

**DRAFT**

# Priority Conservation Areas

Sonoran Desert Conservation Plan

May 2001



**Pima County, Arizona**  
**Board of Supervisors**  
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Raúl M. Grijalva, Chairman, District 5

**County Administrator**  
Chuck Huckelberry



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# MEMORANDUM

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Date: May 15, 2001

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

From: C.H. Huckelberry  
County Administrator

A handwritten signature in black ink, appearing to be "CHH", is written over the printed name "C.H. Huckelberry".

Re: **Priority Conservation Areas**

## I. Overview

The attached study entitled *Priority Conservation Areas* is a companion to the report sent under separate cover entitled *Reserve Design Process Update*. As part of the process of developing the biological information for the Sonoran Desert Conservation Plan, a peer review team has been assembled to contribute the highest expertise available for each specific covered species in the Plan. One task of the review team has been to assist in the identification of priority conservation areas for each of the 56 plants and animals that might be covered under the Sonoran Desert Conservation Plan. For each species, priority conservation areas are identified according to six tiers:

1. Areas that contain populations that must be included in the reserve system;
2. Areas that would be of value to the reserve system;
3. Areas that represent critical landscape linkages;
4. Areas that have the potential for restoration or enhancement;
5. Areas that need not be in the reserve; and
6. Areas that should not be in the reserve based on fragmentation, isolation or degradation.

The attached study provides narrative and maps that reflect these levels of conservation areas for each species. The biological consulting team along with the Science Technical Advisory Team has incorporated this data into on-going assessments of the biological reserve boundaries. This memorandum describes the expert review team and summarizes the initial findings of the *Priority Conservation Areas* study.

## II. Expert Review Team Members

The expert review team, which acts in an independent fashion from the Science Technical Advisory Team and the biological consultants, is coordinated by Dr. Linwood Smith, and includes:

### Contributing expertise in the area of the Arizona Shrew and Merriam's Mouse:

- Bill Van Pelt, Arizona Game and Fish Department

### Contributing expertise in the area of Bats:

- Dr. Ronnie Sidner, Independent Consultant
- Tim Snow, Arizona Game and Fish Department

Contributing expertise in the area of the Cactus Ferruginous Pygmy-Owl:

- Scott Richardson, Arizona Game and Fish Department
- Troy Corman, Arizona Game and Fish Department
- Dr. Thomas Strong, Independent Consultant
- Dr. Linwood Smith, Independent Consultant

Contributing expertise in the area of the Arkenstone Cave Pseudoscorpion:

- Bill Peachey, Independent Consultant
- Bob Pape, Independent Consultant

Contributing expertise in the area of Reptiles and Amphibians:

- Dr. Phil Rosen, University of Arizona
- Mary Tugel, Arizona Game and Fish Department (Sonoran Box Turtle)
- Mike Sredl, Arizona Game and Fish Department (Leopard Frogs)

Contributing expertise in the area of other Raptors:

- Troy Corman, Arizona Game and Fish Department
- Dr. Linwood Smith, Independent Consultant

Contributing expertise in the area of Passerine Birds:

- Troy Corman, Arizona Game and Fish Department
- Dr. Thomas Strong, Independent Consultant
- Dr. Linwood Smith, Independent Consultant

Contributing expertise in the area of Native Fishes:

- Dr. Wendell Minckley, Arizona State University

Contributing expertise in the area of Native Plants:

- Phil Jenkins, University of Arizona

Contributing Talus Snail expertise:

- Dr. Jim Hoffman, Consultant
- Dr. Ken Kingsley, Consultant

**III. Highlights of Findings**

**A. Mammals** -- There are 7 bats included in the list of 9 mammals.

- Mexican Long-tongued Bat. Sites that contain populations that must be in the reserve system include Colossal Cave and the Whetstone Mountains of extreme southeastern Pima County. A number of sites in the Altar, Cienega and San Pedro watersheds would be of value to the reserve system for this species.

*Lesser Long-nosed Bat*



## Priority Conservation Areas

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- Allen's Big-eared Bat. Five polygons are identified in Southeast Pima County that would be of value to the reserve system for Allen's Big-eared Bat.
- Western Red Bat. An area identified on the east side of the Rincon Mountains is highly recommended for inclusion within the reserve. Sites that would be of value to the Western Red Bat include the east slope of the Baboquivari Mountains, the Coyote, Sierrita, Cerro Colorado, Las Guijas, Santa Rita, San Luis, Tumacacori, Catalina, Rincon and Tortolita Mountains.
- Southern Yellow Bat. This bat has priority conservation areas that are similar to the Western Red Bat, but additional areas in the foothills are mapped given the association of the Southern Yellow Bat with fan palms.
- Lesser Long-nosed Bat. Sites in the Colossal Cave, Rincon Mountains and Organ Pipe areas are identified as areas that must be in the reserve. A number of sites in eastern and western Pima County are identified as areas that would be of value to the reserve system for this species, which is listed under the Endangered Species Act.
- California Leaf-nosed Bat. Sites in the Silverbell Mountains and in Organ Pipe Cactus National Monument are identified as areas that must be in the reserve. Two sites that have the potential for restoration are also identified.
- Pale Townsend's Big-eared Bat. Sites in the Colossal Cave, Saguaro National Park, and Empire Mountains areas are identified as necessary for inclusion within the reserve. A number of sites in eastern and western Pima County are identified as areas that would be of value to the reserve system for this species.
- The Arizona Shrew has three sites identified as highest priority for the reserve. These are sites in the Santa Catalina, Santa Rita, and Baboquivari Mountains.
- Merriam's Mouse has three sites identified as high priority for the reserve. These are far flung in the Altar Valley and Upper Santa Cruz watersheds, with one additional site identified along the Tanque Verde Wash. An additional site in the Buenos Aires Refuge would be of value to the reserve.

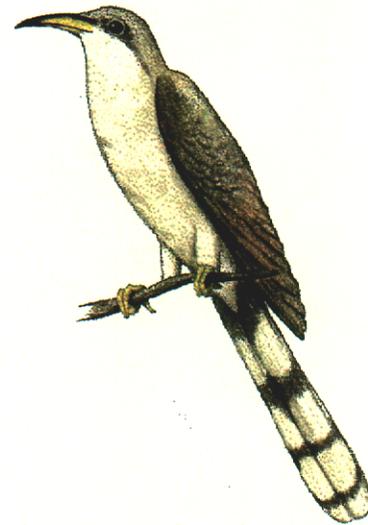
**B. Birds** -- There are eight birds identified as potentially covered by the Sonoran Desert Conservation Plan, and priority conservation areas are identified within the attached report.

- Swainson's Hawk -- Sites that must be in the reserve system include areas of Altar Valley and the Cienega Rincon watersheds.

*Swainson's Hawk*



- Western Yellow-billed Cuckoo -- The entire Cienega Creek, along with areas in Altar Valley are in the category of highest priority conservation areas. Three sites in the northeast portion of the County would be of value to the reserve system.
- Cactus Ferruginous Pygmy-Owl (CFPO) - The sites known to be occupied by owls are included in the highest priority conservation areas. Areas that would be of value to the reserve, and critical landscape linkages are also identified.
- Burrowing Owl -- Urban and agricultural sites are included as the highest conservation priority areas.



*Yellow-billed Cuckoo*



*Bell's Vireo*

- Southwestern Willow Flycatcher -- Arivaca and the Cienega Creek, and the San Pedro are areas that would be of value to the reserve.
- Bell's Vireo -- A number of sites in the Altar Valley, Cienega Creek, and San Pedro Watersheds are identified as highest priority conservation areas, along with additional sites in eastern and western Pima County.
- Abert's Towhee -- Seven major drainages in Eastern Pima County are included as the highest priority conservation areas.
- Rufous-winged Sparrow -- Altar Valley and Upper Santa Cruz sites are identified as the having the highest priority for conservation areas, along with sites in the Catalina State Park and on Tucson's east side. Additional sites are identified as areas that would be of value to the reserve.

**C. Amphibians and Reptiles** -- Nine amphibians and reptiles are discussed.

- Chiricahua Leopard Frog and Lowland Leopard Frog -- Emblematic of Dr. Phil Rosen's terrific knowledge and inventiveness, the Leopard Frogs have sites identified which must be in the reserve, sites that would be of value to the reserve, and sites that are available for restoration and enhancement. The Lowland Leopard Frog also has critical landscape linkage areas identified. The Cienega Creek is essential to both these species.

## Priority Conservation Areas

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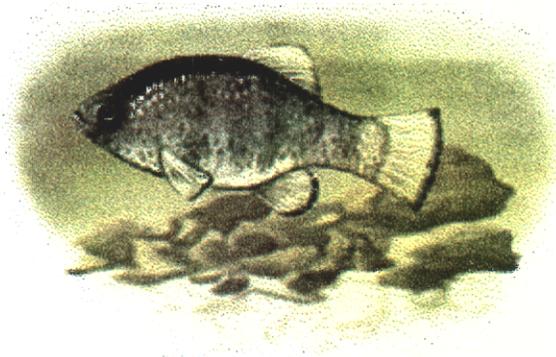
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- Tucson Shovel-nosed Snake and Organ Pipe Shovel-nosed Snake -- Sites in the Avra Valley areas of Eastern Pima County are identified for the conservation of the Tucson Shovel-nosed Snake. Two sites are identified in Western Pima County for the conservation of the Organ Pipe Shovel-nosed snake.
- Giant Spotted Whiptail and Red-backed Whiptail Lizard -- Again reflecting Dr. Rosen's practical and detail-oriented problem solving approach, an array of conservation sites are identified for the Giant Spotted Whiptail in Eastern Pima County -- ranging from areas that must be included in the reserve, to areas that would be of value, to critical linkages, to areas with the potential for restoration or enhancement. Sites in Eastern and Western Pima County are identified for the Red-backed Whiptail Lizard in the top two categories of priority conservation areas.
- Ground Snake and Mexican Garter Snake -- Whereas the Ground Snake's priority conservation area is greatly constrained, the Mexican Garter Snake has conservation areas delineated throughout reaches of the riparian systems of Eastern Pima County.
- Desert Box Turtle -- Specific sites in the Altar and Cienega watersheds must be included in the reserve, while a broader area of Altar Valley would be of value, and an urban patch in northeast Tucson might serve as a conservation area that has the potential for restoration for the Desert Box Turtle.

