49
TORTOLITA	ORO VALLEY	LOW DENS RES (1.3-2.0 DU/ac)	594.56
TORTOLITA	ORO VALLEY	MASTER PLANNED COMMUNITY	295.31
TORTOLITA	ORO VALLEY	MED DENS RES (2.1-5.0 DU/ac)	4,975.11
TORTOLITA	ORO VALLEY	NEIGHBORHOOD COMMERCIAL	738.25
TORTOLITA	ORO VALLEY	OFFICE	58.49
TORTOLITA	ORO VALLEY	PARKS/OPEN SPACE	4,127.35
TORTOLITA	ORO VALLEY	PUBLIC/SEMI-PUBLIC	129.95
TORTOLITA	ORO VALLEY	REGIONAL COMMERCIAL	298.89
TORTOLITA	ORO VALLEY	RURAL LOW DENS RES (0-0.3 DU/ac)	1,555.66
TORTOLITA	ORO VALLEY	SCHOOLS	320.08
TOTAL			18,512.34

The Town plans on adding approximately 5,000 acres of Medium Density Residential, 4,600 acres of Low Density Residential, 1,500 acres of Rural Low Density Residential and 400 acres of High Density Residential uses.

In spite of its current identity of a bedroom community to Tucson, Oro Valley has intentions of diversifying its economy to include commercial and service-based employment opportunities.

The current plans for parks/open space on vacant land sets aside over 4,000 acres of land. Other uses include Public/Semi-Public uses (130 acres), Schools (320 acres), Master Planned Communities (300 acres) and Office Facilities (60 acres).

3. Zoning

In unincorporated Pima County, an area of approximately 58,905 acres are vacant with zoning designations, of which roughly 49,080 acres (83.3 percent) are zoned RH Rural Homestead. Other zone districts, in excess of 1,000 acres, include SR Suburban Ranch (5,884 acres) and GR-1 Rural Residential (2,176 acres), as shown in **Table 5**.

Single family residence (CR-1, CR-2, CR-3) equals 355 acres, commercial equals about 207 acres and industrial equals 185 acres.

Table 5

**ZONING ON VACANT LAND - TORTOLITA FAN WATERSHED
UNINCORPORATED PIMA COUNTY**

ZONING DISTRICT	ACRES
IR INSTITUTIONAL RESERVE	28.39
RH RURAL HOMESTEAD	49,080.26
SR SUBURBAN RANCH	5,883.99
GR-1 RURAL RESIDENTIAL	2,176.06
CR-1 SINGLE RESIDENCE	309.47
CR-2 SINGLE RESIDENCE	3.67
CR-3 SINGLE RESIDENCE	42.11
CR-4 MIXED DWELLING TYPE	52.53
CR-5 MULTIPLE RESIDENCE	308.89
SH SUBURBAN HOMESTEAD	282.32
TH TRAILER HOMESITE	7.36
TR TRANSITIONAL	143.04
MR MAJOR RESORT	29.63
RVC RURAL VILLAGE CENTER	17.56
CB-1 LOCAL BUSINESS	138.51
CB-2 GENERAL BUSINESS	68.45
CPI CAMPUS PARK INDUSTRIAL	21.73
CI-1 LIGHT INDUSTRIAL/WAREHOUSE	-
CI-2 GENERAL INDUSTRIAL	184.00
CI-3 HEAVY INDUSTRIAL	1.60
SP SPECIFIC PLAN	125.83
TOTAL	58,905.40

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 1,987 lots - subject to zoning changes - on a total of approximately 913 acres (at the maximum allowable density for each zone district).

Most of these rezonings are requests for a change from GR Rural Residential, to SH Suburban Homestead, or from SR Suburban Ranch to CR Single Residence zone districts. There are four major rezoning requests on land exceeding 100 acres each: 1) from GR to CR-3 on 110 acres, 2) the Miraval Specific Plan (RH and GR-1 to SP) on 238 acres, 3) GR to SH on 150 acres, and 4) SH to TH on 147 acres.

Table 6

CASE #	CURRENT_ZONE	TO	FROM	ACRES	PROPOSED_LOTS	CONDITIONAL	T-R-S	BASEMAP
Co9-63-095	CR-3	CR-3	GR	110	599	YES	11-14-03	519
Co9-63-095	TR	TR	GR	20	87	YES	11-14-03	519
Co9-81-129	CR-3	CR-3	TR	4.45	24	YES	11-14-09	432, 519
Co9-93-021	SH	SH	GR-1	1.25	1	YES	11-14-04	519
Co9-89-057	SH	SH	GR-1	0.84	1	YES	11-14-03	519
Co9-89-058	SH	SH	GR-1	1	1	YES	11-14-03	519
Co9-95-025	SH	SH	GR-1	1.25	1	YES	11-14-04	519
Co9-93-051	SH	SH	GR-1	1.5	1	YES	11-14-04	519
Co9-98-014	SH	SH	GR-1	1.12	1	YES	11-14-04	519
Co9-98-008	SH	SH	GR-1	1.02	1	YES	11-14-04	519
Co9-84-124	SH	SH	GR	1.2	1	YES	11-14-04	519
Co9-71-061	CMH-1	CMH-1	CB-2	0.5	2	YES	11-14-04, 09	519
Co9-80-200	SH	SH	GR	5	5	YES	11-15-07	519
Co9-97-042	CR-1	CR-1	SR	8.2	8	YES	12-13-17	161, 162
Co9-66-010	CR-1	CR-1	SR	5	5	YES	12-13-20	161
Co9-99-002	CR-1	CR-1	SR	15.95	15	YES	12-13-15, 16	162
Co9-97-042	CR-1	CR-1	SR	8.2	8	YES	12-13-17	162
Co9-97-021	CR-3	CR-3	SR	6.22	33	YES	12-13-21	162
Co9-94-037	CR-5	CR-5	SR	14.9	108	YES	12-13-28	115
Co9-88-018	CR-5	CR-5	SR	12.57	91	YES	12-13-27	115
Co9-70-118	CR-1	CR-1	SR	43	43	YES	12-13-27	115
Co9-95-058	CR-1	CR-1	SR	4.77	4	YES	12-13-35	116
Co9-84-127	SH	SH	GR	0.99	1	YES	11-14-03	520
Co9-81-119	CR-1	CR-1	GR	24	24	YES	11-14-03	520
Co23-96-001	SP (MIRAVALE)	SP	RH, GR-1, GR	238	226	YES	11-14-02	520
Co9-72-010	SH	SH	GR	4.93	4	NO	11-14-09	432
Co9-85-098	CB-1	CB-1	GR-1	23.41	102	YES	11-14-09	432
Co9-99-006	TR	TR	GR-1	2.5	10	YES	11-14-09	432
Co9-70-069	SH	SH	GR	150	150	YES	11-14-15	432
Co9-94-059	CR-1	CR-1	RH	3.11	3	YES	11-12-26	278
Co9-97-042	CR-1	CR-1	SR	8.2	8	YES	12-13-17	161, 162
Co9-66-010	CR-1	CR-1	SR	20	20	YES	12-13-20	161
Co9-98-011	CR-3	CR-3	SR	4.77	26	YES	12-13-31	114
Co9-95-066	CR-1	CR-1	SR	3.4	3	YES	12-13-31	75, 114
Co9-70-039	TH	TH	SH	147	355	YES	12-12-26	113, 114
Co9-67-045	CR-1	CR-1	SR	15	15	YES	13-12-02	74
TOTAL				913.25	1987			

Town of Marana

The Town's zoning on vacant land occurs on roughly 34,600 acres, as shown in **Table 7**. This does not include land that lies in other watersheds (Avra Valley and Middle Santa Cruz).

Table 7

MARANA - ZONING ON VACANT LAND

WATERSHED	ZONING DISTRICT	SPECIFIC PLAN	ACRES
TORTOLITA	A Small Lot Zone		1,169.95
TORTOLITA	AG Agricultural		40.50
TORTOLITA	B Medium Lot Zone		698.77
TORTOLITA	C Large Lot Zone		8,587.25
TORTOLITA	CO Commercial (Office)		2.62
TORTOLITA	D Designated Floodplain Zone		227.15
TORTOLITA	E Transportation Corridor Zone		2,275.68
TORTOLITA	F Specific Plan Zone	ACACIA HILLS	858.68
TORTOLITA	F Specific Plan Zone	ANWAY FARMS	1,754.00
TORTOLITA	F Specific Plan Zone	CALMAT	128.79
TORTOLITA	F Specific Plan Zone	CONTINENTAL RANCH	829.24
TORTOLITA	F Specific Plan Zone	DOVE MOUNTAIN	416.82
TORTOLITA	F Specific Plan Zone	FOOTHILLS	1,584.06
TORTOLITA	F Specific Plan Zone	FOREST CITY	207.46
TORTOLITA	F Specific Plan Zone	HARTMAN HILLS	4,664.00
TORTOLITA	F Specific Plan Zone	MARANA GARDENS	7.87
TORTOLITA	F Specific Plan Zone	NORTHGATE	598.40
TORTOLITA	F Specific Plan Zone	PIMA FARMS	727.50
TORTOLITA	F Specific Plan Zone	PIMA FARMS NORTH	3.97
TORTOLITA	F Specific Plan Zone	RANCHO MARANA	244.72
TORTOLITA	F Specific Plan Zone	TANGERINE HILLS	72.18
TORTOLITA	HI Heavy Industrial		204.18
TORTOLITA	LI Light Industrial		233.36
TORTOLITA	MH Manufactured Housing		34.28
TORTOLITA	MR-1 Multi-Family (High Density)		8.90
TORTOLITA	MR-2 Multi-Family (Med/High Density)		28.21
TORTOLITA	NC Neighborhood Commercial		34.28
TORTOLITA	R-144 Single Family Residential		833.65
TORTOLITA	R-16 Single Family Residential		41.16
TORTOLITA	R-36 Single Family Residential		1,180.82
TORTOLITA	R-6 Single Family Residential		1,185.01
TORTOLITA	R-7 Single Family Residential		15.85
TORTOLITA	R-8 Single Family Residential		5,226.85
TORTOLITA	VC Village Commercial		485.75
TOTAL			34,611.87

Residential uses account for the bulk of zoned vacant land. Of approximately 37,200 acres of vacant land with zoning designations, approximately 20,000 acres account for residential use

zones. The Specific Plan Zones account for roughly 13,425 acres. Single family residential zones are anticipated on approximately 7,300 acres. Large lot zones account for 9,517 acres, and small/medium lot zones for roughly 1,870 acres. In contrast, multifamily zone districts account for less than 40 acres and manufactured home zones total less than 35 acres.

The zoned vacant land for industrial (light and heavy) equals about 460 acres, village commercial is roughly 485 acres, neighborhood commercial is about 34 acres and office commercial is at a low three acres.

Town of Oro Valley

The Town’s zoning on vacant land occurs on roughly 8,443 acres, as shown in **Table 8**. Single Family Residential uses account for the bulk of zoned vacant land, measuring 4,770 acres.

Other zone districts include Commercial (C-1 and C-2) on 792 acres, Multi-Family Residential on 313 acres, Townhouse Residential on 739 acres, Parks and Open Space on 910 acres, Private Schools and Churches on 167 acres, and Technological Parks on 711 acres.

Table 8

ORO VALLEY - ZONING ON VACANT LAND

ZONING DISTRICT	ACRES
R1-144 Single Family Residential	2,625.47
R1-43 Single Family Residential	66.85
R1-36 Single Family Residential	572.85
R1-20 Single Family Residential	675.33
R1-10 Single Family Residential	432.62
R1-7 Single Family Residential	396.76
R-6 Multi-Family Residential	312.99
R-4 Townhouse Residential	738.56
R-4R Resort District	4.78
R-S Residential Service District	30.52
C-N Neighborhood Commercial	6.10
C-1 Commercial	414.61
C-2 Commercial	377.72
P/OS Parks and Open Space	909.57
PS&C Private Schools and Churches	167.11
TP Technological Park	711.45
TOTAL	8,443.29

D. Topography

The Tortolita Fan watershed topography is composed of peaks and ridges to the north and east and an extension of the Tucson basin to the west and south. The Pusch and Samaniega Ridges of the Santa Catalina mountains are to the east of the watershed. The Tortolita Mountains are to the north.

The low-lying areas vary in altitude ranging between 750 and 1,700 meters above the mean sea level (MSL). The mountain ranges vary in altitude between 1,300 and 2,800 meters above MSL. Some of the prominent peaks of the mountain ranges, that lie within the watershed, are listed in **Table 8**.

Table 8

MOUNTAINS	PEAKS	ALTITUDE (METERS)*	LOCATION
PUSCH RIDGE	Bighorn	1,700	T12S, R14E
	Buster	1,401	T12S, R14E
	Cathedral	2,452	T12S, R15E
	Kimbal	2,212	T12S, R14E
	Pusch	1,634	T12S, R14E
	Rosewood Point	1,337	T12S, R14E
	Table	1,900	T12S, R14E
SAMANIEGA RIDGE	Lemmon	2,791	T11S, R15E
	Red Ridge	2,100	T11S, R15E
	Reef of Rock	2,300	T11S, R15E
	Samaniega	2,300	T11S, R15E

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

* Highest point of any given peak (within watershed)

There are several canyons in the Pusch and Samaniega Ridges that connect with the valley to the west. **Table 9**, lists some of the prominent canyons that lie within the watershed.