**D. Fishes** -- Making the options available for other species in decline look abundant by comparison, the maps for desert fishes show limited specific sites for conservation areas. Instead sites (such as Cienega Creek) are generically identified for some of the covered species. These include:

- Desert Pupfish
- Gila Topminnow
- Longfin Dace
- Desert Sucker
- Sonoran Sucker
- Gila Chub

*Desert Pupfish*



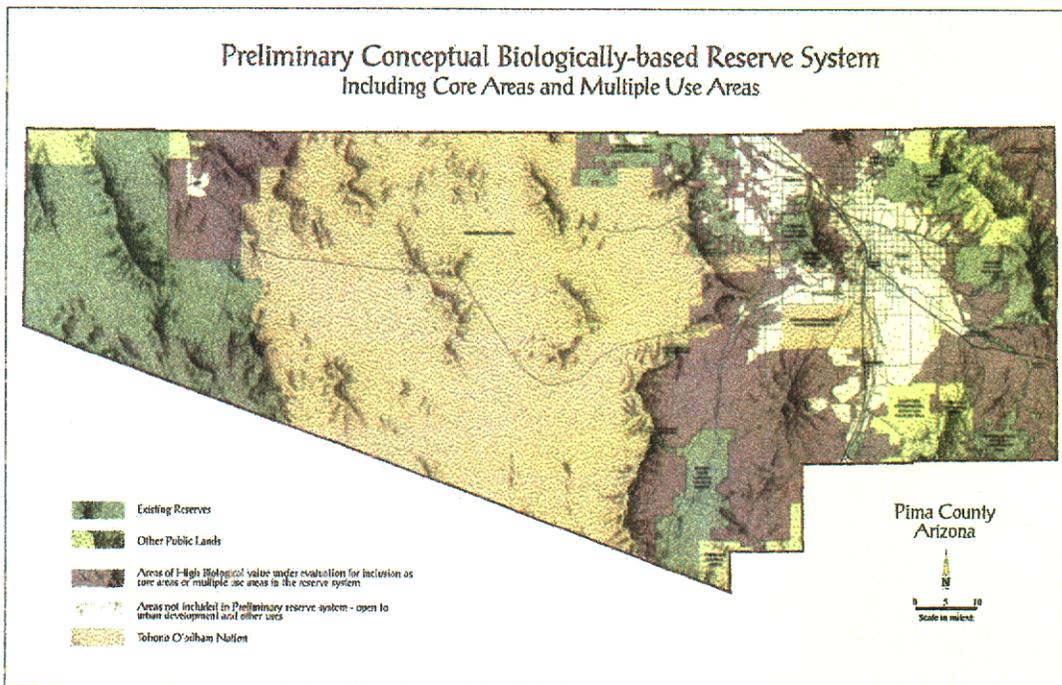
Dr. Smith notes that "Of the vertebrate faunas of Arizona, none have been more profoundly affected by a variety of human activities than the fishes. ... Of the 31 native species found in the state, 10 are listed by the Fish and Wildlife Service as Threatened or Endangered. It is conceivable that the entire native fish fauna of the state will some day be included on list of Threatened or Endangered species."

**E. Invertebrates** -- The Arkenstone Cave Pseudoscorpion and a variety of Talus Snails are discussed on pages 30 through 31 of the report, and mapped in Figures 33 and 34.

**F. Plants** -- Six plants are discussed on pages 31 through 36, and mapped in Figures 35 through 41, including Pima Pineapple Cactus; Gentry Indigo Bush; Nichol's Turk's Head Cactus; Acuna Cactus; Needle-spined Pineapple Cactus; Huachua Water Umbel; and Tumamoc Globeberry.

#### **IV. Conclusion**

Perhaps more than any report issued through the science process to date, the *Priority Conservation Areas* study makes the construction of the biological reserve a more tangible process, just as it makes our knowledge about the species that will be protected within the reserve more real.



## INTRODUCTION

The cornerstone of any habitat conservation plan (HCP) is the establishment of a set of reserves that are ultimately managed to preserve or enhance populations of a particular species or suite of species (Beatley 1994). Also, with any priority species in a particular region there are geographic areas that are much more important to the species than others. Identifying those areas is an important part of the planning process and a required activity to help assure that the best habitat areas for each species are identified and targeted for inclusion within the reserve system.

As part of the Pima County HCP planning process, the Environmental Planning Group (EPG) was retained by the County to interview local individuals who were considered to be experts in a particular group or species. The purpose of the interview process was to have the experts review potential habitat maps and identify Priority Conservation Areas (pcas) that: (1) contained populations that must be included in the Pima County reserve system (excluding the Tohono O'odham Nation), (2) that would be of value to the reserve system, (3) represented critical landscape linkages, (4) have potential for restoration or enhancement. Additionally, the County requested that the experts identify areas, if any, which (5) need not or (6) should not be included in the reserve system based on current fragmentation or isolation or existing level of degradation. Reviewers were asked to exclude the Tohono O'odham Nation from consideration, but jurisdictional boundaries of any kind were not included on draft suitability maps provided for their review. Consequently, some pcas delineated by the experts included lands within the nation. Pcas will provide guidance to the design of the SDCP Reserve System, which will exclude lands within the Tohono O'odham Nation.

The following is a summary of the results of interviews and recommendations for priority conservation areas that should be included in the reserve system of the Sonoran Desert Conservation Plan.

## METHODS

Large format (22" X 42") maps (1:264,000 scale) of modeled potential habitat were generated by RECON for 40 of the 56 priority vulnerable species. Talus snails (16 species) were mapped on a single map. The GIS-based maps depict areas of High, Medium, Low, and No Potential habitat for each species. Habitat was modeled by scoring characteristics for multiple environmental data layers including elevation, aspect, slope, vegetation type, hydrology, soils, geology, landform, and cave and mine potential. Combinations of parameters used in habitat models were unique to each species.

Maps including modeled habitat and known location data were presented to local individuals with expertise in one or more species or groups of species and they were asked to identify areas on the map that needed to be included in the Pima County habitat reserve system (pca1). They were also asked to identify areas that would be desirable to have in the system (pca2) and areas that could serve as habitat linkages between reserve

areas (pca3). Further, the experts were asked to identify areas where enhancement or restoration would be appropriate (pca4). Finally, they were asked to identify areas that were inappropriate for inclusion in the reserve system due to current levels of fragmentation, isolation, or degradation (pca5,6).

The group of experts that assisted in the identification of reserve priority areas is listed below:

***Bats***

Ronnie Sidner, Ph.D., Independent Consultant  
Tim Snow – Arizona Game & Fish Department

***Arizona Shrew and Merriam's Mouse***

Bill VanPelt – Arizona Game & Fish Department

***Cactus Ferruginous Pygmy-owl***

Scott Richardson – Arizona Game & Fish Department  
Troy Corman – Arizona Game & Fish Department  
Thomas R. Strong, Ph.D. – Environmental Planning Group  
E. Linwood Smith, Ph.D. – Environmental Planning Group

***Raptors Other Than CFPO***

Troy Corman – Arizona Game & Fish Department  
E. Linwood Smith – Environmental Planning Group

***Passerine Birds***

Troy Corman – Arizona Game & Fish Department  
Thomas R. Strong, Ph.D. – Environmental Planning Group  
E. Linwood Smith, Ph.D. – Environmental Planning Group

***Reptiles and Amphibians***

Phil Rosen, Ph.D. – University of Arizona  
Marty Tuegel – Arizona Game & Fish Department (Sonoran Box Turtle)  
Mike Sredl – Arizona Game & Fish Department (Leopard Frogs)

***Native Fishes***

W. L. Minckley, Ph.D. – Arizona State University

***Arkenstone Cave Pseudoscorpion***

Bob Pape – Independent Consultant  
Bill Peachey – Independent Consultant

***Native Plants***

Phil Jenkins – University of Arizona

### *Talus Snails*

Jim Hoffman, Ph.D. – Independent Consultant

Ken Kingsley, Ph.D. – SWCA, Inc.

Interviews with expert reviewers were conducted between 22 December 2000 and 9 February 2001. Interviews with the Arizona Game & Fish Department were conducted on 4 (Tucson Office) and 10 (Phoenix Office) January 2001. EPG encountered some difficulty scheduling interviews because of the holiday season, and several potential interviewees were out of town through most of the month of January.

We note at this point that some of the pcas that were identified by expert reviewers tend to overstate the areas that are described in text. Such overstatement is often due to a lack of precise habitat mapping for a particular species (e.g., stock ponds for frogs). In such cases, it is not our intent to suggest that the entire area delineated will be included in the reserve system, only the specific reserve sites within the delineated pca that contain suitable habitat for the species in question.

## RESULTS

The following is a summary of written and oral comments provided by the expert reviewers including a description of locations that they felt were important to the Pima County reserve design.

### Mammals

#### Bats

Dr. Ronnie Sidner noted that the boundaries she provided for reserve design elements are based on estimates with limited survey effort. Most surveys for the Priority Vulnerable Species of bats have been conducted at National Parks and Monuments, in National Forests, in wooded or forested areas, and in riparian woodlands. Other landscapes in Pima County are largely unsurveyed. Consequently, the suggested reserve design boundaries can only be considered approximations, generally surrounding areas of known occurrences for a given species.

#### Mexican Long-tongued Bat (*Choeronycteris mexicana*)

##### 1. Sites that must be in the reserve system:

Colossal Cave Mountain Park contains the largest number of known maternity roosts of this species in the county. A reserve site for this species should be established in eastern Pima County and centered on Colossal Cave.

A second site identified by Dr. Sidner is in the Whetstone Mountains of extreme southeastern Pima County. Portions of the land included in the polygon drawn by

## Mexican Long-tongued Bat (*Choeronycteris mexicana*) – Cont.

Dr. Sidner are on the Coronado National Forest. The suggested reserve extends west to include a portion of Cienega Creek.

Mr. Tim Snow, Arizona Game & Fish Department agreed with Dr. Sidner's designations of reserve category 1, and suggested that the higher elevation sites in the Catalina Mountains be designated reserve category 1

### 2. Sites that would be of value to the reserve system:

Areas that could be of value to the reserve system for this species include most of extreme eastern Pima County from the Pinal County Line south, nearly to Interstate 10. Also included in this category are the Santa Rita and Empire Mountains of southern and southeastern Pima County.

Other lands suggested for inclusion in this category include the higher elevations of the Sierrita, Cerro Colorado, and Las Guijas Mountains, and the eastern slopes of the Baboquivari Mountains.

Mr. Tim Snow suggested that the location at Organ Pipe Cactus National Monument should be included in the plan as a site that could be of value to the reserve system. He also suggested that mid-elevation sites in the Santa Catalina Mountains should be included in this category.

### 3. Critical landscape linkages:

Both Dr. Sidner and Mr. Snow agreed that the most important landscape linkages were intermittent streams and desert washes although much of the species use of landscape features is poorly known.

### 4. Areas with potential for restoration or enhancement:

None identified

### 5. Areas which need not or should not be included in the reserve system based on current levels of isolation, fragmentation, or degradation.

None identified

## Allen's Big-eared Bat (*Idionycteris phyllotis*)

### 1. Sites that must be in the reserve system:

None identified. This is a ponderosa pine snag beast with no known lowland records. The nearest known record to eastern Pima County is at Klondyke in

## Allen's Big-eared Bat (*Idionycteris phyllotis*) – Cont.

Graham County. Hoffmeister (1986, p. 28) indicates that known localities for this species are primarily from montane conifer forest habitats with no known locations in Sonoran Desertscrub habitats.

### 2. Sites that would be of value to the reserve system:

Dr. Sidner identified a polygon in southern Pima County that includes part of the Empire Mountains and grassland/oak woodland areas to the south. She also identified an area in the northern part of the Whetstones centered on Haystack Mountain. Another polygon on the Coronado National Forest includes Cumaro Spring and Ash Creek on the east side of the Rincon Mountains. A very small polygon was also located north of Interstate 10, apparently along Mescal Arroyo. Mr. Tim Snow took exception to a polygon on the Madera Canyon Road and Santa Rita Experimental Range noting that the elevation was much too low for this species. However, Dr. Sidner pointed out that she has encountered the bat in Mohave Desertscrub in northwestern Arizona and the Madera Canyon polygon is a viable category 2 location in which to seek this species.

### 3. Critical landscape linkages:

Both Dr. Sidner and Mr. Snow agreed that the most important landscape linkages are permanent and intermittent streams. Mr. Snow opined that this is particularly true in ponderosa pine forests.

### 4. Areas with potential for restoration or enhancement:

None identified

### 5. Areas which need not or should not be included in the reserve system based on current levels of isolation, fragmentation, or degradation.

None identified

## Western Red Bat (*Lasiurus blossevillii*)

### 1. Sites that must be in the reserve system:

The site recommended by Dr. Sidner and seconded by Mr. Tim Snow is a narrow polygon on the east side of the Rincon Mountains. The polygon includes Cumaro Spring, Ash Creek, Happy Valley and extends north to include Driscoll Mountain and several springs south of Lechuguilla Peak. Broadleaf riparian woodlands in this area are the principal habitat components that need to be protected.

**Western Red Bat (*Lasiurus blossevillii*) – Cont.**

2. Sites that would be of value to the reserve system:

Dr. Sidner identified a number of areas in this category and Mr. Snow agreed with her assessment. Moreover, Mr. Snow felt that the red bat map was probably the most accurate of the bat maps. Fairly large polygons have been identified for this category. However, the habitats of concern within the polygons are broadleaf riparian woodlands. Sites include the east slope of the Baboquivari Mountains, the Coyote, Sierrita, Cerro Colorado, Las Guijas, Santa Rita, San Luis, Tumacacori, Catalina, Rincon, and Tortolita Mountains.

3. Critical landscape linkages:

Both Dr. Sidner and Mr. Snow agreed that the most important landscape linkages are intermittent and perennial streams.

4. Areas with potential for restoration or enhancement:

None identified

5. Areas which need not or should not be included in the reserve system based on current levels of isolation, fragmentation, or degradation.

None identified

**Southern Yellow Bat (*Lasiurus xanthinus*)**

1. Sites that must be in the reserve system:

None identified – this species seems to be largely urban and associated with fan palms (*Washingtonia filifera*).

2. Sites that would be of value to the reserve system:

Dr. Sidner identified 20 polygons in this category and Mr. Snow added the higher elevations of the Sierrita Mountains, expressing the belief that the red bat and yellow bat maps should be nearly identical. Although yellow bats are generally associated with fan palm trees, they are also known from broadleaf riparian areas where, for example, they have been found roosting in canyon hackberry (*Celtis reticulata*) trees (Snow, Personal Communication to E.L. Smith, January 2001).

3. Critical landscape linkages:

Both Dr. Sidner and Mr. Snow agreed that the most important landscape linkages are intermittent and perennial streams.

**Southern Yellow Bat (*Lasiurus xanthinus*) – Cont.**

4. Areas with potential for restoration or enhancement:

None identified

5. Areas which need not or should not be included in the reserve system based on current levels of isolation, fragmentation, or degradation.

None identified

**Lesser Long-nosed Bat (*Leptonycteris curasoae yerbabuena*)**

1. Sites that must be in the reserve system:

Two large areas have been identified that both Dr. Sidner and Mr. Snow believe contain lands that should be in the Pima County reserve system. One on the southeast side of Tucson centers on Colossal Cave and the Rincon Mountains. The second site is in western Pima County and is largely included within Organ Pipe Cactus National Monument and the Cabeza Prieta National Wildlife Refuge. Despite the fact most of the latter area is presently protected, Mr. Snow thought This area is of higher priority than the eastern site.

2. Sites that would be of value to the reserve system:

Dr. Sidner identified all of extreme eastern and southeastern Pima County east of the old Nogales Highway in this category. She also outlined a large area on the east slope of the Baboquivari mountains north and east to include all or part of the Sierrita, Roskrige, Cerro Colorado, Tumacacori, Las Guijas, and San Luis Mountains. There is also a fairly large polygon surrounding Ajo, Arizona in which suitable foraging substrate (i.e. saguaro cacti) is present, but there are few or no records of the species in the area. Smaller areas are centered on Kinney Road in Tucson Mountain Park and on the Silverbell Mountains north of the Tohono O'odham Nation boundary.

3. Critical landscape linkages:

Both Dr. Sidner and Mr. Snow agreed that the most important landscape linkages are washes and permanent and intermittent streams.

4. Areas with potential for restoration or enhancement:

None identified

**Lesser Long-nosed Bat (*Leptonycteris curasoae yerbabuena*) – Cont.**

5. Areas which need not or should not be included in the reserve system based on current levels of isolation, fragmentation, or degradation.

None identified

**California Leaf-nosed Bat (*Macrotis californicus*)**

1. Sites that must be in the reserve system:

Critical winter roost sites in the Silverbell Mountains should be included in the system. Winter roost sites are vitally important to this species which cannot tolerate temperatures below 70°-75° F. Roosts on the Organ Pipe Cactus National Monument should also be included in the reserve system. Copper Mountain Mine and Growler mine on Organ Pipe are probably winter roosting sites for this species.

2. Sites that would be of value to the reserve system:

None identified

3. Critical landscape linkages:

Both Dr. Sidner and Mr. Snow agreed that the most important landscape linkages are washes and permanent and intermittent streams in desert scrub habitats below 4,500 feet elevation.

4. Areas with potential for restoration or enhancement:

Areas with potential for enhancement are present in the Tucson Mountains, Silverbell Mountains, San Luis, and Las Guijas Mountains. Enhancement in most locations translates to protection of winter and maternity roost sites by gating or other means to keep humans out of abandoned mines and caves that host bats.

5. Areas which need not or should not be included in the reserve system based on current levels of isolation, fragmentation, or degradation.

None identified

## **Pale Townsend's Big-eared Bat (*Plecotus townsendii pallescens*)**

### 1. Sites that must be in the reserve system:

One of four areas in this category identified by Dr. Sidner is on the Tohono O'odham Nation and will not be considered here. Two other sites south and east of Tucson include Colossal Cave and caves at Saguaro National Park and a site in the Empire Mountains east of Highway 83. The fourth site in Pima County is actually associated with a cave across the county line in Santa Cruz County.

### 2. Sites that would be of value to the reserve system:

Dr. Sidner has identified a number of sites in the county that fall into this category and Mr. Snow is in agreement with her choices. Most of the sites are associated with caves or mine adits including sites in the Sierrita, San Luis, Las Guijas, Santa Rita, Tucson, and Santa Catalina Mountains.

### 3. Critical landscape linkages:

Both Dr. Sidner and Mr. Snow agreed that the most important landscape linkages are permanent and intermittent streams.

### 4. Areas with potential for restoration or enhancement:

None identified

### 5. Areas which need not or should not be included in the reserve system based on current levels of isolation, fragmentation, or degradation.

None identified

## **Arizona Shrew and Merriam's Mouse**

### **Arizona Shrew (*Sorex arizonae*)**

#### 1. Sites that must be in the reserve system:

This is a sky island creature that *should* be present in the higher elevations of the Santa Catalina, Santa Rita, and Baboquivari Mountains. The species could potentially occur in the higher elevations of the Rincon and Whetstone Mountains also. However, status reviews are needed in all of the higher elevation regions of the county that have suitable habitat present. No realistic projections of desirable reserve areas can be made in the absence of documented occurrence of this species. Madera Canyon in the Santa Rita Mountains is probably one of the more

**Arizona Shrew (*Sorex arizonae*) – Cont.**

likely places to find this animal based on historic records for the county coupled with the elevational range (down to 5,000 ft) of the species (Bill VanPelt, Ariz. Game & Fish Dept., Pers. Comm. January 2001).

2. Sites that would be of value to the reserve system:

None identified

3. Critical landscape linkages:

A sky island creature – there are no landscape linkages.

4. Areas with potential for restoration or enhancement:

None identified

5. Areas which need not or should not be included in the reserve system based on current levels of isolation, fragmentation, or degradation.

None identified

**Merriam's (= Mesquite) Mouse (*Peromyscus merriami*)**

1. Sites that must be in the reserve system:

As with the Arizona Shrew, this species needs to be studied intensively before reasonable recommendations for the reserve system can be made. Mr. Bill VanPelt, Arizona Game & Fish Department believes that the most likely areas to harbor populations of this species are the mesquite woodlands associated with Arivaca Creek, the Puertocito and Altar Washes on the Buenos Aires National Wildlife Refuge, the Santa Cruz River at the Santa Cruz County line, and along Tanque Verde Wash on Tucson's east side.

2. Sites that would be of value to the reserve system:

Wash systems on the Buenos Aires National Wildlife Refuge, assuming the species is present there.

3. Critical landscape linkages:

None identified

**Merriam's (= Mesquite) Mouse (*Peromyscus merriami*) – Cont.**

4. Areas with potential for restoration or enhancement:

None identified

5. Areas which need not or should not be included in the reserve system based on current levels of isolation, fragmentation, or degradation.

None identified

**Birds**

**Falconiformes – Eagles, Hawks, and Falcons**

**Swainson's Hawk (*Buteo swainsoni*)**

1. Sites that must be in the reserve system:

Although this species may occur nearly statewide during migration, important areas for nesting in Pima County include semi-desert grasslands of the Santa Rita Experimental Range and Santa Rita Mountains and those of the Altar Valley and Sierrita Mountains. Mr. Troy Corman, Arizona Game and Fish Department identified these general areas, as high priority areas for inclusion in reserve designs.

2. Sites that would be of value to the reserve system:

None identified

3. Critical landscape linkages:

None identified

4. Areas with potential for restoration or enhancement:

None identified

5. Areas which need not or should not be included in the reserve system based on current levels of isolation, fragmentation, or degradation.

None identified

## Cuculiformes - Cuckoos and Allies

### Western Yellow-billed Cuckoo (*Coccyzus americanus occidentalis*)

1. Sites that must be in the reserve system:

Mesquite bosques along the Arivaca road are occupied by this species during the monsoon season, but Yellow-billed Cuckoos are generally more common in cottonwood-willow associations associated with running water. In the Arivaca area, cuckoos are more common along Arivaca Creek for this reason. The entire Cienega Creek system and Florida Wash in the Santa Rita Mountains are also high priority sites that should be included in the reserve design for this species.

2. Sites that would be of value to the reserve system:

Riparian areas and dense mesquite bosques along Tanque Verde Creek, Sabino Creek, and the San Pedro River all fall into this category. Although they are not Sonoran Desert plant assemblages, the pecan orchard at Continental have been identified as important summer use areas for this species. However, because they are not natural habitats, we are not recommending their inclusion in the reserve system.

3. Critical landscape linkages:

None identified

4. Areas with potential for restoration or enhancement:

None identified by Arizona Game & Fish. However, enhancement or restoration of riparian habitat along Rillito Creek and elsewhere in the county could result in this species moving in to new habitat areas. Similarly, continued establishment of riparian vegetation along the Santa Cruz River resulting from presence of wastewater in the channel could enhance the prospects of this species occurring along the Santa Cruz.

5. Areas which need not or should not be included in the reserve system based on current levels of isolation, fragmentation, or degradation.

None identified

## Strigiformes – Owls

### **Cactus Ferruginous Pygmy-owl (*Glaucidium brasilianum cactorum*)**

#### 1. Sites that must be in the reserve system:

Generally, areas that are currently known to be occupied by CFPOs fall into this category. Of the five general areas known to be occupied by owls; northwest Tucson, the Sierrita Mountains, the Coyote Mountains, the Altar Valley, and Organ Pipe Cactus National Monument, the populations in northwest Tucson are in the greatest jeopardy and likely warrant more immediate and focused attention. Mr. Scott Richardson, Arizona Game & Fish Department suggested that lands should be reserved within an area roughly bounded by Cortaro Farms Road on the South, La Cholla Boulevard on the east and extending north across the western face of the Tortolita Mountains and west to the west side of Interstate 10. Areas on the north and east side of Tucson that have historic records of owl occurrence are also included in this category.

#### 2. Sites that would be of value to the reserve system:

Most of the habitat in this category identified by the Arizona Game & Fish Department is on the Tohoho O'odham Nation.

#### 3. Critical landscape linkages:

Critical landscape linkages exist in the form of suitable, relatively unfragmented habitat that extends from northwest Tucson west and south through the Avra and Altar Valleys to the U.S. – Mexico border.

#### 4. Areas with potential for restoration or enhancement:

None identified

#### 5. Areas which need not or should not be included in the reserve system based on current levels of isolation, fragmentation, or degradation.