Table 9

CANYON	AVG. ALTITUDE	LOCATION	PROXIMITY
Alamo	900 - 1,250	T12S, R14E	South of Catalina State Park
Cañada Agua	900 - 1,200	T11S, R13E	East of Dove Mountain
Cargodera	1,250	T11S, R15E	East of Catalina State Park
Cochie	750 - 850	T11S, R12E	North of Dove Mountain
Honey Bee	900 - 1,000	T11S, R13E	North of Oro Valley
Montrose	1,000 - 1,700	T12S, R14E	South-east of Catalina State Park
Pima	900 - 1,700	T12S, R14E	E. of Oro Valley/N. of Casas Adobes
Romero	1,500	T11S, R14E	South-east of Catalina State Park
Ruelas	900 - 1,100	T11S, R13E	North-east Marana (Dove Mountain)
Wild Burro	800 - 1,000	T11S, R12E	North-east Marana (Dove Mountain)

The Big Wash, Cañada del Oro, Chalk Creek, Pima, Sahuarita, Sutherland, Sausalita Creek are some of the washes in the watershed. The northern part of the Rillito River also lies in the watershed.

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 Santa Cruz River, Cañada del Oro, Honey Bee Canyon, Ruelas Canyon, and Wild Burro Canyon lie in the watershed. Of the 82 intermittent stream reaches, the Cañada del Oro, Cargodera Canyon, Pima Canyon and Sutherland Wash 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), Mogollon Chaparral Scrubland (Mixed Evergreen Sclerophyl), Sonoran Desert Scrub (Paloverde - Mixed Cacti), Sonoran Desert Scrub (Saltbush), and Sonoran Desert Scrub (Creosotebush - Bursage).⁷ Some vegetation types are unclassified in the GAP/EROS maps. There are also large areas of agriculture, mining and urban activities.

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 Tortolita Fan watershed's prime viewsheds are the Santa Catalina, Tortolita and Tucson Mountain Ranges, offering wonderful panoramic views.

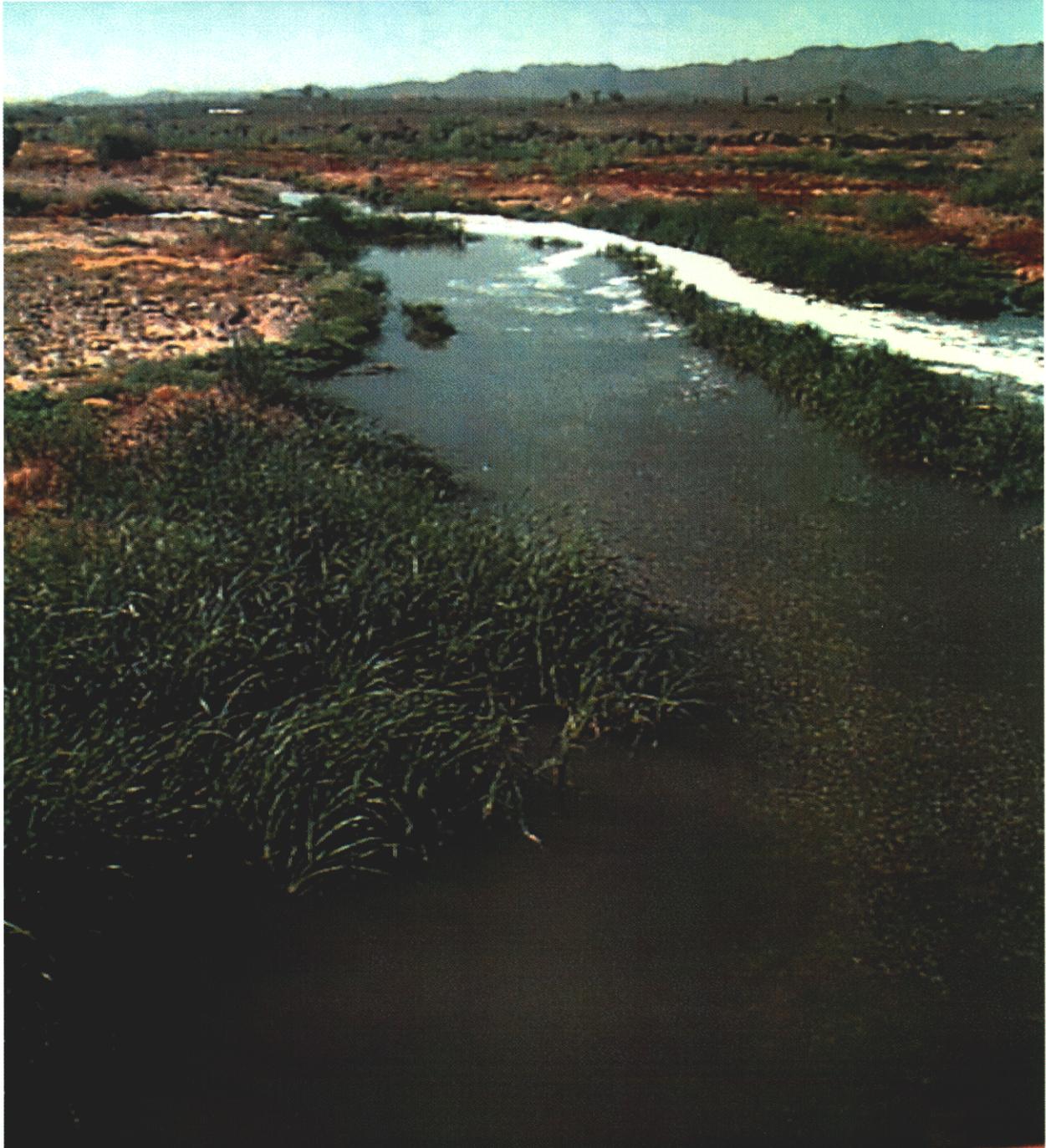


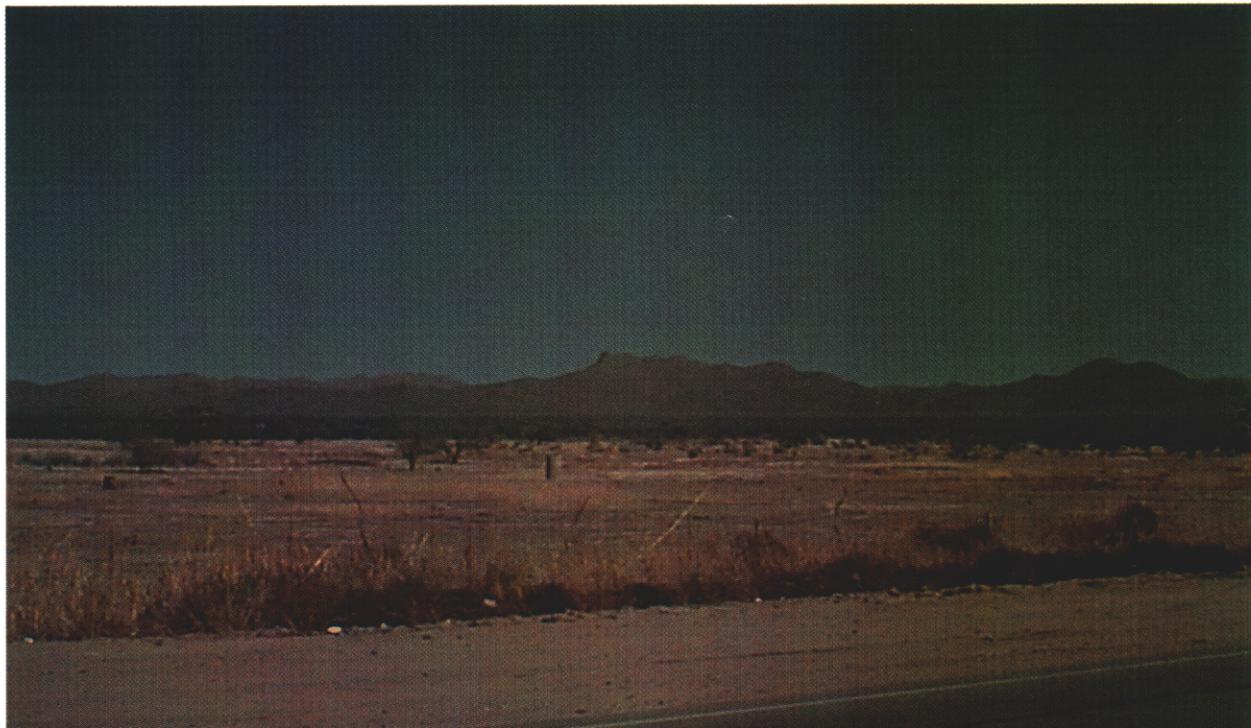
Plate I (above): Santa Cruz River, Ina Road, looking south



Plate II (above): Western part of Tortolita watershed with Rattlesnake Pass in the back ground.

Draft

Plate III (below): Tortolita watershed



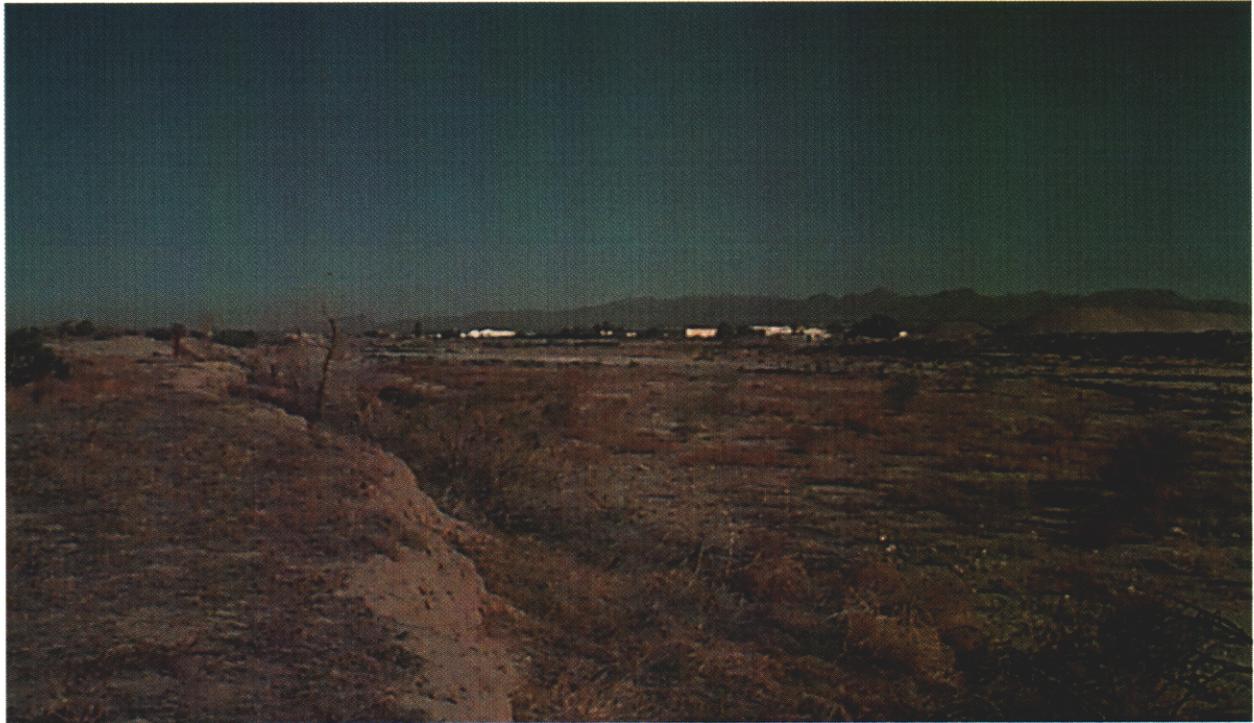


Plate IV (above): Looking north at Santa Cruz River, unincorporated Pima County and Tortolita Mountains

Plate V (below): Unincorporated Pima County, looking southwest from Twin Peaks Road/Rattlesnake Pass