None identified

### **Burrowing Owl (*Athene canicularia*)**

#### 1. Sites that must be in the reserve system:

Davis Monthan Air Force Base, the Santa Cruz River, and agricultural areas west and northwest of Tucson were identified as areas with high potential for harboring

## **Burrowing Owl (*Athene canicularia*) – Cont.**

burrowing owls. Mr. Scott Richardson, Arizona Game & Fish Department believes that the Santa Cruz River is the most important habitat area in the county for this species. Elsewhere in the county it is considered to be a sparse resident that is apparently declining in southeastern Arizona (Tucson Audubon Society 1995).

2. Sites that would be of value to the reserve system:

None identified

3. Critical landscape linkages:

None identified

4. Areas with potential for restoration or enhancement:

None identified

5. Areas which need not or should not be included in the reserve system based on current levels of isolation, fragmentation, or degradation.

None identified

## **Passeriformes – Songbirds**

### **Southwestern Willow Flycatcher (*Empidonax traillii extemis*)**

1. Sites that must be in the reserve system:

None identified – there is potential habitat along Cienega Creek, including that reach of the stream south of the Marsh Station Road. The habitat is currently not occupied. It may not be thick enough or, perhaps, the birds simply haven't found it. There is also potential habitat along Arivaca Creek and on the San Pedro River, although the habitat is not occupied by Southwestern Willow Flycatchers.

2. Sites that would be of value to the reserve system:

Potential habitat along Cienega Creek, Arivaca Creek, and the San Pedro River fall into this category. Although these sites are not currently occupied, it is possible that suitable habitat could develop and become occupied at one or more of these sites.

**Southwestern Willow Flycatcher (*Empidonax traillii extemis*) – Cont.**

3. Critical landscape linkages:

None identified

4. Areas with potential for restoration or enhancement:

None identified, although there may be some potential for enhancing riparian habitats along the effluent-dominated reaches of the Santa Cruz River. It is also

possible that suitable habitat could be developed along the Rillito River if the proposed riparian habitat restoration activities actually occur.

5. Areas which need not or should not be included in the reserve system based on current levels of isolation, fragmentation, or degradation.

None identified

**Bell's Vireo (*Vireo bellii*)**

1. Sites that must be in the reserve system:

Larger washes and drainages at lower elevations in the Santa Catalina, Santa Rita, and Baboquivari Mountains are likely to sustain Bell's Vireos in numbers. Specific sites that could be included in reserve design include mesquite-dominated reaches of the San Pedro River, Altar Wash, Cienega Creek, Tanque Verde Creek, Sabino Canyon, and Sutherland Wash in Catalina State Park. Organ Pipe Cactus National Monument also has substantial good habitat for this species. Stands of mesquite along the Arivaca Road and Arivaca Wash also provide habitat for this species.

2. Sites that would be of value to the reserve system:

There are numerous large washes and canyons not depicted on the Bell's Vireo map that could be placed in this category.

3. Critical landscape linkages:

None identified, but probably include xeroriparian and riparian vegetation along ephemeral, intermittent, and perennial streams.

4. Areas with potential for restoration or enhancement:

None identified, but any areas where riparian restoration or enhancement is undertaken is likely to ultimately provide habitat for this species.

**Bell's Vireo (*Vireo bellii*) – Cont.**

5. Areas which need not or should not be included in the reserve system based on current levels of isolation, fragmentation, or degradation.

None specifically identified, but could include isolated patches of mesquite along almost any drainage in the Tucson basin.

**Abert's Towhee (*Pipilo aberti*)**

1. Sites that must be in the reserve system:

Major drainages in eastern Pima County provide suitable habitat for this species. Abert's Towhee is present in habitats similar to those occupied by Bell's Vireo, but generally prefers a more mesic environment than the vireo. Also, the vireo selects habitats based more on arborescence while Abert's Towhee selects more on the basis of brush and weeds. Any weedy, brushy areas along Cienega Creek, Arivaca Creek, the Altar Wash, and the Santa Cruz and San Pedro Rivers should support populations of this species. Also, larger wash systems such as Sutherland Wash in Catalina State Park provide habitat for Abert's Towhee.

2. Sites that would be of value to the reserve system:

There are numerous large washes and canyons not depicted on the Abert's Towhee map that could be placed in this category.

3. Critical landscape linkages:

None identified but probably include large wash complexes such as the Altar Wash system traversing valley floors.

4. Areas with potential for restoration or enhancement:

None identified, but any areas where riparian restoration or enhancement is undertaken is likely to ultimately provide habitat for this species.

5. Areas which need not or should not be included in the reserve system based on current levels of isolation, fragmentation, or degradation.

None identified

## Rufous-winged Sparrow (*Aimophila carpalis*)

### 1. Sites that must be in the reserve system:

Sites on the Santa Rita Experimental Range and in the Altar Valley should be included in the reserve design. Rufous-winged Sparrows are also fairly common on Tucson's east side and in the vicinity of Catalina State Park. An excellent population of this species occurred formerly (still present?) on tobosa grass (*Hilaria mutica*)/mesquite/desert hackberry swales just north of the intersection of Interstate 10 and Wilmot Road. This site should be investigated to determine its current integrity prior to suggesting its inclusion in the reserve design system.

### 2. Sites that would be of value to the reserve system:

Most of the areas that fit this category are located on Tohono O'odham Nation lands, which are not being considered in this plan. Areas in the north half of Tucson that fall into this category include undeveloped lots

### 3. Critical landscape linkages:

None identified but probably include large wash complexes such as the Altar Wash system traversing valley floors.

### 4. Areas with potential for restoration or enhancement:

None identified

### 5. Areas which need not or should not be included in the reserve system based on current levels of isolation, fragmentation, or degradation.

None identified

## Amphibians and Reptiles

### Amphibians

#### Chiricahua Leopard Frog (*Rana chiricahuensis*)

### 1. Sites that must be in the reserve system:

Areas identified by Dr. Phil Rosen that need to be included in the reserve system include Cienega Creek on the Empire Ranch, a portion of the Buenos Aires National Wildlife Refuge and Florida, Fish, and Sawmill Canyons in the Santa Rita Mountains, and some of the canyon systems in the southern Baboquivari Mountains. Mr. Mike Sredl, Arizona Game & Fish agreed with Dr. Rosen.

## **Chiricahua Leopard Frog (*Rana chiricahuensis*) – Cont.**

### 2. Sites that would be of value to the reserve system:

Generally, areas that surround those sites that must be in the system fall into this category.

### 3. Critical landscape linkages:

None identified

### 4. Areas with potential for restoration or enhancement:

Dr. Rosen felt there was reasonable opportunity for restoration of populations of this species in the Arivaca area. Successful restoration would, however, require the elimination of non-native predators in the area including spiny ray fishes and bullfrogs.

### 5. Areas which need not or should not be included in the reserve system based on current levels of isolation, fragmentation, or degradation.

None identified

## **Lowland Leopard Frog (*Rana yavapaiensis*)**

### 1. Sites that must be in the reserve system:

Dr. Phil Rosen identified Cienega Creek and the San Pedro River system in eastern Pima County as the primary areas that needed to be included in the reserve design. He also identified Tanque Verde Creek southeast of Agua Caliente Hill and an area on Rincon Creek as sites that needed to be included. Areas of perennial water in Catalina State Park should also be included. Mike Sredl, Arizona Game & Fish agreed with Dr. Rosen's assessment and felt that all of Cienega Creek should be included.

### 2. Sites that would be of value to the reserve system:

Sites identified in this category include upper Sutherland Wash and upper Cañada del Oro on the Pima/Pinal County line. Canyons on the south side of the Santa Catalina Mountains, including Sabino Canyon, are also included. In the Rincons, some of the lower reaches of Rincon Creek and canyons on the east side of the loop drive at Saguaro National Park are part of a large area of this category that extends to the south and east and includes part of Agua Verde Creek, Posta Quemada Canyon, Papago Spring, Hidden Spring, and Cumaro Spring in extreme eastern Pima County. A large area centered on Altar Wash and Arivaca Creek are included in this category. Finally, although they are not mapped and do not appear

### Lowland Leopard Frog (*Rana yavapaiensis*) – Cont.

in the habitat modeling, springs should be included as reserve sites and should have adequate adjacent habitat included to provide a protective buffer.

#### 3. Critical landscape linkages:

Pantano Wash downstream of the Cienega Creek Preserve and Tanque Verde Creek downstream to its confluence with Pantano Wash to form Rillito Creek are considered by Dr. Rosen to be critical landscape linkages. Rillito Creek is also placed in this category from its origin downstream to about north 1<sup>st</sup> Avenue is also placed in this category.

#### 4. Areas with potential for restoration or enhancement:

Dr. Rosen identified the Santa Cruz River from the Santa Cruz County line north to about the Black Mountain Road exit off Interstate 19 as an area of potential restoration or enhancement. He also identified the Santa Cruz River from about Valencia Road downstream to a point 2.5 miles north of Ina Road. Included in this reach of the Santa Cruz is Rillito Creek for about five miles upstream from its confluence with the Santa Cruz.

#### 5. Areas which need not or should not be included in the reserve system based on current levels of isolation, fragmentation, or degradation.

None identified

### Reptiles

#### Tucson Shovel-nosed Snake (*Chionactis occipitalis klauberi*)

##### 1. Sites that must be in the reserve system:

A small patch of desert in the vicinity of Trico and Silverbell roads in the agriculturally developed Avra Valley was the last place this small snake was found. It has not been found since 1982. The area designated pcal on the map is largely agriculture and reclamation to pre-agricultural conditions could result in this snake's recovery in Pima County. Native desert parcels within this polygon should be central focus of the reserve design for this species.

##### 2. Sites that would be of value to the reserve system:

An area in the Avra Valley roughly bounded by Sandario Road on the east and Reservation Road and Anway Road on the west and extending north to Twin Peaks Road and south to about Snyder Hill Road was identified by Dr. Rosen as

### **Tucson Shovel-nosed Snake (*Chionactis occipitalis klauberi*) – Cont.**

an area that would be of value to the reserve system. This species is not known from this area but it probably did occur there. Similarly, a second area between the West Silverbell Mountains and the Santa Rosa Mountains probably supported the Tucson Shovel-nosed Snake.

3. Critical landscape linkages:  
None identified

4. Areas with potential for restoration or enhancement:

The possibility exists that some of the agricultural lands within the identified reserve area could be reclaimed to native desert.

5. Areas which need not or should not be included in the reserve system based on current levels of isolation, fragmentation, or degradation.

None identified

### **Organ Pipe Shovel-nosed Snake (*Chionactis palarostris organica*)**

1. Sites that must be in the reserve system:

Suitable reserve sites for this subspecies species should be identified on Organ Pipe Cactus National Monument in western Pima County. The primary center of distribution of this subspecies in the United States is on the monument with a few, scattered localities along Highway 85 north of the monument.

2. Sites that would be of value to the reserve system:

Dr. Phil Rosen identified an area extending across Ranges 3 to 5 West on the Pima/Maricopa County line that he felt contained suitable habitat and probably supports populations of this snake although there are no records from the area. The area is centered on the Batamote Mountains and includes broad, alluvial valleys on the east and west sides of the Batamotes.

3. Critical landscape linkages:

None specifically identified, although the lands lying between pca1 and pca2 and containing records of the species would fall into this category if pca2 is actually occupied by the species.

**Organ Pipe Shovel-nosed Snake (*Chionactis palarostris organica*) – Cont.**

4. Areas with potential for restoration or enhancement:

None identified

5. Areas which need not or should not be included in the reserve system based on current levels of isolation, fragmentation, or degradation.

None identified

**Giant Spotted Whiptail (*Cnemidophorus burti stictogrammus*)**

1. Sites that must be in the reserve system:

The lower foothills, particularly brushy, rocky canyons, around the Santa Catalina Mountains represent the prime Pima County habitats of this subspecies. Interestingly, there is also an extant population of this lizard along the Santa Cruz River in downtown Tucson. Reserve sites for the Giant Spotted Whiptail should include sites in the Catalina foothills.

2. Sites that would be of value to the reserve system:

A number of sites in eastern Pima County were identified by Dr. Rosen as areas that would be of value to the reserve system including canyons along the eastern slope of the Baboquivari Mountains and similar habitats in the San Luis, Las Guijas, Atascosa, and Santa Rita Mountains. Also included in this category is Sabino Canyon in the Santa Catalina Mountains, and an area along Rincon Creek in the Rincon Mountains.

3. Critical landscape linkages:

Critical landscape linkages between Santa Catalina and Rincon Mountain Populations exist along the west side of the Rincons, north to approximately the Molino Canyon region of the Santa Catalinas. This linkage continues westward along Tanque Verde Creek and the Rillito River to its confluence with the Santa Cruz River. This linkage potentially ties all Number 1 and Number 2 sites associated with the Santa Catalina and Rincon Mountains and Santa Cruz River together.

4. Areas with potential for restoration or enhancement:

Areas with the potential for enhancement or restoration are present on Tanque Verde and Rillito Creeks as well as along the Santa Cruz River. A potential

## Giant Spotted Whiptail (*Cnemidophorus burti stictogrammus*) – Cont.

enhancement area on the Santa Cruz exists between Roger Road on the north and 22<sup>nd</sup> Street on the south. Further south on the Santa Cruz, Dr. Rosen identified another potential restoration/enhancement area between the Santa Cruz County line and a point about four miles north of the Pima Mine Road on Interstate 19.

5. Areas which need not or should not be included in the reserve system based on current levels of isolation, fragmentation, or degradation.

None identified

## Red-backed Whiptail Lizard (*Cnemidophorus burti xanthonotus*)

1. Sites that must be in the reserve system:

Dr. Phil Rosen enthusiastically identified Martina Mountain west of Three Points on the north side of the Ajo Highway as a site that must be included in the reserve design for this subspecies. Other areas from which reserve sites should be selected include the west slope of the Ajo Mountains at Organ Pipe Cactus National Monument and an area centered on the Batamote Mountains northwest of Ajo.

2. Sites that would be of value to the reserve system:

Dr. Rosen identified a unit in the Silverbell area that may be of value to the reserve system although, he pointed out, the subspecies is not currently known to be present in the area. Other sites in this category include the Growler Mountains on the Barry M. Goldwater Range, Puerto Blanco Mountains on Organ Pipe Cactus National Monument, and Childs Mountain on the Cabeza Prieta National Wildlife Refuge. pca2 as mapped covers a large portion of western Pima County. Specific sites within the pca should be identified for inclusion in the reserve system. Other units include a small site west of the Batamote Mountains, a small site south of the Batamotes, and a small site in the southern reaches of the Pozo Redondo Mountains at the intersection of Highways 85 and 86 at Why, Arizona.

3. Critical landscape linkages:

None identified

**Red-backed Whiptail Lizard (*Cnemidophorus burti xanthonotus*) – Cont.**

4. Areas with potential for restoration or enhancement:

None identified

5. Areas which need not or should not be included in the reserve system based on current levels of isolation, fragmentation, or degradation.

None identified

**Ground Snake (Valley Form) (*Sonora semiannulata*)**

1. Sites that must be in the reserve system:

Areas of heavy, undisturbed soils between the Avra Valley Road and the Pinal County line are the only places in the county where reserve design may be of benefit to this species. This is a geographically similar area to that recommended for the Tucson Shovel-nosed Snake. The two snakes are known to occur in the same general area northwest of Tucson, but are not sympatric in that the Tucson Shovel-nosed Snake prefers finer, sandier soils.

2. Sites that would be of value to the reserve system:

None identified

3. Critical landscape linkages:

None identified

4. Areas with potential for restoration or enhancement:

See Number 1 above. Reclaiming agricultural fields in the area described above is the only real possibility for restoring habitat for this species.

5. Areas which need not or should not be included in the reserve system based on current levels of isolation, fragmentation, or degradation.

None identified

**Mexican Garter Snake (*Thamnophis eques megalops*)**

1. Sites that must be in the reserve system:

Within the county, the Cienega Creek system from about the Colossal Cave Road crossing of Pantano wash upstream to near the Santa Cruz County line represents

## Mexican Garter Snake (*Thamnophis eques megalops*) – Cont.

the finest habitat for this species and must be included in the reserve system.

### 2. Sites that would be of value to the reserve system:

Arivaca Creek from the Santa Cruz County line northwest to a point about 2.5 to 3.0 miles northwest of the village of Arivaca was identified by Dr. Rosen as an area that would be of value to the reserve system. This same reach of Arivaca Creek was also identified as an area where restoration or enhancement activities could be of value.

### 3. Critical landscape linkages:

Landscape linkages for this species are, not surprisingly, reaches of streams downstream from known or potential population centers. For example, the Pantano Wash between Cienega Creek and a possible restoration/enhancement area on Tanque Verde Creek could serve as linkage between populations, especially during flooding episodes when snakes could be washed from Cienega Creek downstream to Tanque Verde Creek. Dr. Rosen also identified a linkage on the Rillito River between potential restoration areas on the Santa Cruz River and Tanque Verde Creek. A similar link exists between two potential restoration areas on the Santa Cruz River (see Number 4).

### 4. Areas with potential for restoration or enhancement:

Four areas that hold promise for restoration and/or enhancement were identified by Dr. Rosen. The general area identified on Arivaca Creek in extreme southern Pima County may represent an enhancement opportunity inasmuch as Mexican Garter Snakes may still persist in this area where they were once abundant.

Two general areas where restoration may be effected on the Santa Cruz River include a reach from the Santa Cruz County line northward to about Continental. Effluent-dominated flows in the Santa Cruz River extend at least to the Santa Cruz/Pima County line in most years and may extend as far north as Continental, providing potential habitat for this species. The second reach of the Santa Cruz originates in the vicinity of Valencia Road and runs north to a point just upstream of Cortaro. The second Santa Cruz reach will require input of water from an outside source (CAP ?) upstream of the outfall for the Roger Road Wastewater Plant.

The fourth potential restoration/enhancement area identified by Dr. Rosen lies along Tanque Verde Creek and includes parts of Molino and Sabino Creeks at their lower elevations. On Tanque Verde Creek, this area extends from about the mouth of Reddington Canyon downstream to Swan Road.

**Mexican Garter Snake (*Thamnophis eques megalops*) – Cont.**

5. Areas which need not or should not be included in the reserve system based on current levels of isolation, fragmentation, or degradation.

None identified

**Desert Box Turtle (*Terrapene ornate luteola*)**

1. Sites that must be in the reserve system:

A reserve system that includes this species must include a parcel of the grasslands in the Cienega Creek watershed immediately north of the Santa Cruz County line, east and west of Highway 83. Good habitat for this species extends from the county line north through T19S and midway through T18S. The habitat identified by Mr. Marty Teugel includes parts of Range Nos. 16,17, and 18E. Mr. Teugel also felt that there were areas in the southern Altar Valley that should also be included in the reserve design. Dr. Rosen opined that the species was quite rare in the Altar Valley and felt most of that grassland system should be included in the category of sites that would be of value to the reserve system. Clearly, the Sonoita/Empire Ranch grassland site in extreme southeastern Pima County is the priority site for this animal.

2. Sites that would be of value to the reserve system:

Grassland habitats from the Sierrita Mountains south and west through the Altar Valley to the Mexican border fall into this category.

3. Critical landscape linkages:

Generally, much of the Altar Valley can be viewed as a linkage between the northern extent (Sierrita Mountains) of the species range and Mexico. Linkages in southeastern Pima County need to be maintained with Santa Cruz and Cochise Counties, both of which are probably more important to the continued existence of this species than is Pima County.

4. Areas with potential for restoration or enhancement:

A curious area of occurrence of Desert Box Turtle is mapped on either side of Tanque Verde Road from about Camino Rinconada west to about Pantano Road. The area extends north to the Catalina Highway and south to about Speedway Boulevard. This area was suggested as a possible restoration/enhancement area by Dr. Rosen. Mr. Marty Tuegel, Arizona Game & Fish Department, agreed and wondered whether this apparently isolated population might have arisen from escaped backyard pets. Conversely, there other species with Chihuahuan Desert affinities that occur on the north and east side of the Catalina/Rincon block. We

### **Desert Box Turtle (*Terrapene ornate luteola*) - Cont.**

cannot, therefore rule out the possibility this is a relictual, natural population.

5. Areas which need not or should not be included in the reserve system based on current levels of isolation, fragmentation, or degradation.

None identified

### **Fishes**

Of the vertebrate faunas of Arizona, none have been more profoundly affected by a variety of human activities than the fishes. Minckley (1973) lists a total of 99 full species of fishes in Arizona. Of this number, 68 species have been accidentally or intentionally introduced from other parts of the country and world. Many of the introduced species were brought to Arizona to provide sport fishing and many others were brought to the state to be used as bait to catch the introduced sport fishes. Of the 31 native species found in the state, 10 are listed by the U.S. Fish and Wildlife Service as Threatened or Endangered species. It is conceivable that the entire native fish fauna of the state will some day be included on lists of Threatened or Endangered species.

The plight of Arizona's fishes results from massive alterations in habitats (Minckley and Deacon 1991), most notable on the Salt, Gila, and Colorado Rivers where dams, diversions, and removal of water have seriously damaged or utterly destroyed habitats required by the native fauna. Habitat alteration/destruction has been exacerbated by the introduction of a large number of exotic fish species, many of which prey directly on the native fishes.

Wholesale reconstruction of some stream systems (e.g., Arivaca Creek) including removal of dams and diversions and poisoning of non-native inhabitants will be required if populations of native species are to be recovered (Minckley, Pers. Comm. with E.L. Smith, February 2001).

### **Desert Pupfish (*Cyprinodon macularius malarialis*)**

1. Sites that must be in the reserve system:

No specific sites were identified by Dr. W.L. Minckley. He believes Desert Pupfish could be sustained in virtually any lowland pond or stream system in Pima County provided the Mosquitofish (*Gambusia affinis*) is not present. Any spring fed seepage or isolated stream segments at the heads of watersheds could provide suitable habitat.

Sites generically identified but not specifically mapped by Dr. Minckley included Cienega Creek, springs at Agua Caliente Park, and Buehman Canyon.

## Desert Pupfish (*Cyprinodon macularius malaris*) – Cont.

### 2. Sites that would be of value to the reserve system:

See 1 above. Dr. Minckley also noted that all standing water in the county should be surveyed for permanence. Sites with permanent water, including stock tanks could be selected, non-native species killed, and the site stocked with native species. He suggested fencing cattle out and using solar-powered pumps to move water from the stock tank to watering troughs outside the fence line.

### 3. Critical landscape linkages:

None specifically identified.

### 4. Areas with potential for restoration or enhancement:

No areas specifically identified, but see Nos. 1 and 2 above. Almost any permanent water source could be restored or enhanced for this species.

### 5. Areas which need not or should not be included in the reserve system based on current levels of isolation, fragmentation, or degradation.

None identified

## Gila Topminnow (*Poeciliopsis occidentalis occidentalis*)

### 1. Sites that must be in the reserve system:

No specific sites were identified by Dr. W.L. Minckley. He believes Gila Topminnow could be sustained in virtually any lowland pond or stream system in Pima County provided the Mosquitofish (*Gambusia affinis*) is not present. Any spring fed seepage or isolated stream segments at the heads of watersheds could provide suitable habitat.