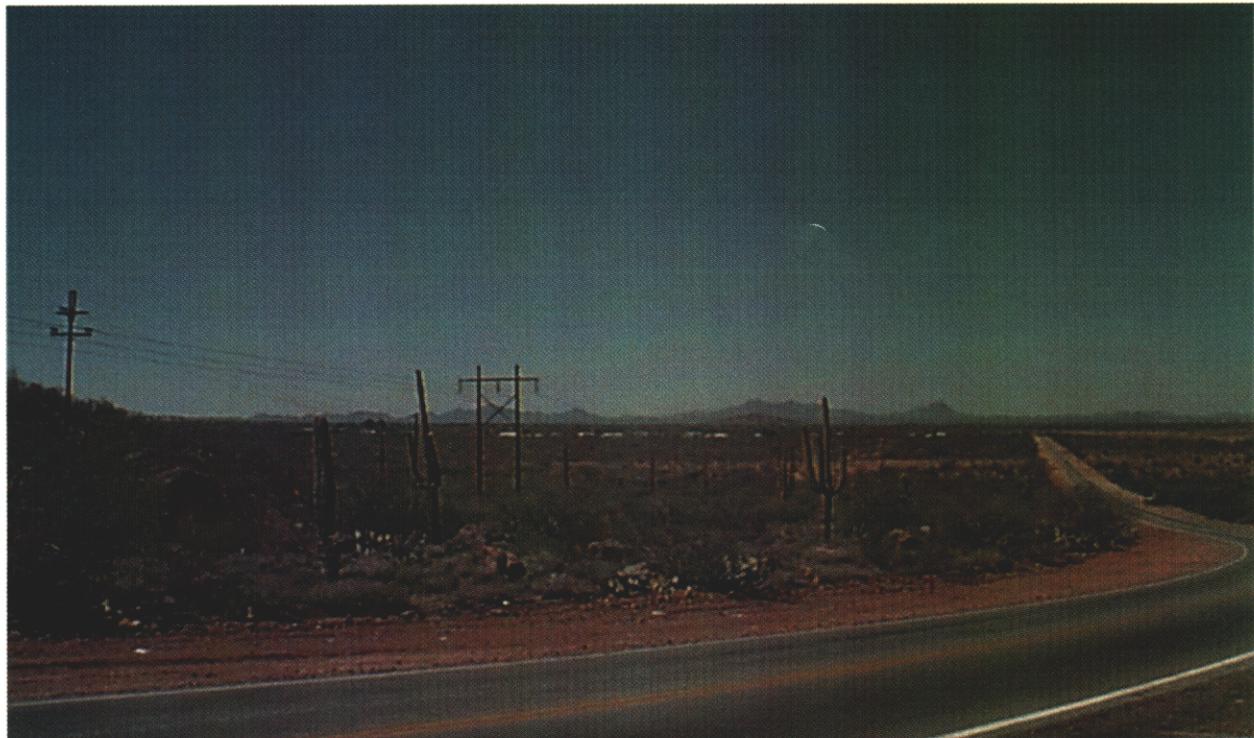
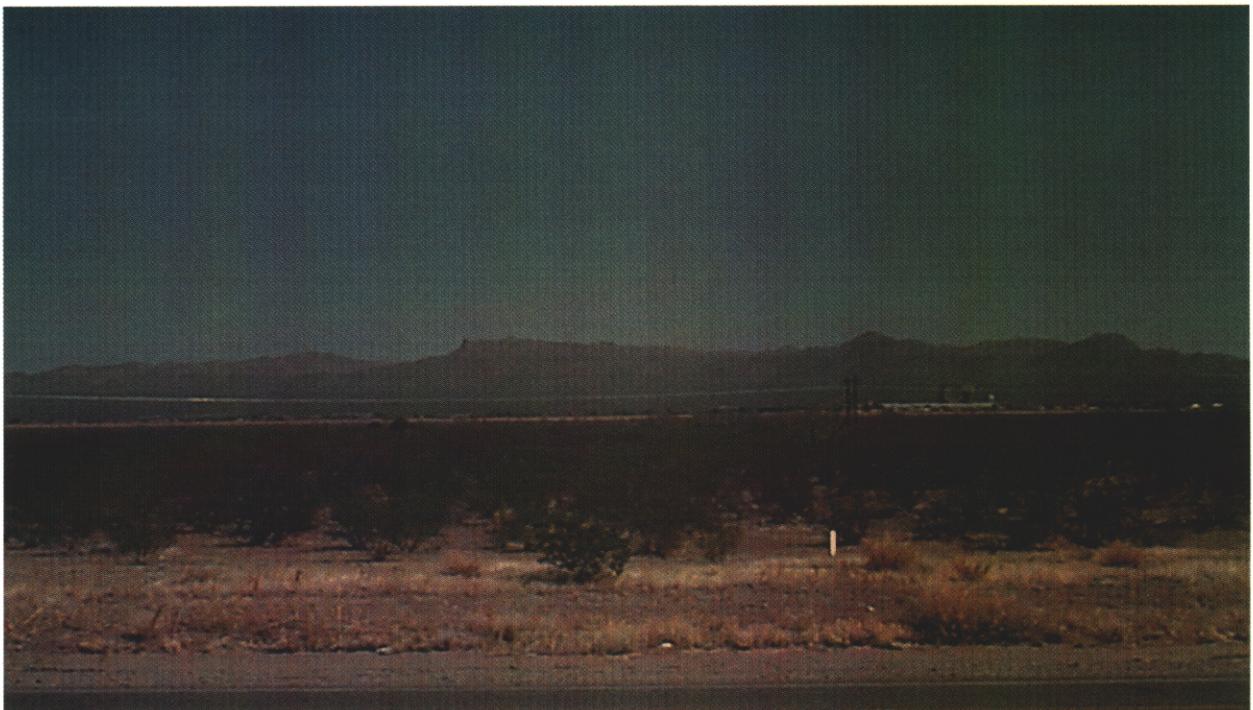




Plate VIII (above): Marana residential development (Silverbell Road and Linda Vista Boulevard)

Plate IX (below): Western part of Tortolita watershed



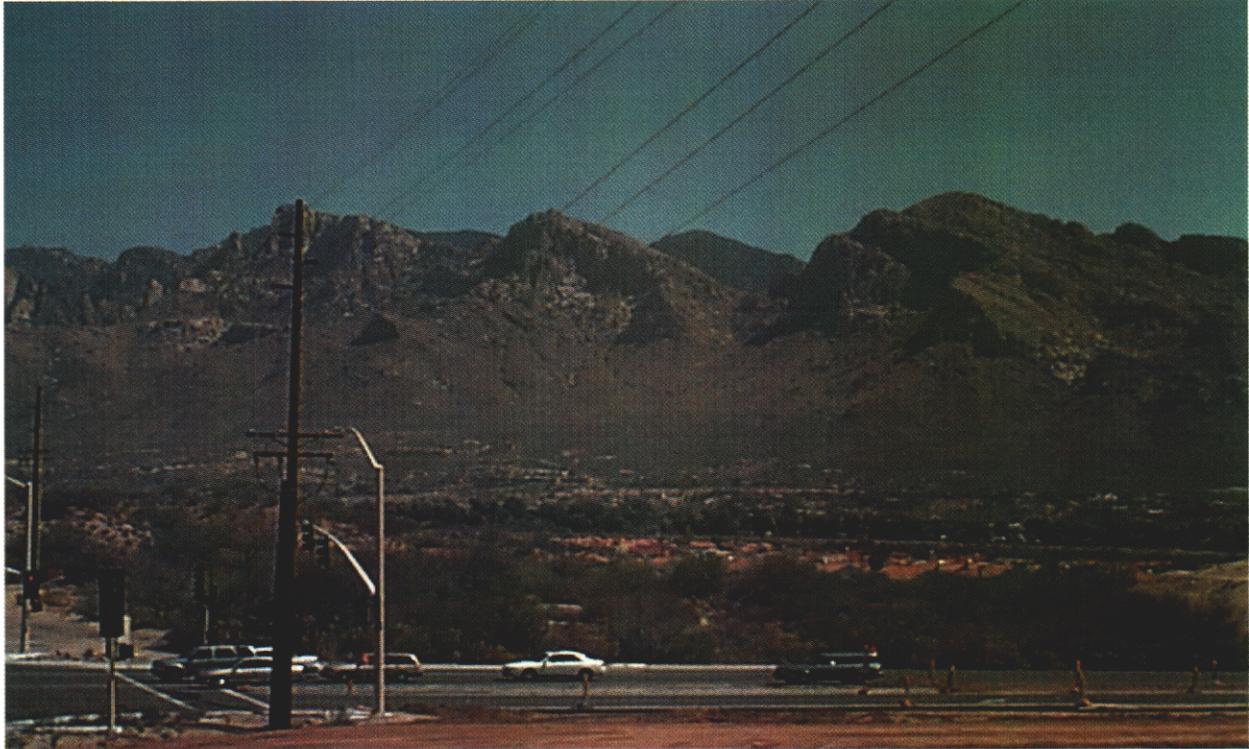
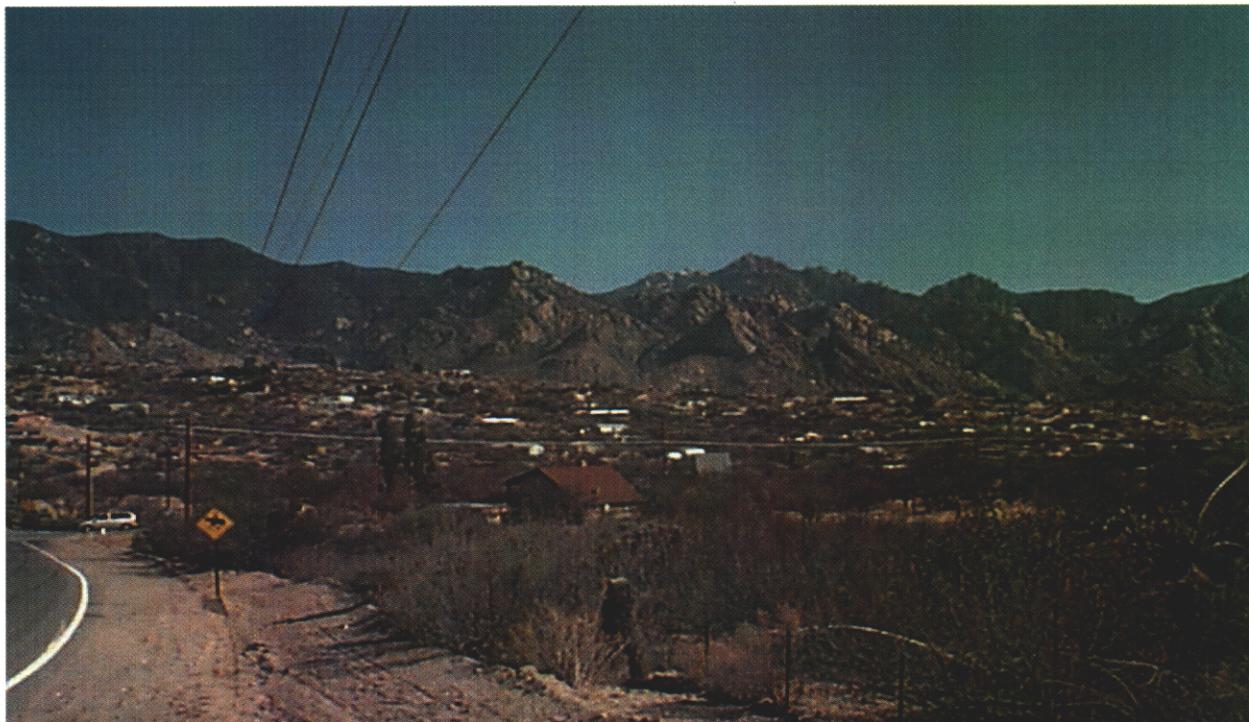


Plate X (above): Oro Valley, looking east from La Cañada Drive and Lambert Lane

Draft

Plate XI (below): Oro Valley, looking south-east from Golder Ranch Road and Lago del Oro



I. Infrastructure

The major areas of development are in Tortolita, northern Casas Adobes and Catalina (all within unincorporated Pima County) and the municipalities of Marana and Oro Valley.

1. Roads and Access

Within this watershed, Interstate 10 connects metro Tucson in a north-westerly direction to Pinal County. State Highway 77 (Oracle Road) connects metro Tucson in a northerly direction to Pinal County. Interstate 10 and State Highway 77 are both designated "Major Streets and Scenic Routes" with special zoning regulations for abutting properties.

Other designated major streets and scenic routes within the watershed are: Tangerine Road, Moore Road, Lambert Lane, Shannon Road, Lago del Oro Parkway, Golder Ranch Road, Avra Valley Road, Sunset Road, Twin Peaks, and Linda Vista Boulevard/Hardy Road. Tangerine Road is a major link between I-10 and Oracle Road and further south are Magee/Cortaro Farms Road and Orange Grove Road. This area is the recipient of many of the November 1997 transportation bond improvement projects such as several focused on portions of Thornydale Road, La Cañada Drive, and Orange Grove Road.

2. Water

This watershed lies within the Department of Water Resources Tucson Active Management Area. There are 19 water companies located in this watershed from the tiny Despoblado Water Company serving a small area near Overton Road between La Cholla Boulevard and La Cañada Drive to the very large service areas of Tucson Water Company, Cortaro Marana Water Company, Lago del Oro Water Company, and Metropolitan Water Company (northwest urban area). Outside of these areas served by water companies, private wells are used.

The water companies and their general service areas are: Canada Hills Water Company (T12S, R12E, Sections 23 and 24, and south of Rancho Vistoso); Cortaro Water Company (T12S, R12E, Sections 8 and 17); Cortaro Marana Water Company covers a large area along I-10 up to Pinal County; Dateland Water Company (Shannon and Hardy Roads); Despoblado Water Company (Overton Road between La Cholla Boulevard and La Cañada Drive); Honea Water Company (T11S, R11E, Section 33); Lago del Oro Water Company (Catalina area); Logan Hills Water Company (North Sunset and Abington Roads); Los Cerros Water Company (Golder Ranch Road and Lago del Oro Boulevard); Lynn Lee Water Company (T11S, R10E, Section 24); Marana Water Company (T12S, R12E, Section 7, and Ina and Wade Roads); Mesaland Water Company (La Cañada Dr. and Hardy Road), Metropolitan Water Company (Overton Road and La Cholla Boulevard); Proctor Water Company (Oracle Road and 1st Avenue); Rancho Vistoso Water Company (the Rancho Vistoso development); Rillito Water Users Association (T12S, R12E, Section 6); Tortolitas Water Company (T11S, R12E, Section 26); Tucson Water Company; Village Water Company (T11S, R11E, Section 20 - Southeastern quadrant, and T12S, R12E, Section 8).

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 Tortolita Fan area has been partially developed east of the Camino de Oeste alignment, and into the Oro Valley and Catalina areas, mostly on sewers. The eastern Catalina area near the Cañada del Oro wash is being developed on septic tanks.

The Rancho Vistoso, Countryside and Continental Ranch areas have sanitary sewers. The proposed development inside the Rancho Vistoso Boulevard loop will require public sewer (Honey Bee Canyon Outfall) adjacent to Big Wash to near Tangerine Road.

The existing Dove Mountain area now connects by means of a pump station to a gravity flow sewer in the Camino de Oeste alignment. The Dove Mountain Bajada area is to be developed by means of a new gravity flow sewer flowing southerly into the Continental Ranch Regional Wastewater Permanent Pump Station. The Dove Mountain Bajada is in the planning review process for plats and sewer plans.