Specific sites generically identified by Dr. Minckley included Cienega Creek, springs at Agua Caliente Park, and Buehman Canyon. All of these sites should be included in the reserve system for this species.

### 2. Sites that would be of value to the reserve system:

See 1 above. Dr. Minckley also noted that all standing water in the county should be surveyed for permanence. Sites with permanent water, including stock tanks could be selected, non-native species killed, and the site stocked with native species. He suggested fencing cattle out and using solar-powered pumps to move water from the stock tank to watering troughs outside the fence line.

**Gila Topminnow (*Poeciliopsis occidentalis occidentalis*) – Cont.**

3. Critical landscape linkages:

None specifically identified.

4. Areas with potential for restoration or enhancement:

No areas specifically identified, but see Nos. 1 and 2 above. Almost any permanent water source could be restored or enhanced for this species.

5. Areas which need not or should not be included in the reserve system based on current levels of isolation, fragmentation, or degradation.

None identified

**Longfin Dace (*Agosia chrysogaster*)**

1. Sites that must be in the reserve system:

Cienega Creek and Buehman Canyon are two sites where this species persists and should be included in the reserve design.

2. Sites that would be of value to the reserve system:

None specifically identified. Dr. Minckley suggested that any good, clear stream flowing over a shifting sand bottom could provide suitable habitat for this species.

3. Critical landscape linkages:

None specifically identified.

4. Areas with potential for restoration or enhancement:

Dr. Minckley identified Arivaca Creek as a possible restoration/enhancement area. He also suggested that this species is common enough in Cienega Creek that stockers could be taken from Cienega Creek and introduced at other restoration sites to serve as the "canary in the coal mine" to monitor the effectiveness of restoration activities.

5. Areas which need not or should not be included in the reserve system based on current levels of isolation, fragmentation, or degradation.

None identified

## Desert Sucker (*Catostomus clarkii*) and Sonoran Sucker (*Catostomus insignis*)

### 1. Sites that must be in the reserve system:

Dr. Minckley felt that Cienega Creek was the best habitat in the county for both of these species. He suggested obtaining stockers of *C. clarkii* from Sonoita Creek in Santa Cruz County. He also suggested that it may be possible to get stockers of *C. insignis* from the upper Santa Cruz River. He also suggested that *C. insignis* might take hold at Aqua Caliente Park. Should Pima County plan introductions of either species in Cienega Creek or Agua Caliente Park, Dr. Minckley offered to help ascertain the genetic make-up of stockers. Although we have identified Cienega Creek as pcal for both of these species, there are currently no known populations of either species in the county and it may be more appropriate to identify Cienega Creek pca4 for both species.

### 2. Sites that would be of value to the reserve system:

None specifically identified.

### 3. Critical landscape linkages:

None specifically identified.

### 4. Areas with potential for restoration or enhancement:

Dr. Minckley identified Arivaca Creek as a possible restoration/enhancement area for both of these species.

### 5. Areas which need not or should not be included in the reserve system based on current levels of isolation, fragmentation, or degradation.

None identified

## Gila Chub (*Gila intermedia*)

### 1. Sites that must be in the reserve system:

Cienega Creek on the Empire Ranch was identified as the number one priority for maintaining this species in the county.

### 2. Sites that would be of value to the reserve system:

Sabino Canyon is an area that would be of value to the reserve system. With recent efforts by the U.S. Forest Service and Arizona Game & Fish to eliminate non-native fish and crayfish from Sabino Creek, this area is further enhanced as a potential site to be included in reserve design.

**Gila Chub (*Gila intermedia*) – Cont.**

3. Critical landscape linkages:

None specifically identified.

4. Areas with potential for restoration or enhancement:

Dr. Minckley identified Arivaca Creek as a possible restoration/enhancement area for this species. Agua Caliente Spring is another location that should be considered for introduction of this species.

5. Areas which need not or should not be included in the reserve system based on current levels of isolation, fragmentation, or degradation.

None identified

**Invertebrates**

**Arkenstone Cave Pseudoscorpion (*Albiorix anophthalmus*)**

1. Sites that must be in the reserve system:

Arkenstone Cave in Colossal Cave Mountain Park on Tucson's far east side is the only known location of occurrence for this species. Consequently, this cave is the only location in the county that falls into this category.

2. Sites that would be of value to the reserve system:

None known.

3. Critical landscape linkages:

None known.

4. Areas with potential for restoration or enhancement:

None known.

5. Areas which need not or should not be included in the reserve system based on current levels of isolation, fragmentation, or degradation.

None known.

## **Talus Snails (*Sonorella* spp.)**

### 1. Sites that must be in the reserve system:

Since talus snails are so immobile, areas where snails are known to occur are of primary importance and should be identified as pcal in the reserve design.

### 2. Sites that would be of value to the reserve system:

Generally, locations of known snail populations that are in County parks or on Forest Service land are of lower priority than those on private and BLM lands inasmuch as they receive at least some level of de facto protection.

### 3. Critical landscape linkages:

Landscape linkages are meaningless for this group of organisms.

### 4. Areas with potential for restoration or enhancement:

None known.

### 5. Areas which need not or should not be included in the reserve system based on current levels of isolation, fragmentation, or degradation.

None known.

## **Plants**

### **Pima Pineapple Cactus (*Coryphantha scheeri robustispina*)**

#### 1. Sites that must be in the reserve system:

Areas of known populations should be included in the reserve design. Specific suitable areas include the grasslands north and south of Interstate 10 at the Sonoita Highway exit. Other suitable sites are located on the Santa Rita Experimental Range.

Mr. Phil Jenkins did not identify any specific areas that should be included as pcal but indicated that the habitat model was probably reasonably accurate south of Ajo Way and to the east of Interstate 19. Specific reserve sites within this broad area should be identified as pcal1 for this species.

#### 2. Sites that would be of value to the reserve system:

Generally, locations of known Pima Pineapple Cactus populations that do not get included in pcal areas should be designated pca2.

**Pima Pineapple Cactus (*Coryphantha scheeri robustispina*) – Cont.**

3. Critical landscape linkages:

None known.

4. Areas with potential for restoration or enhancement:

None known.

5. Areas which need not or should not be included in the reserve system based on current levels of isolation, fragmentation, or degradation.

None known.

**Gentry Indigo Bush (*Dalea tentaculoides*)**

1. Sites that must be in the reserve system:

The most likely locations for this species in Pima County are in the Baboquivari Mountains although the species could be present in the San Luis and Tumacacori Mountains. Specific sites to be included in the reserve design system are mid elevation canyons on the east slope of the Baboquivari Mountains. Generally, within the areas labeled 1,2 on the habitat map for this species, priority sites are rocky, non-sandy drainages (pca 1) and adjacent slopes and ridges are categorized as pca2. Although the species is not known from Pima County, potential reserve sites on the east slope of the Baboquivari Mountains should be investigated.

2. Sites that would be of value to the reserve system:

See number 1 above.

3. Critical landscape linkages:

The Sierrita, Cerro Colorado, and Las Guijas mountains may represent landscape linkages. The species evolved in the Sierritas and Tumacacori Mountains and migrated to the Baboquivari Mountains or vice versa (Gentry 1950).

4. Areas with potential for restoration or enhancement:

The Sierrita, Cerro Colorado, and Las Guijas mountains may be areas where this species could be enhanced.

**Gentry Indigo Bush (*Dalea tentaculoides*) – Cont.**

5. Areas which need not or should not be included in the reserve system based on current levels of isolation, fragmentation, or degradation.

None identified.

1. Sites that must be in the reserve system:

In Pima County, this species is known only from the Waterman and Silverbell Mountains where it is restricted to Horquilla Limestone. There are also old records from Twin Peaks, but this population has likely been eliminated by mining activities at Twin Peaks. Consequently, the highest priority sites for this species are occupied areas of Horquilla Limestone on the south slopes of the Waterman Mountains.

2. Sites that would be of value to the reserve system:

Smaller areas of Horquilla Limestone in the Silverbell and Waterman Mountains.

3. Critical landscape linkages:

Linkages probably exist in the Waterman and Silverbell Mountains, although they are not easily or clearly defined.

4. Areas with potential for restoration or enhancement:

This species is present in the Vekol Mountains in southwest Pinal County. It is possible that enhancement opportunities may exist in the Cimarron and Sheridan Mountains on the Tohono O'odham Nation.

5. Areas which need not or should not be included in the reserve system based on current levels of isolation, fragmentation, or degradation.

None identified.

**Acuña Cactus (*Echinomastus erectocentrus* var. *acuñensis*)**

1. Sites that must be in the reserve system:

Dark, gravelly to stony slopes with grass and mesquite within Organ Pipe Cactus National Monument and the Cabeza Prieta National Wildlife Refuge.

**Acuña Cactus (*Echinomastus erectocentrus* var. *acuñensis*) – Cont.**

2. Sites that would be of value to the reserve system:

Other upland (non-sandy) sites within Organ Pipe Cactus National Monument and the Cabeza Prieta National Wildlife Refuge and all non-sandy parts of the Barry M. Goldwater Range.

3. Critical landscape linkages:

None identified.

4. Areas with potential for restoration or enhancement:

None identified.

5. Areas which need not or should not be included in the reserve system based on current levels of isolation, fragmentation, or degradation.

None identified.

**Needle-spined Pineapple Cactus (*Echinomastus erectocentrus* var. *erectocentrus*)**

1. Sites that must be in the reserve system:

Parcels of land immediately south of Interstate 10 at the Sonoita Highway exit should be considered for inclusion in the reserve design as pcal. Also, the expanded portion of Colossal Cave Mountain Park supports this species. Phil Jenkins believes there are many more localities for this species that are not shown on the map and areas where the species is lacking simply have not been surveyed. All known locations should be reserve sites and other areas within pcal should be surveyed and subsequently included as reserve sites as populations are found.

2. Sites that would be of value to the reserve system:

Generally, unsurveyed areas within the major polygon outlined on the map for this species fall into this category. Due to sketchy information on total distribution of this species, these sites are included within pcal. Also a known location for this species in the grassland areas near the Empire Ranch would also be of value to the reserve system.

3. Critical landscape linkages:

Landscape linkages may exist along the Pima/Cochise County line and in the general vicinity of Corona de Tucson and south to the Santa Cruz County line.

**Needle-spined Pineapple Cactus (*Echinomastus erectocentrus* var. *erectocentrus*) –  
Cont.**

4. Areas with potential for restoration or enhancement:

Possible restoration or enhancement areas may exist along the Pima/Cochise County line and in the general area of Corona de Tucson.

5. Areas which need not or should not be included in the reserve system based on current levels of isolation, fragmentation, or degradation.

None identified.

**Huachuca Water Umbel (*Lilaeopsis schaffneriana* var. *recurvata*)**

1. Sites that must be in the reserve system:

Cienega Creek is the most important potential habitat for this species in Pima County. Any areas along the creek where this species is actually present must be in the reserve design.

2. Sites that would be of value to the reserve system:

Any sites along Cienega Creek that have the potential to support this species should be considered in this category.

3. Critical landscape linkages:

None identified.

4. Areas with potential for restoration or enhancement:

Phil Jenkins identified Arivaca Creek near Ruby and the Santa Cruz River downstream of Pima County wastewater discharge points as potential areas for restoration or enhancement for this species.

5. Areas which need not or should not be included in the reserve system based on current levels of isolation, fragmentation, or degradation.

None identified.

## **Tumamoc Globeberry (*Tumamoca macdougalii*)**

### 1. Sites that must be in the reserve system:

Phil Jenkins felt that this species is so widely distributed in Sonoran Desertscrub habitats that specific sites for reserve design were difficult to identify. Consequently, no pcas were specifically mapped. Any reserve design components that include creosote bush/bursage to ironwood habitats on fine soils will probably be successful in capturing this species.