The areas north of Cortaro Road and north-east of I-10, and south of Tangerine Road may develop in the near future. Sanitary sewers will have to be extended into any high density developments in this area. Only small areas south-west of Silverbell Road are connected to the sewer; large parts of this area are on septic systems, and other parts remain undeveloped.

The Santa Cruz River flood protection levee in Marana (almost completed) will open up development east of Sanders Road and north of the Santa Cruz River. Several rezoning of Specific Plan amendments have been submitted. Significant treatment and conveyance sewer construction will be necessary to provide capacity for the proposed developments.

4. Natural Gas

Much of this watershed is served by Southwest Gas Company (e.g. Dove Mountain development area, Catalina, northwest urban areas) or otherwise by private, propane tanks.

5. Telephone and Electricity

U.S. West serves this area. The West Ina District of Tucson Electric Power Company serves the entire watershed except the portion roughly described as north of I-10 and El Camino de Manana which is served by Trico Electric Coop.

6. Schools

The following school districts overlay this watershed:

- a. Amphitheater S.D. covers the northeastern portion of the watershed. The district has 13 elementary schools, three middle schools, and one high school.
- b. The Flowing Wells S.D. overlaps a small piece of the watershed generally described as north of Orange Grove Road, south of Ina Road, between Shannon Road and Camino de Oeste.
- c. The remainder of the watershed (western portion) is within the Marana School District. The district has nine elementary schools, four middle schools, and two high schools.

7. Parks

The following Pima County parks and recreational facilities are located within this watershed:

- a. Catalina Recreation Center - community of Catalina
- b. Denny Dunn Park - northwest of Massingale Road and Oldfather Place
- c. Sunset Pt. Park - northwest of Cortaro Farms Road and Camino de Oeste
- d. Richardson Park - southeast of Ina and Thornydale Roads
- e. Ted Walker Park - southwest of Ina Road and I-10
- f. Rillito Vista Park Recreation Center - community of Rillito
- g. Arthur Pack Park - southwest corner of Linda Vista and Thornydale Roads (500 acres).

Other park facilities (and their ownership or agency) within this watershed are:

- a. Coronado National Forest (Catalina Mountains) - acts as eastern boundary of watershed
- b. Catalina State Park (State of Arizona park) - Oracle Road/south of Catalina community
- c. Saguaro National Park (west) - acts as western boundary of watershed
- d. Dennis Weaver Park - within the Town of Oro Valley.
- e. Marana Park - near Grier Road & I-10/Town of Marana
- f. Archaeo Park - near Cortaro Road & Hartmann, within a subdivision but not part of the plat (owned by The Archaeological Center)
- g. Tortolita Mountain Park (Arizona State Land Department) - near Pinal County boundary and west of Oracle Road

Town of Marana

Transportation:

Currently, the Town's main transportation access into Tucson is I-10. An alternate route is Silverbell Road, parallel to- and approximately a mile west of I-10. Within the corporate limits, the main arteries are Avra Valley Road, Dove Mountain Boulevard, Sanders, Tangerine and Trico Marana roads.

Parks and Open Space:

Water service to the Town are provided by both Tucson Water and the Town of Marana, which is currently expanding its utility role.

Sanitary Sewers:

Service is provided by Pima County Wastewater. Significant plans for increased sanitary sewer capacity are underway, particularly for north-west Marana.

Schools:

The Town of Marana is within the Marana Unified School District.

Parks and Open Space:

The Town recently completed a Parks, Open Space and Trails Master Plan, the recommendations of which provides the basis for the Town's Active Park Development Program.

J. Open Space

The primary open spaces in the watershed are the reserves. Studies were done where "reserve boundaries were verified by land managers,"⁸

Table 10

NO	RESERVE	PROTECTION STATUS (GAP)	ACRES (APPROX).	LOCATION
1.	Catalina State Park	2	5,493	T11-12S, R14E
2.	Coronado National Forest	3-b	43,346	T11-12S, R14-15E
3.	Saguaro National Park (West)	1-b	5,942	T12-13S, R11-12E
	TOTAL		54,781	

The reserves that lie partially or wholly within the watershed are the Catalina State Park, Coronado National Forest and Saguaro National Park (West).⁹ The combined total of the reserves account for about 54,781 acres (27 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.¹⁰

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.”¹¹

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.”¹²

The large areas of unplatted land (wild cat, lot-splitting) are to the north-east. These contribute to the disparity in fiscal capacity when compared with platted land. The watershed has four of the sixteen urbanizing areas and part of one in Pima County.¹³ In terms of infrastructure and fiscal strength, cash value of platted and unplatted land in the four areas is shown in **Table 11**, below.¹⁴

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.”¹⁵

Table 11

URBANIZING AREAS	UNPLATTED *	PLATTED (P)*	U.P. AND P.*
Catalina (4 % platted)	\$12,852	\$68,859	\$15,346
Marana (7 % platted)	\$4,351	\$156,785	\$14,896
Oro Valley (50 % platted)	\$27,364	\$188,642	\$108,312
Tortolita (5 % platted)	\$17,957	\$46,158	\$19,307
Casas Adobes (Part) (69 % platted)	\$68,791	\$214,531	\$168,638

* Full Cash Value per Acre

M. Capital Improvement Projects (by Departments)

There are a total of 47 capital improvement projects underway involving \$114,284,717, 11 in Parks and Recreation, 18 in Transportation, eight in Flood Control, three in Facilities Management, five in Wastewater Management, one in Cultural Resources and one currently unfunded project.

Parks and Recreation

Avra Valley Rd. Bridge at Santa Cruz River County HURF, AZ Special Appropriations)**	\$2,677,513
Thornsdale: Orange Grove to Ina Rd. (HURF Bond No. DOT-21, Urban HURF)**	3,021,807
Cortaro Farms Rd.: I-10 to Thornsdale (HURF Bond No. DOT-18, Impact Fees)	17,092,835
Twin Peaks Rd.: Sidewinder Rd. to Marana Town Limits (Impact Fees)	5,200,000
Thornsdale Rd.: Ina to Cortaro Farms Rd. (HURF Bond No. DOT-22, County HURF, Urban HURF)	11,623,648
Thornsdale Rd.: Cortaro Farms to Linda Vista (HURF Bond No. DOT-23, Urban HURF)	9,625,000
La Canada: Ina to Lambert Ln. (HURF Bond No. DOT-10, Urban HURF, Impact Fees)	21,250,000
Hartman Ln. North of Cortaro Farms Rd. (HURF Bond No. DOT-19)	530,000
Mainsail Blvd. & Twin Lakes Dr., 27 Wash (HURF Bond No. DOT-24)	2,625,000
Hardy Rd. & Thornsdale (Impact Fees)	228,620
Shannon Rd.: Ina to Magee Rd. (Urban HURF)	5,750,000
Total:	<u>\$79,624,423</u>

Transportation

Upper Honeybee Canyon (General Obligation Bond No. RW-15)*	\$1,000,000
Tucson Mountain Park – Los Morteros (General Obligation Bond No. SD-04)	276,972
Tortolita Mountain Park (General Obligation Bond No. SD-05, Pinal County)	640,583
Tortolita Ironwood Forrest (General Obligation Bond No. SD-06)*	3,000,000
Catalina State Park Expansion (General Obligation Bond No. SD-07)*	1,000,000
Dennis Weaver Park Improvements (General Obligation Bond No. P-09)	250,000
Coronado Middle School Playing Field (General Obligation Bond No. P-10)	64,316
Catalina Park Land Acquisition (General Obligation Bond No. P-27)	200,000
Oro Valley/Canada del Oro River Park (General Obligation Bond No. P-34)	1,000,000
Canada del Oro Riverfront Park (General Obligation Bond No. P-39, Oro Valley)	1,087,000
Roadrunner School/Community Park (General Obligation Bond No. P-43)	200,000
Marana Rattlesnake Park, Continental Ranch (General Obligation Bond No. P-45)	500,000
Northwest Community Center (General Obligation Bond No. P-58)	4,274,707
Ted Walker District Park (General Fund)**	346,197
Linda Vista Neighborhood Park (General Fund)**	2,463
Central Arizona Project Trailhead (General Obligation Bond No. T-18)	100,000
Tortolita Mountain Park Trail System (General Obligation Bond No. T-20)	150,000
Total:	<u>\$14,092,238</u>

Flood Control

Rillito Creek Bank Stabilization (Corps of Engineers, Flood Control Tax Levy)	\$2,390,838
Highland Wash Channel Improvements (Flood Control Tax Levy, Oro Valley)	1,000,000
Rancho Feliz Drainage Improvements (Flood Control Tax Levy)	282,000

Northwest Replenishment Project	
(Bureau of Reclamation, Flood Control Tax Levy, Political Subdivisions)	1,052,600
Santa Cruz River Study (Flood Control Tax Levy)	412,654
Canada del Oro River Park: Thornydale to Magee (Flood Control Tax Levy)	1,700,000
Santa Cruz River Bank Stabilization near Ina Rd. (Flood Control Tax Levy)**	63,387
Oro Valley Drainage Improvements (General Obligation Bond No. FC-08)	<u>350,000</u>
Total:	\$7,251,479

Facilities Management

Sheriff's New Substations (General Obligation Bond No. S-3)***	\$980,000
Northwest Branch Library, Town of Oro Valley (General Obligation Bond No. L-1)	1,670,000
Marana Library Expansion (General Obligation Bond No. L-4)	<u>100,000</u>
Total:	\$2,750,000

Wastewater Management

Trico-Marana/Sanders WWPS Replacement (System Development Funds)**	\$344,972
Marana WWTF Expansion (System Development Funds)	707,910
Thornydale Rd. Trunk Sewer: Phase I & II (System Development Funds)	1,033,435
Marana WWTF (Sewer Bond No. SS-08, System Development Funds)	3,500,000
Marana Interceptor (Sewer Bond No. SS-12)	<u>50,000</u>
Total:	\$5,636,317

Airport

Avra Valley Airport Widen Light Taxiway (General Fund, ADOT)**	363,245
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Cultural Resources

Los Morteros (General Obligation Bond No. CA-32)	\$542,700
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UNFUNDED PROJECTS:

Tortolita Shooting Range (Parks/Recreation - General Obligation Bond No. SD-11)	\$4,024,315
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PROJECTS ON HOLD:

Tortolita Shooting Range (Parks/Recreation - General Obligation Bond No. SD-11)	\$4,024,315
Avra Valley Airport Fire Suppression System (Transportation, Airports).	

* future project

** completed project

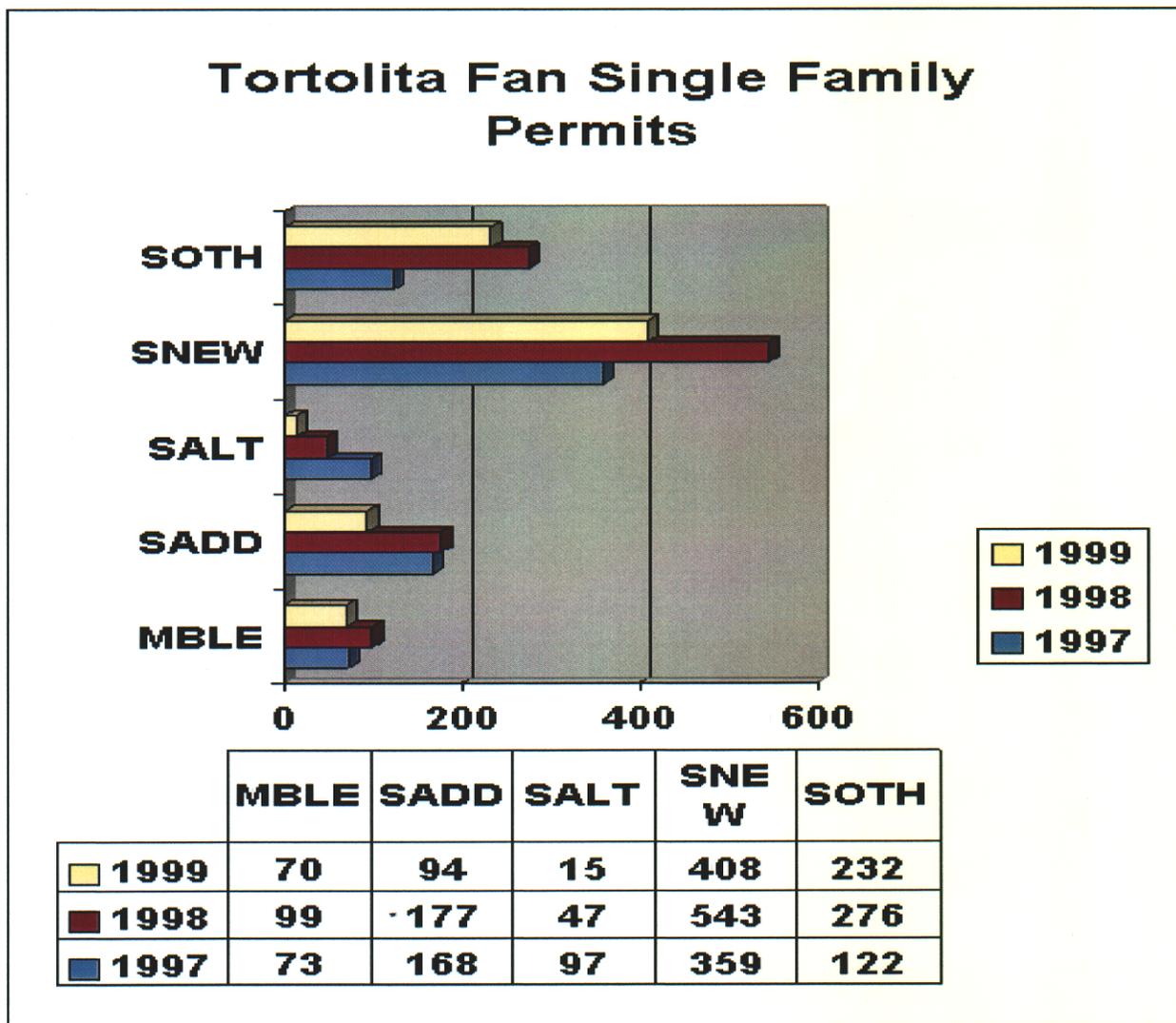
*** Sheriff's New Substations consists of construction of three substations, one of which will be located in the Tortolita Fan area (Catalina).

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 (1,142 permits). Of these, 543 (48 percent) were for new single family residence while 99 (9 percent) were for mobile homes. In 1999, the number of single family residence permits went down from 543 to 359, while mobile home permits saw a decline, by roughly 26 percent, from 99 to 73.

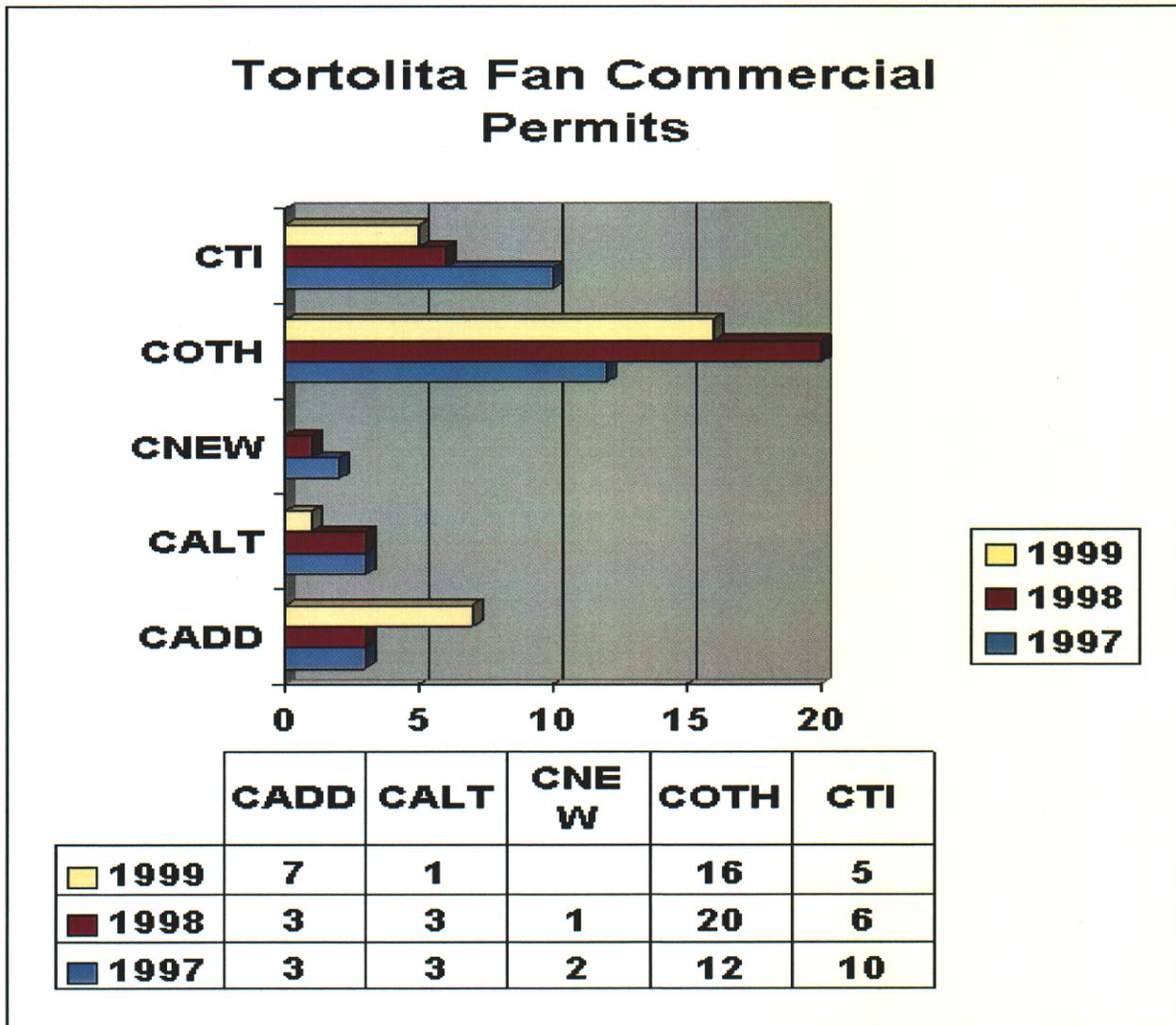
Graph 1



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. Commercial permitting activities have been very consistent in the years between 1997 and 1999.

Graph 2



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

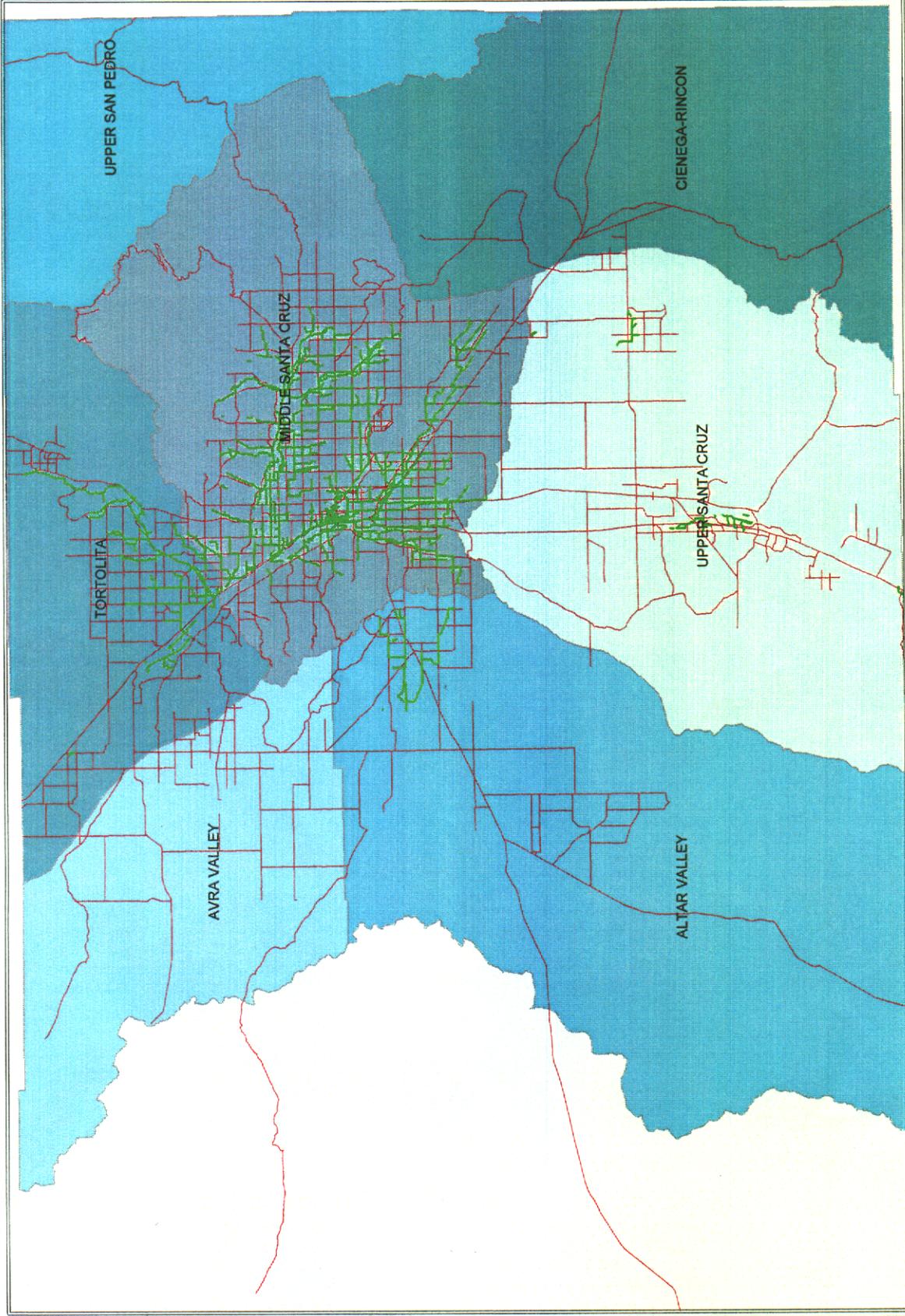
APPENDICES

Maps:

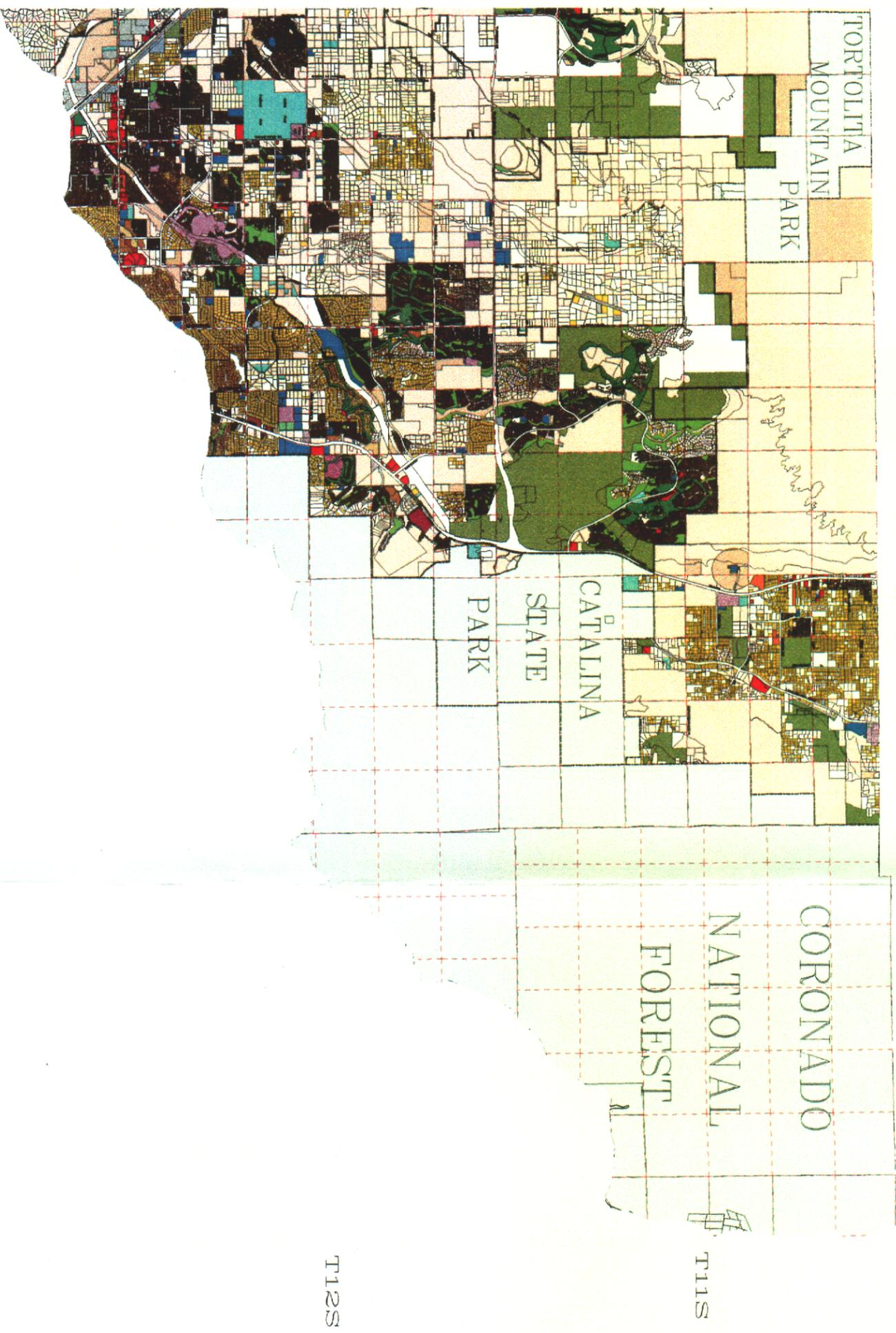
1. Map of Existing Land Use
2. Map of Existing Zoning on Vacant Land (Pima County and)
3. Map of Planned Land Use (Pima County and)
4. Map of Committed Land (Pima County and)
5. Map of Subdivisions on Vacant Land
6. Map of Wastewater Infrastructure

Draft

Wastewater Infrastructure By Watershed Area



- Legend**
- Major Wastewater Lines
 - Major Roadways
- | NAME | Color |
|-------------------|-------------|
| ALTAR VALLEY | Light Blue |
| AVRA VALLEY | Medium Blue |
| CIENEGA-RINCON | Dark Blue |
| MIDDLE SANTA CRUZ | Light Green |
| TORTOLITA | Light Blue |
| UPPER SAN PEDRO | Light Blue |
| UPPER SANTA CRUZ | Light Blue |



R13E

R14E

R15E

T11S

T12S

EXISTING LAND USE

Tortolita Watershed East Half

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 25.0 RAC | | OTHER |
| | GREATER THAN 25 RAC | | MILITARY/ST. POLICE |
| | LODGING | | VACANT-STATE |
| | RESORT | | VACANT-JURISDICTION |
| | OFFICE | | PARTIALLY DEVELOPED |
| | COMMERCIAL | | NO DATA |
| | PVT STREETS | | |