### 2. Sites that would be of value to the reserve system:

None identified.

### 3. Critical landscape linkages:

None identified.

### 4. Areas with potential for restoration or enhancement:

None identified.

### 5. Areas which need not or should not be included in the reserve system based on current levels of isolation, fragmentation, or degradation.

None identified.

## **RECOMMENDATIONS**

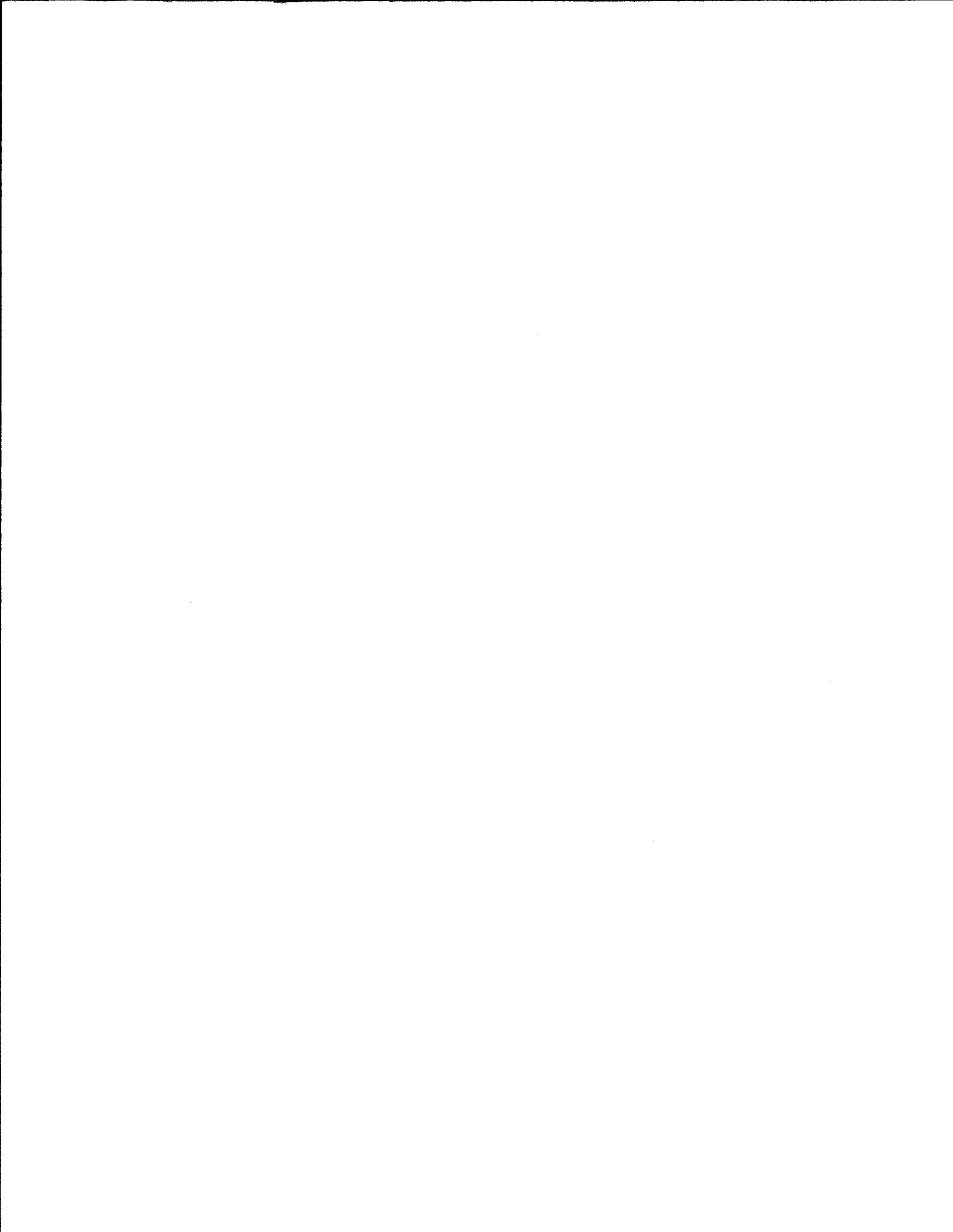
1. The actual locations of reserve sites within pcas needs to be carefully considered, as some pcas are too broadly defined relative to the modeled habitat within the pca.
2. Where pcas lack predicted habitat, it is recommended that experts define what environmental parameters of the pca make it an important area for the species. Species for which this kind of effort may be needed include Western Red Bat, Southern Yellow Bat, Abert's Towhee, Bell's Vireo, Giant Spotted Whiptail, and Red-backed Lizard.
3. Where experts do not agree about which are the most important areas for a species, it is recommended that a working group be convened to discuss pca delineation and classification. Species for which this kind of work may be needed include Allen's Big-eared Bat, Chiricahua and Lowland Leopard Frog, and Southern Yellow Bat.
4. Additional on the ground work needs to be done prior to defining any final reserve sites. For example, it may be necessary to determine that the actual habitat targeted for preservation still exists at a proposed reserve site, or that

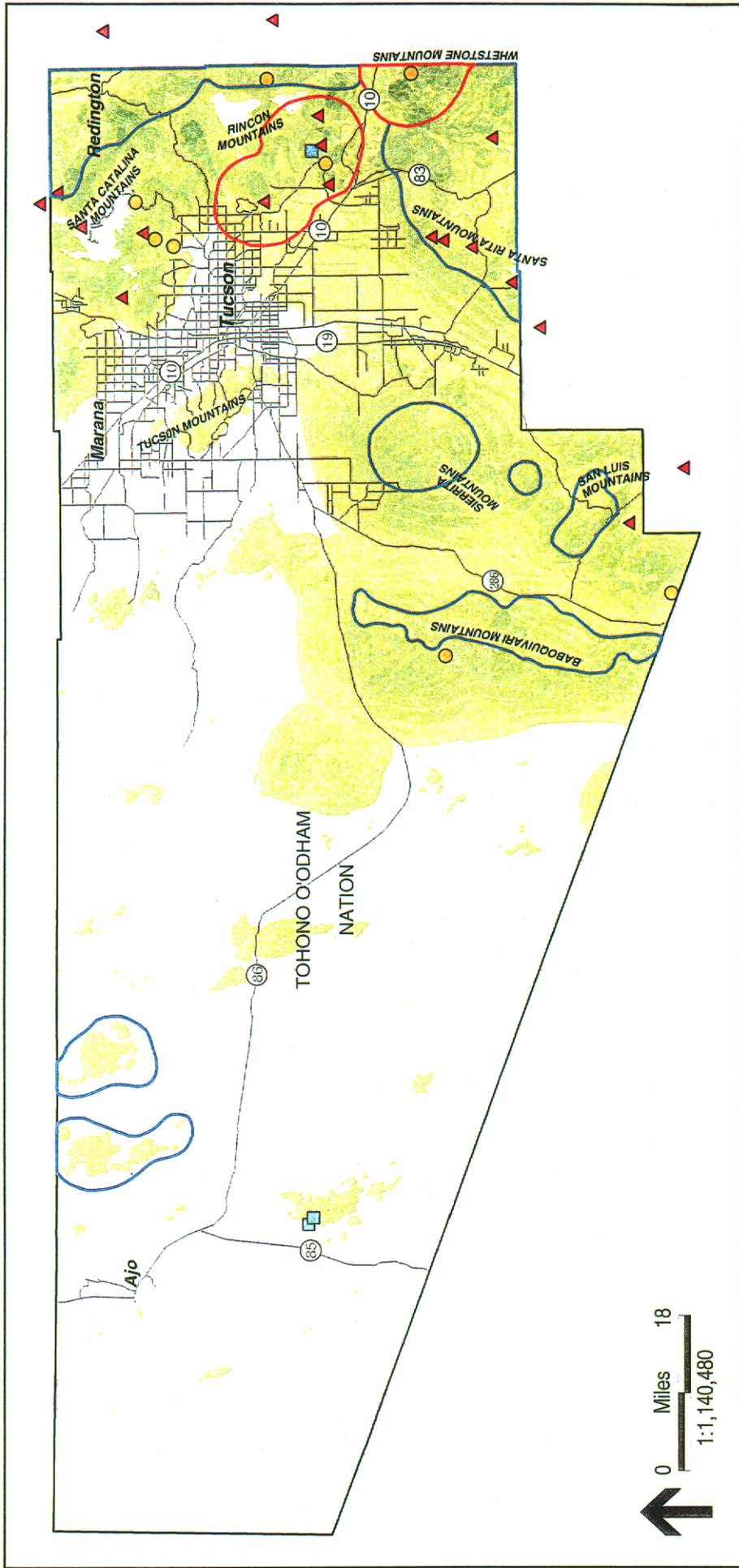
populations of the target species are still present on the site. A good example is the robust population of Rufous-winged Sparrows that was present at Wilmot Road and Interstate 10 in 1965-1970 – if that population is still there, this would be a very good site to establish a pca for this species.

5. Further discussion with experts is warranted. For example, several people identified the Sierrita Mountains as a primary or secondary pca for several species even though they had not visited the area. The Sierritas may represent a data gap that we may need to fill prior to recommending the establishment of pcas at this location. Also, experts were sometimes inconsistent in their consideration of land use or species vulnerability.
6. Landscape linkages for Cactus Ferruginous Pygmy-owl need to be shown on the map for this species.
7. The Davis-Monthan Air Force Base polygon on the Burrowing Owl map needs to be corrected – it currently includes a lot of urban Tucson, which is incorrect.
8. Additional discussion and data entry (habitat models) are needed for Bell's Vireo and Abert's Towhee. While the two species occupy similar habitats, there are subtle differences in habitat selection that are not currently captured in the habitat models. It may not be possible to fine-tune the models with the data currently in hand. Field reconnaissance should be conducted prior to identifying reserve sites for either species.
9. Additional discussion about Rufous-winged Sparrow appears appropriate. A lot of the urbanized north side of Tucson is included in a pca for this species. This seems inappropriate.