Basemap Features

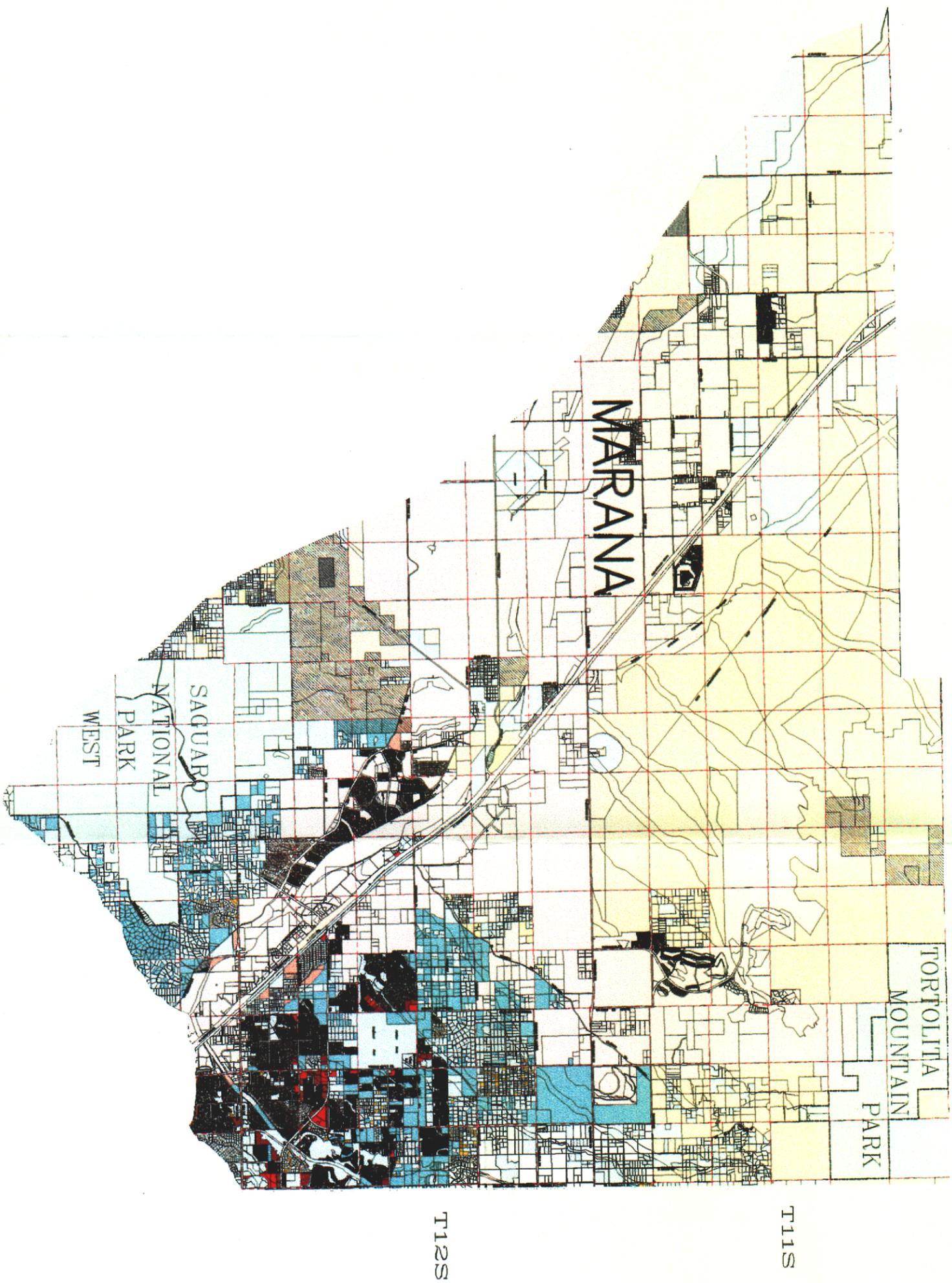
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|--|------------------|--|--------------------------|
| | Public Preserves | | Public Preserve Boundary |
| | Tribal Lands | | City and Town Limits |
| | | | Sections |



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



PLAN COORDINATION:
Pima County Development Services Department
Planning Division, Comprehensive Plan Section
Tucson, Arizona 85711
520.746.6900



R10E

R11E

R12E

R13E

T11S

T12S

EXISTING ZONING

ON VACANT LAND

Unincorporated Pima County

Tortolita Watershed-West Half

15-MAR-2000

Legend

- Zoning Districts**
- IR Institutional Reserve
 - RH Rural Homestead
 - GR-1 Rural Residential
 - SR Suburban Ranch
 - SR-2 Suburban Ranch Estate
 - SH Suburban Homestead
 - CR-1 Single Residence
 - CR-2 Single Residence
 - CR-3 Single Residence
 - CR-4 Mixed Dwelling Type
 - CR-5 Multiple Residence
 - TR Transitional
 - CMH-1 Mobile Home 1
 - Comd1 Zoning Boundary
 - CMH-2 Mobile Home-2
 - TH Trailer Homeite
 - MU Multiple Use
 - MR Major Resort
 - RVC Rural Village Center
 - CB-1 Local Business
 - CB-2 General Business
 - CPI Campus Park Industrial
 - CI-1 Light Industrial/Warehouse
 - CI-2 General Industrial
 - CI-3 Heavy Industrial
 - SP Specific Plan
 - GC Golf Course

Basemap Features

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

Note: Vacant land shown by zoning district color



This map is prepared in accordance with the Pima County Zoning Ordinance, including the Pima County Zoning Ordinance, and the Pima County Zoning Ordinance, and the Pima County Zoning Ordinance.



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R13E

R14E

R15E

EXISTING ZONING ON VACANT LAND

Unincorporated Pima County Tortolita Watershed-East Half

15-MAR-2000

Legend

Zoning Districts

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

Basemap Features

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

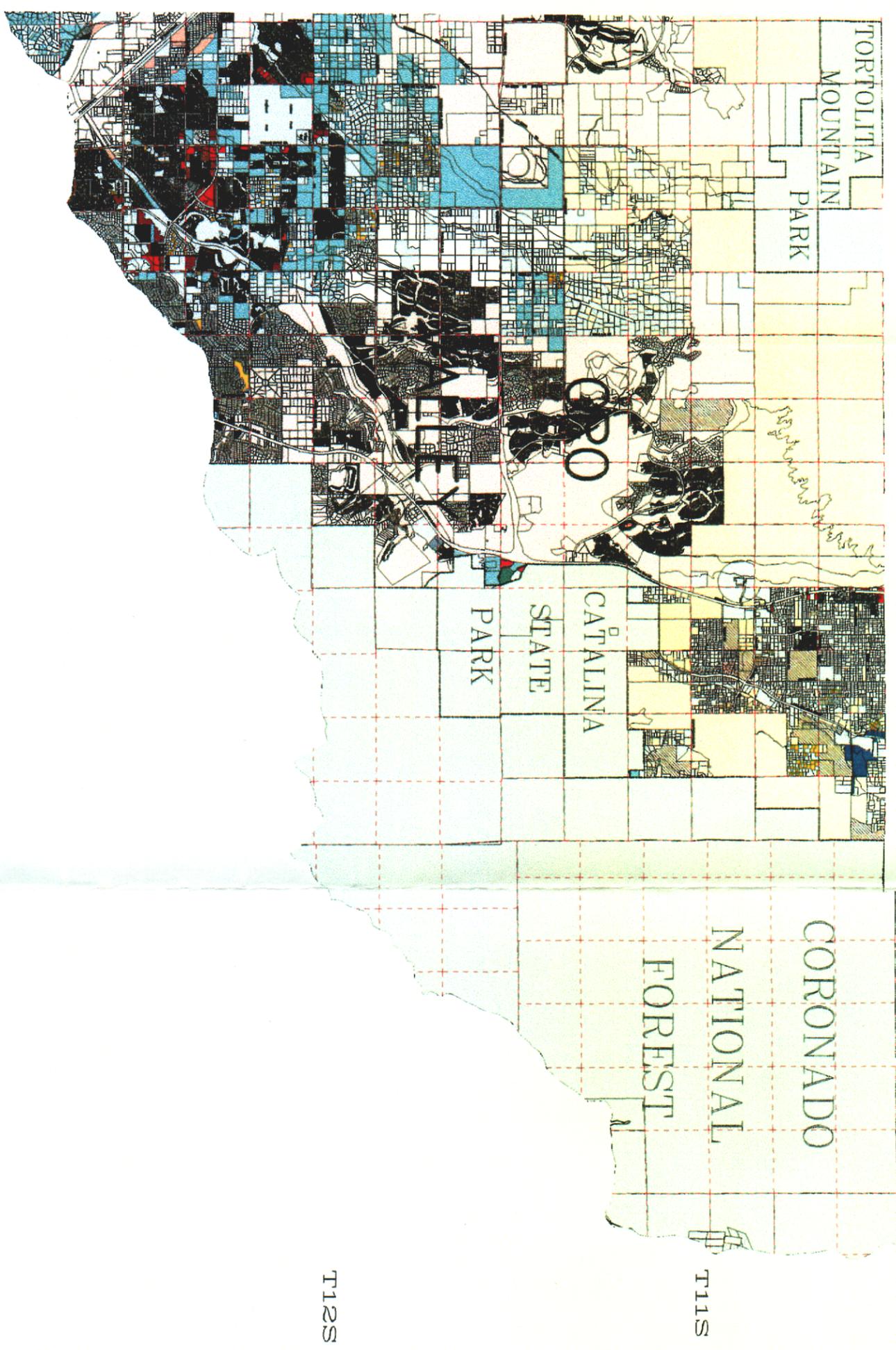
Note: Vacant land shown by zoning district color

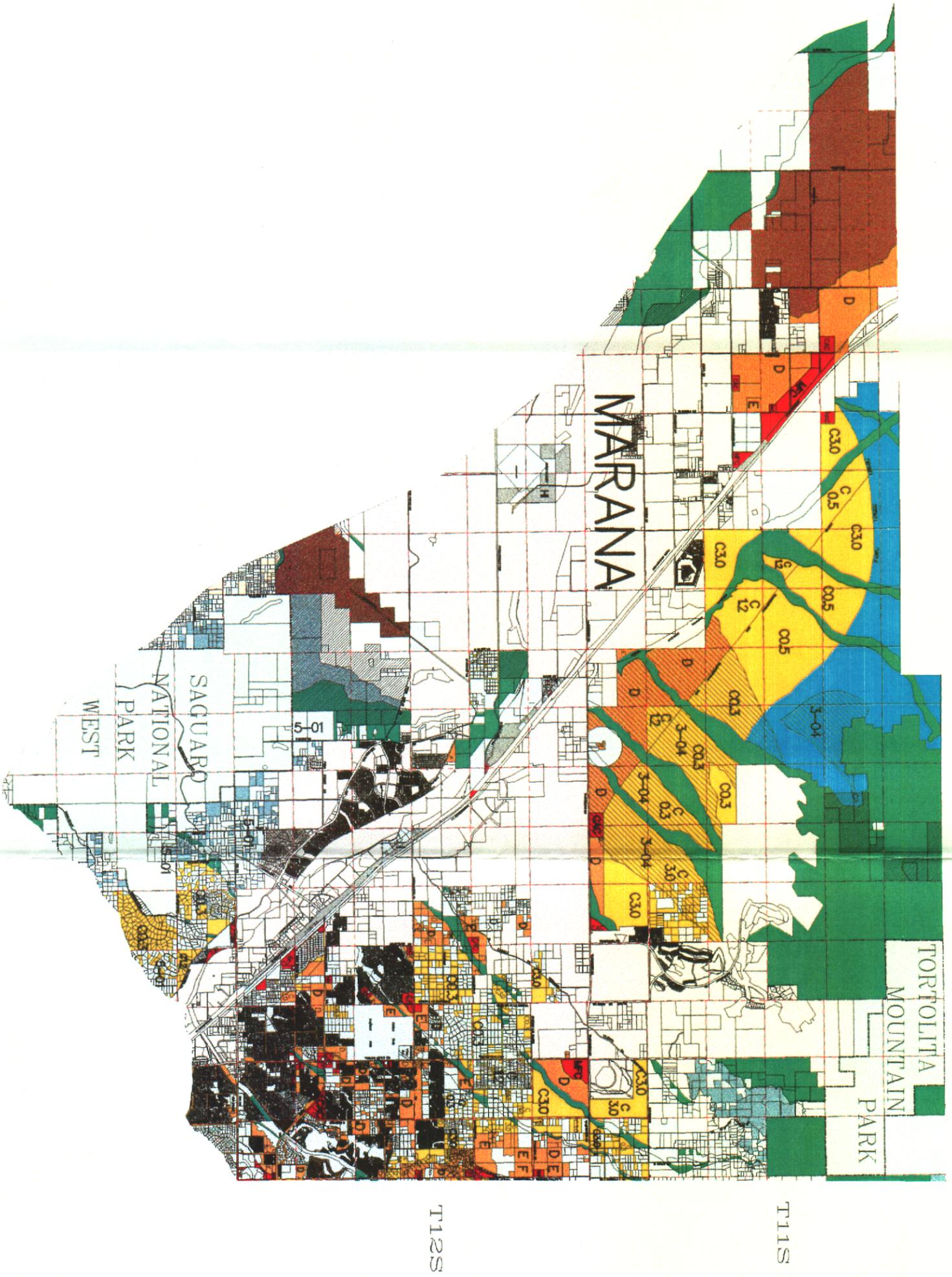


This map is prepared in accordance with the Pima County Planning Division, Comprehensive Plan, Chapter 10, Section 10.1.1. The map is prepared by the Planning Division, Pima County Assessor's Office.



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Pima County Assessor's Office
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R10E

R11E

R12E

R13E

MARANA

SAGUARO NATIONAL PARK
WEST PARK

TORTOLITA MOUNTAIN PARK

T11S

T12S

PLANNED LAND USE ON VACANT LAND Unincorporated Pima County Tortolita Watershed-West Half

15-MAR-2000

Legend

Planned Land Use

- | | |
|---------------------------------------|-------------------------------|
| C3.0 Activity Centers | Medium Intensity Rural |
| C3.0 NEAC Regional Activity Center | Low Intensity Rural |
| C3.0 CAC Community Activity Center | Resource Transition |
| C3.0 NAC Neighborhood Activity Center | Resource Productive |
| C3.0 MFC Multifunctional Corridor | Industrial 1 Urban Industrial |
| D Medium/High Intensity Urban | IH Heavy Industrial |
| D Medium High Intensity Urban | Resource Conservation |
| E High Intensity Urban | Special Areas |
| C1.2 Low Intensity Urban 3.0 | Not in Plan Area |
| C1.2 Low Intensity Urban 1.2 | |
| C1.2 Low Intensity Urban 0.5 | |
| C1.2 Low Intensity Urban 0.15 | |
| C1.2 Low Intensity Urban 0.3 | |
| Development Reserve | |
| Rural Activity Centers | |
| RUAC Rural Activity Center | |
| RX Rural Crossroads | |

Basemap Features

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

Note: Vacant land shown by plan designation color



This map is prepared in accordance with the Pima County Planning Department's policies and procedures. It is intended for informational purposes only and does not constitute a contract or a guarantee of any kind. The Pima County Planning Department is not responsible for any errors or omissions on this map.



PLANNED LAND USE
Pima County Planning Department
Planning Division - Comprehensive Plan Section
Tortolita Watershed - West Half
Tortolita, Arizona 85701
520 740 5580

COMMITTED LANDS

Unincorporated Pima County
Tortolita Watershed-East Half

20-MAR-2000

Legend

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
- 0.3-1.0 RAC Equivalent Zoning
- 0.3-1.0 RAC-Subdivision or Development Plan Applied For
- 0.3-1.0 RAC-Approved Subdivision or Development Plan
- 1.0-3.0 RAC Equivalent Zoning
- 1.0-3.0 RAC-Subdivision or Development Plan Applied For
- 1.0-3.0 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
- Tribal Lands
- Sections
- Public Preserve Boundary
- Public Preserves
- Ranching or Grazing Land

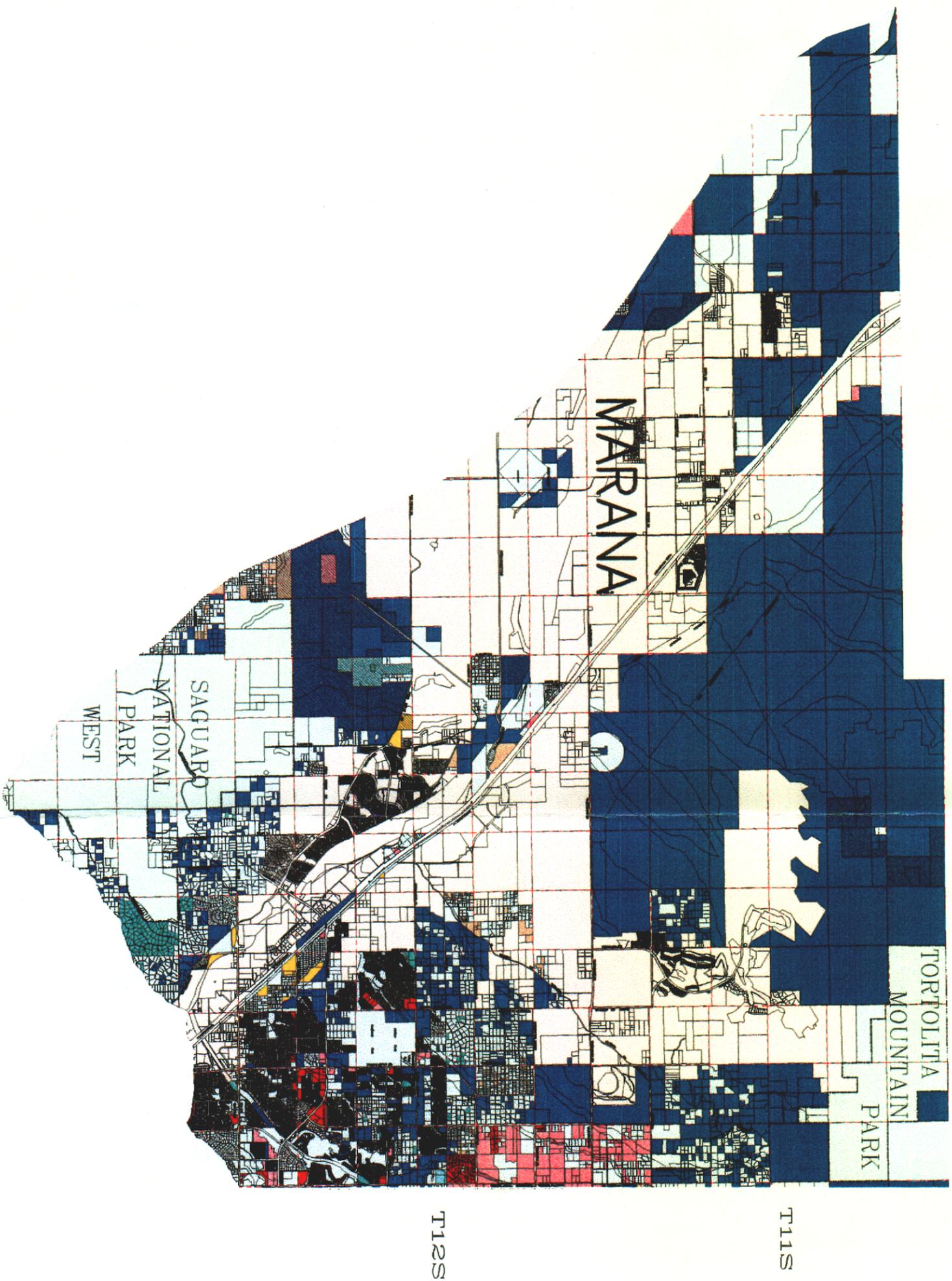


This map is prepared in color. Data comes from many sources, including the Pima County Development Services Dept., Dept. of Transportation and the Pima County Assessor's Office.



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COMMITTED LANDS

Unincorporated Pima County

Tortolita Watershed - West Half

20-MAR-2000

Legend

Status of Land

- Built or Committed Land
- Categories of Vacant Land
- Rural Zoning
- Rural Zoning-Subdivision or Development Plan Applied For
- Rural Zoning-Approved Subdivision or Development Plan
- 0.3-1.0 RAC Equivalent Zoning
- 0.3-1.0 RAC-Subdivision or Development Plan Applied For
- 0.3-1.0 RAC-Approved Subdivision or Development Plan
- 1.0-3.0 RAC Equivalent Zoning
- 1.0-3.0 RAC-Subdivision or Development Plan Applied For
- 1.0-3.0 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

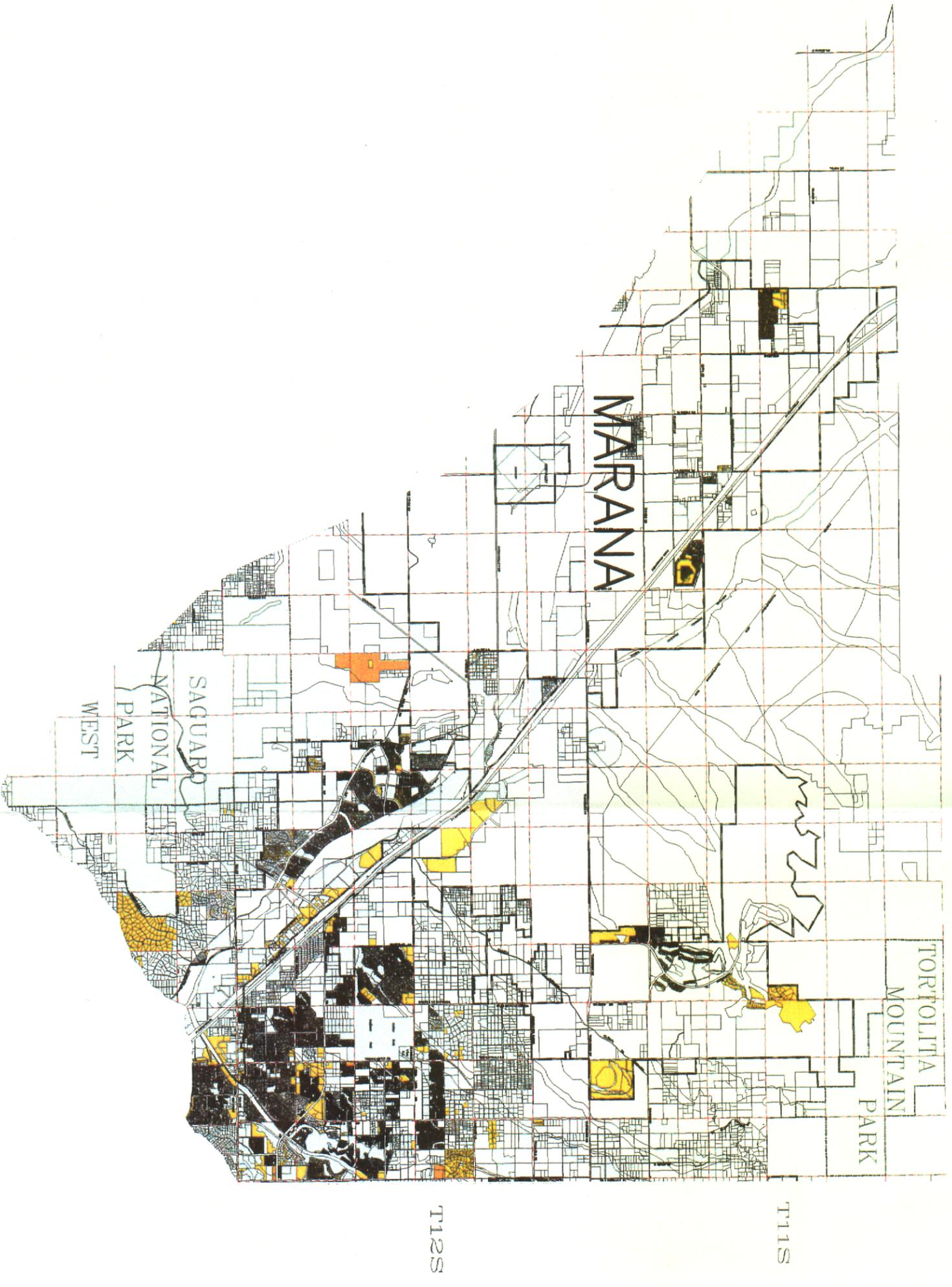
- Cities and Towns
- Tribal Lands
- Sections
- Public Preserve Boundary
- Public Preserves
- Ranching or Grazing Land



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R10E

R11E

R12E

R13E

T11S

T12S

APPROVED AND PROPOSED SUBDIVISIONS ON VACANT LAND

Tortolita Watershed-West Half

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 Preserve Boundary
- Public Preserves
- Tribal Lands



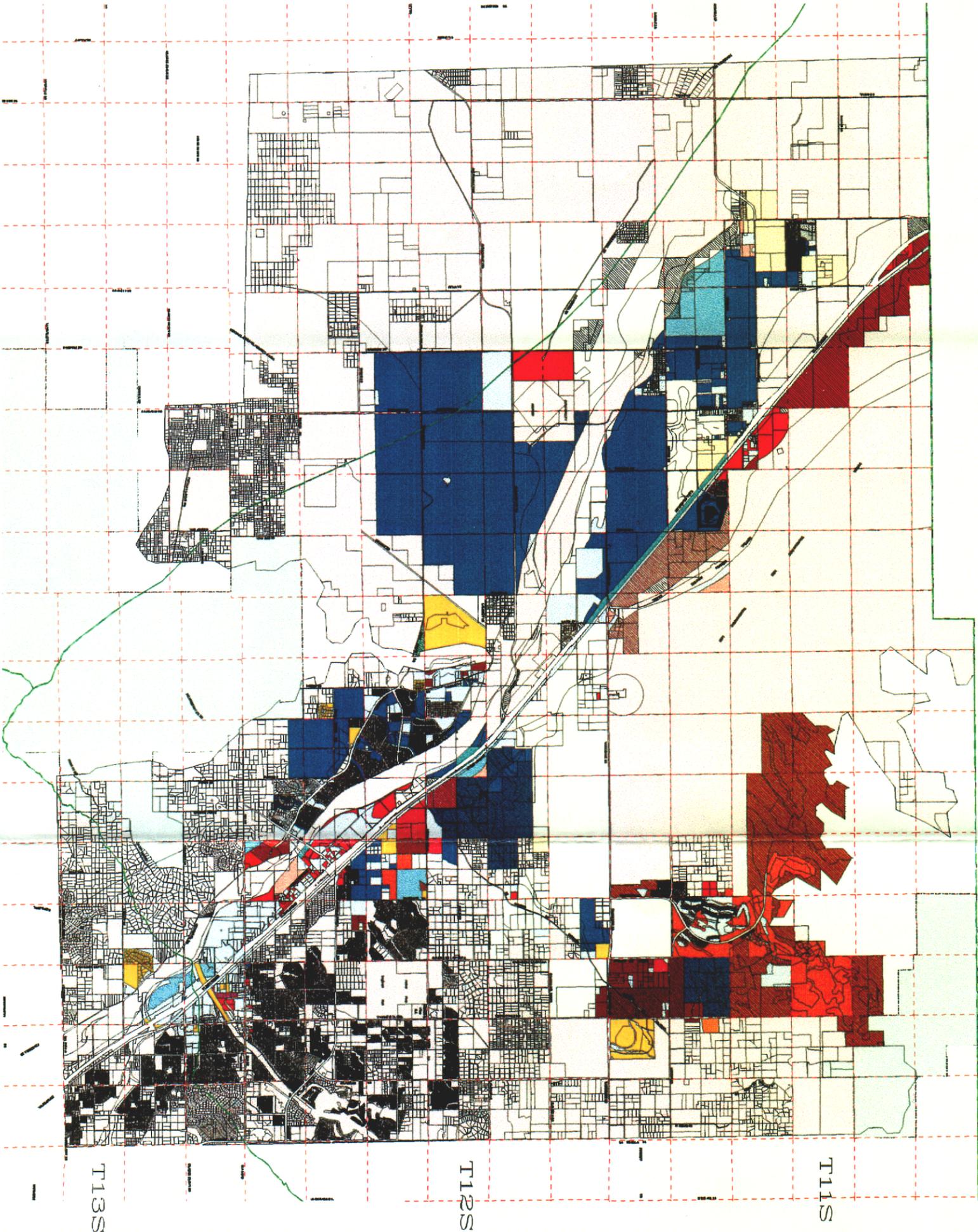
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R11E

R12E



EXISTING ZONING ON VACANT LAND

Town of Marana

20-MAR-2000

Legend

Zoning Districts

- C Large Lot Zone
- B Medium Lot Zone
- A Small Lot Zone
- R-144 Single Family Residential
- R-36 Single Family Residential
- R-18 Single Family Residential
- R-8 Single Family Residential
- R-7 Single Family Residential
- R-6 Single Family Residential
- MFR-2 Multi-Family (Med-High Density)
- Multi-Family (High Density)
- F Specific Plan
- CO Commercial (Office)
- VC Village Commercial
- NC Neighborhood Commercial
- E Transportation Corridor Zone
- I Light Industrial
- HI Heavy Industrial
- AG Agricultural
- D Designated (Floodplain) Zone

Basemap Features

- Built or Committed Land
- Unincorporated Pima County
- Section
- Watershed Boundaries
- Public Preserve Boundary
- Public Preserves
- Tribal Lands
- Ranching or Grazing Land

Note: Vacant land shown by zoning district color



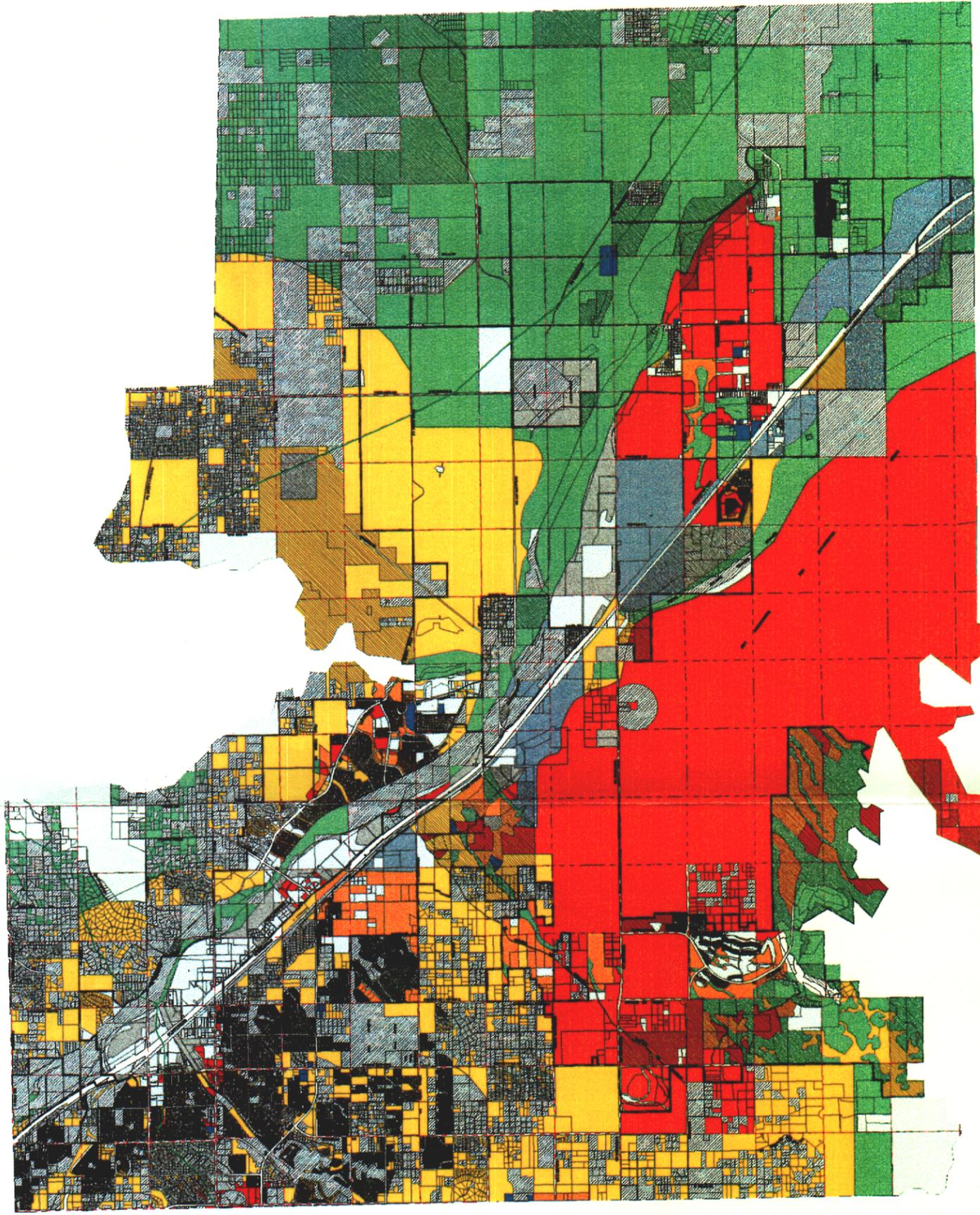
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R11E

R12E



T11S

T12S

T13S

PLANNED LAND USE ON VACANT LAND

Town of Marana

17-MAR-2000

Legend

Planned Land Use

- Low Density Residential
- Medium to High Residential
- Community Development Zone
- Commercial: Community
- Commercial: Tourism
- Industrial/Business Park
- Interstate Development Zone
- Public Facilities
- Open Space: Agricultural
- Open Space: Recreational

Basemap Features

- Built or Committed Land
- Planned Areas Outside Town Limits
- Sections
- Public Preserve Boundary
- Public Preserves
- Tribal Lands
- Ranching or Grazing Land
- Watershed Boundaries

Note: Vacant land shown by planned land use color



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R11E

R12E

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T12S

T13S

COMMITTED LANDS

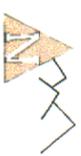
Town of Marana

22-MAR-2000

Legend Status of Land

- Built or Committed Land
- Categories of Vacant Land
- Rural Zoning
- Rural Zoning-Subdivision or Development Plan Applied For
- Rural Zoning-Approved Subdivision or Development Plan
- 0.3-1.0 RAC Equivalent Zoning
- 0.3-1.0 RAC-Subdivision or Development Plan Applied For
- 0.3-1.0 RAC-Approved Subdivision or Development Plan
- 1.0-3.0 RAC Equivalent Zoning
- 1.0-3.0 RAC-Subdivision or Development Plan Applied For
- 1.0-3.0 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
- Unincorporated Pima County
- Sections
- Tribal Lands
- Watershed Boundaries
- Public Reserve Boundary
- Public Reserves
- Ranching or Grazing Land

Basemap Features

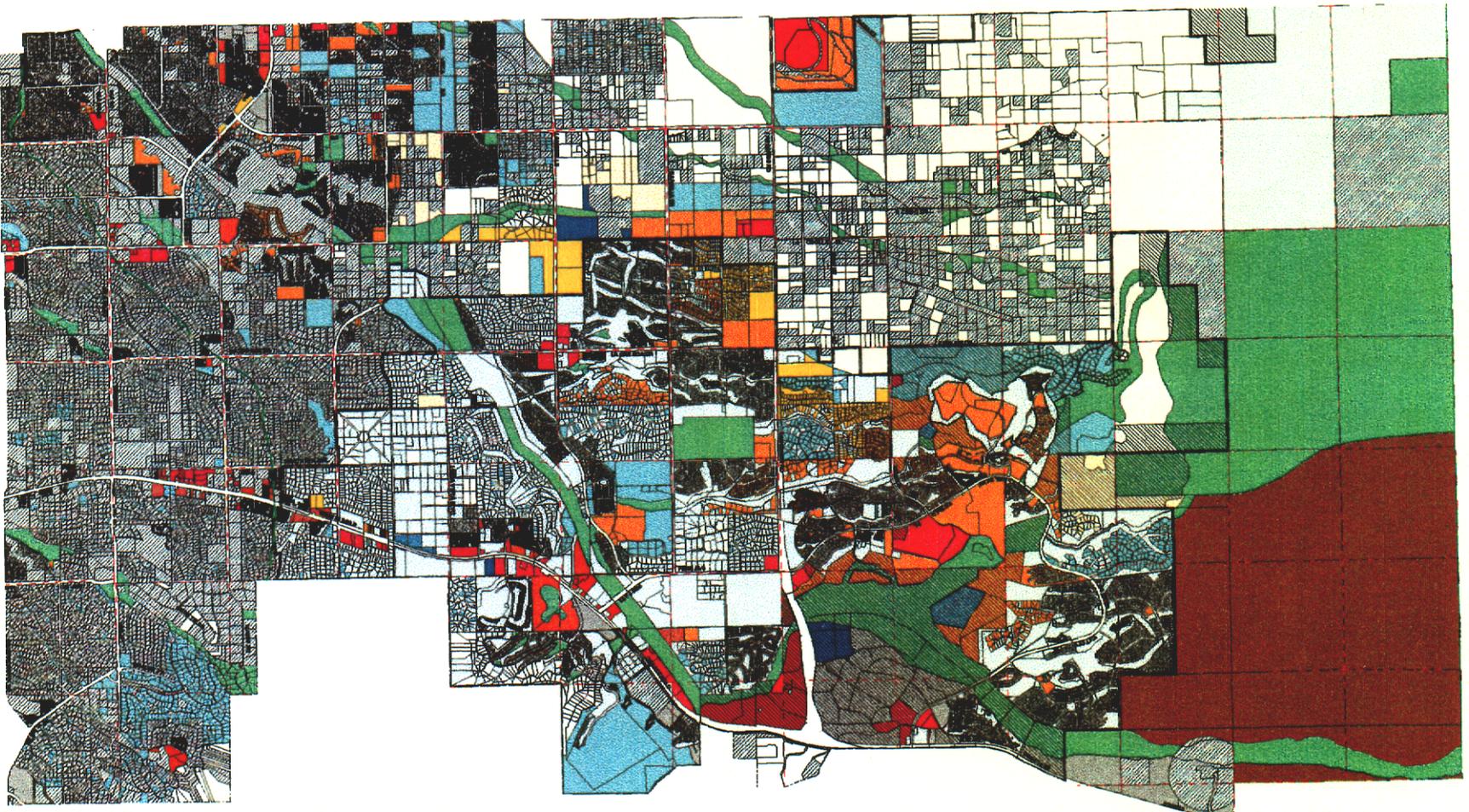


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202-100-1000

R13E



T11S

T12S

PLANNED LAND USE ON VACANT LAND

Town of Oro Valley

20-MAR-2000

Legend

Planned Land Use

- | | | | |
|--|-------------------------------------|--|-------------------------------------|
| | R-LDR Rural Low Density Residential | | R-LDR Rural Low Density Residential |
| | LDR 0.5 Low Density Res-0.5 | | LDR 0.5 Low Density Res-0.5 |
| | LDR 1.2 Low Density Res-1.2 | | LDR 1.2 Low Density Res-1.2 |
| | LDR 2.0 Low Density Res-2.0 | | LDR 2.0 Low Density Res-2.0 |
| | MDR Medium Density Residential | | MDR Medium Density Residential |
| | MHDR Medium High Density Res | | MHDR Medium High Density Res |
| | HDR High Density Residential | | HDR High Density Residential |
| | MPC Master Planned Community | | MPC Master Planned Community |

Basemap Features

- | | | | |
|--|-------------------------|--|--------------------------|
| | Built or Committed Land | | Public Preserve Boundary |
| | Planned Aves Outside | | Public Preserves |
| | Town Limits | | Tribal Lands |
| | Sections | | Ranching or Grazing Land |
| | | | Watershed Boundaries |

Note: Vacant land shown by planned land use color



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



PLANNING COORDINATION:
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Planning Division - Comprehensive Pima Section
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REFERENCES

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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*.

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Pima County. *Sonoran Desert Conservation Plan*.

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END NOTES

1. Pima County, *Land Stewardship in Pima County, Sonoran Desert Conservation Plan*, February 2000, Table 6, p. 14.
2. Pima County, *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. Pima County, *Land Stewardship in Pima County, Sonoran Desert Conservation Plan*, February 2000, p. 4.
9. Ibid, Figure 1, p. 5.
10. Ibid, p. 1.
11. 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.
12. Pima County, "Impact of Unregulated Development at the Community and Watershed Level", *Fiscal Impact of Land Use*, March 2000.
13. Ibid.
14. Ibid.
15. Ibid.