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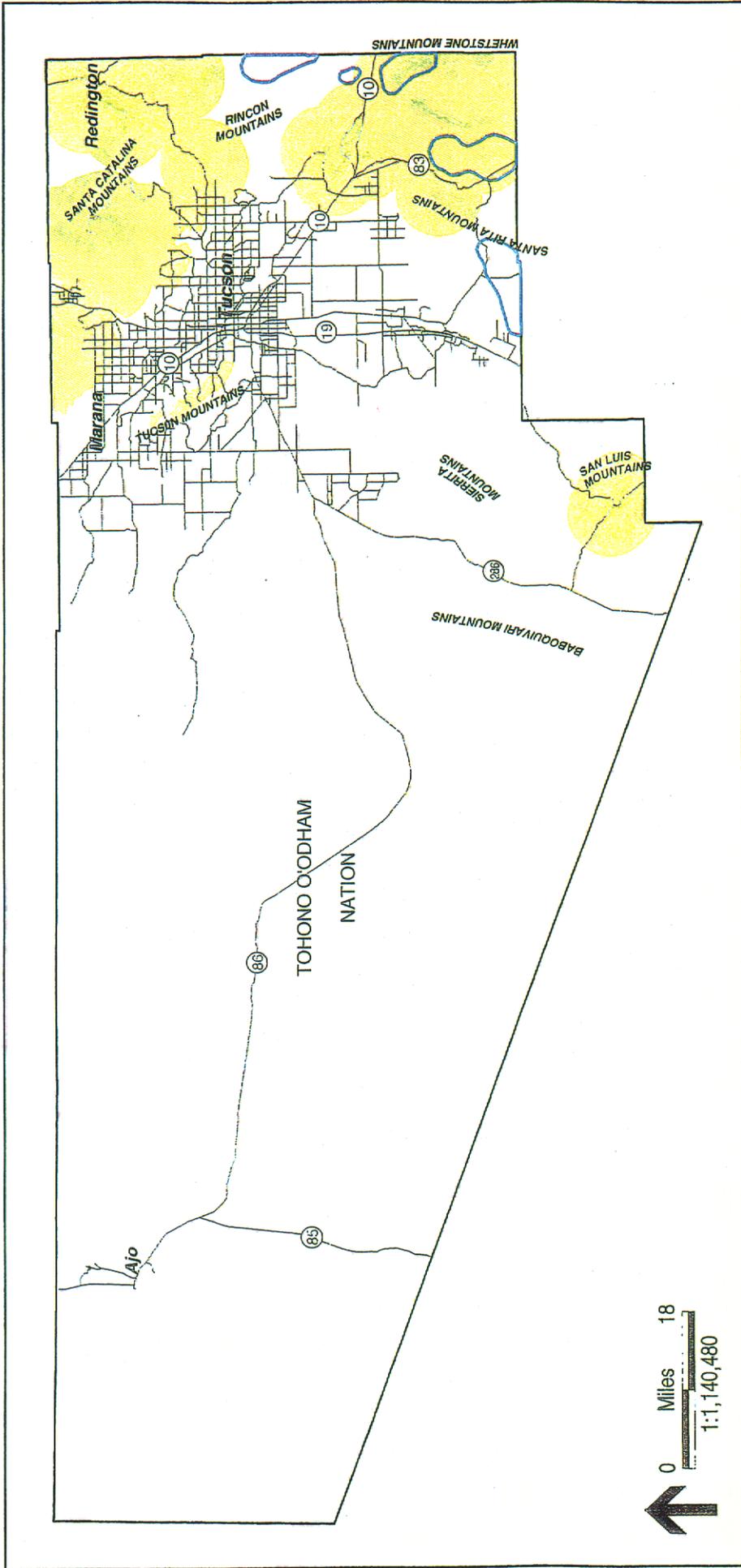


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# Mexican Long-tongued Bat (*Choeronycteris mexicana*) Priority Conservation Areas and Modeled Potential Habitat

- Pima County Boundary
- Major Road or Highway
- 1** Priority Conservation Areas (STAT, January 2001)
  - Areas with populations which must be within the reserve system (excluding the Tohono O'odham Nation)
  - Areas that would be of value to the reserve system
- Modeled Potential Habitat (RECON, January 2001)
  - No Potential
  - Low Potential
  - Medium Potential
  - High Potential
- Known Locations
  - (SWCA, 2000)
  - (HDMS, 2000)
  - (Sidner, 1989-1997)

Figure 1

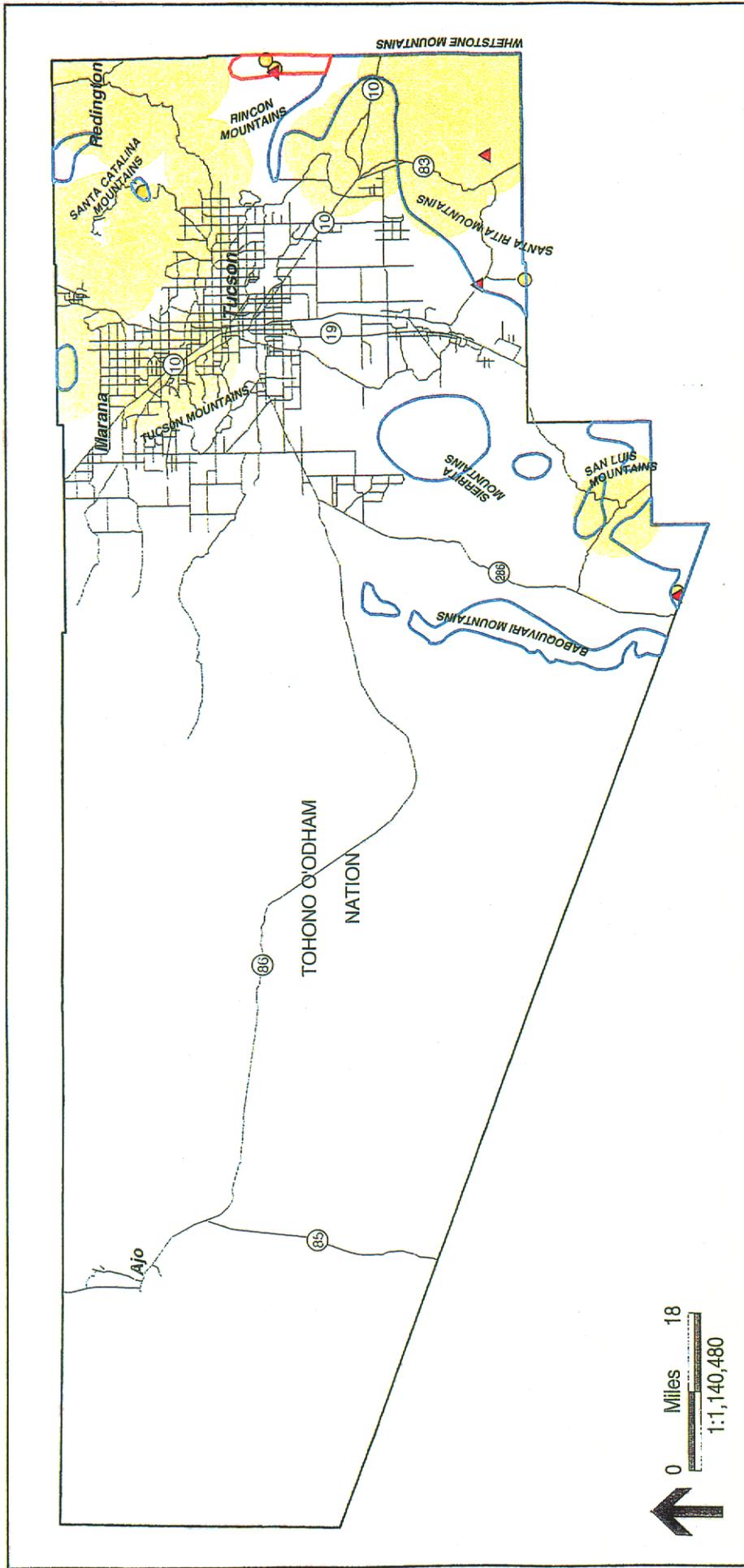


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# Allen's Big-eared Bat (*Idionycteris phyllotis*) Priority Conservation Areas and Modeled Potential Habitat

- Pima County Boundary
- Major Road or Highway
- Priority Conservation Areas (STAT, January 2001)
- Areas that would be of value to the reserve system
- Modeled Potential Habitat (RECON, January 2001)**
  - No Potential
  - Low Potential
  - Medium Potential
  - High Potential

Figure 2



## Western Red Bat (*Lasiurus blossevillii*)

### Priority Conservation Areas and Modeled Potential Habitat

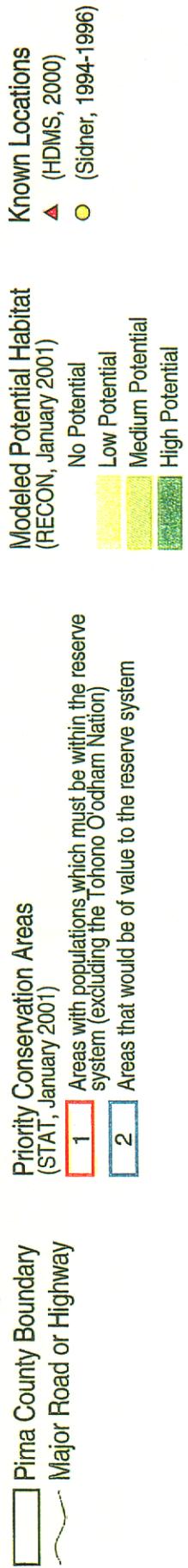
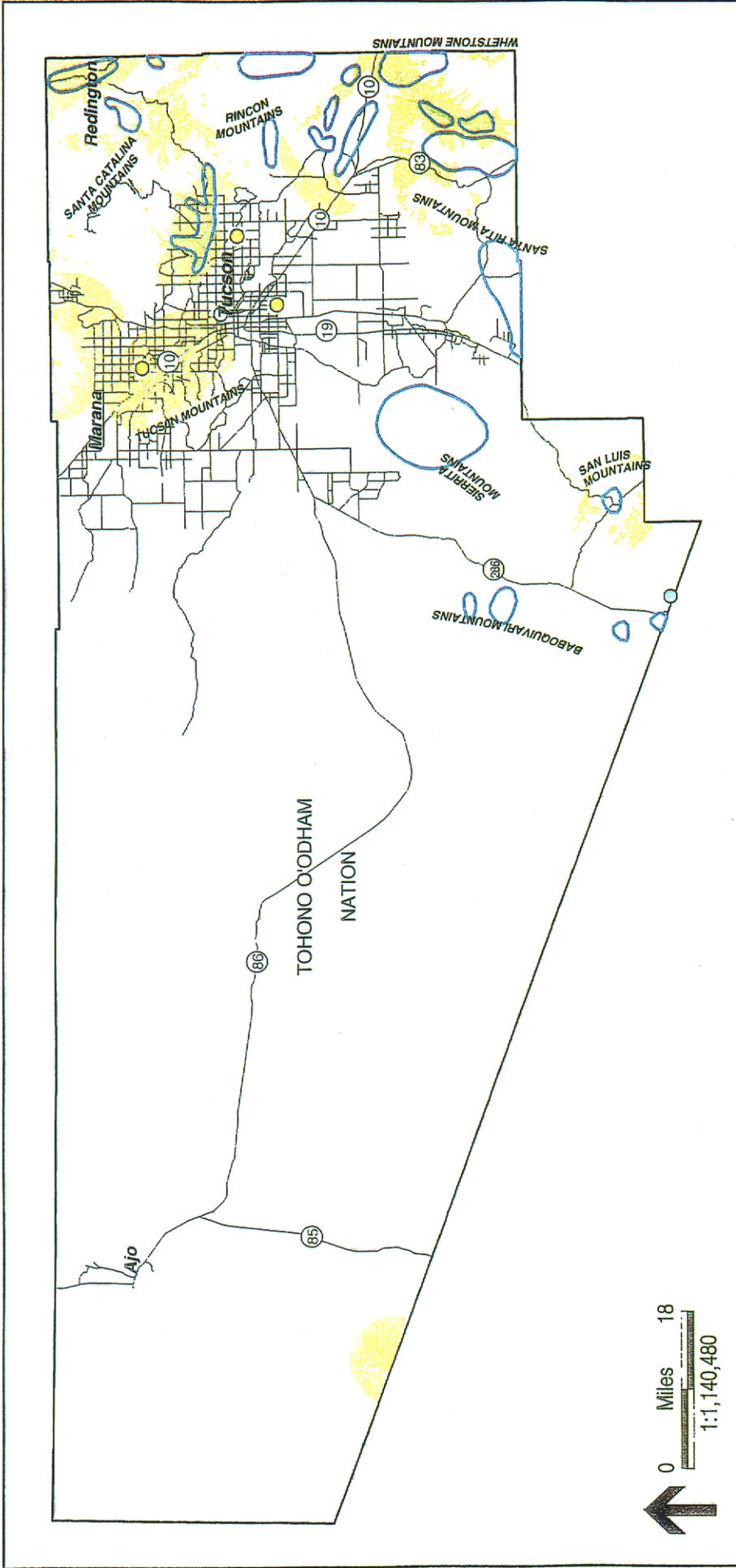


Figure 3

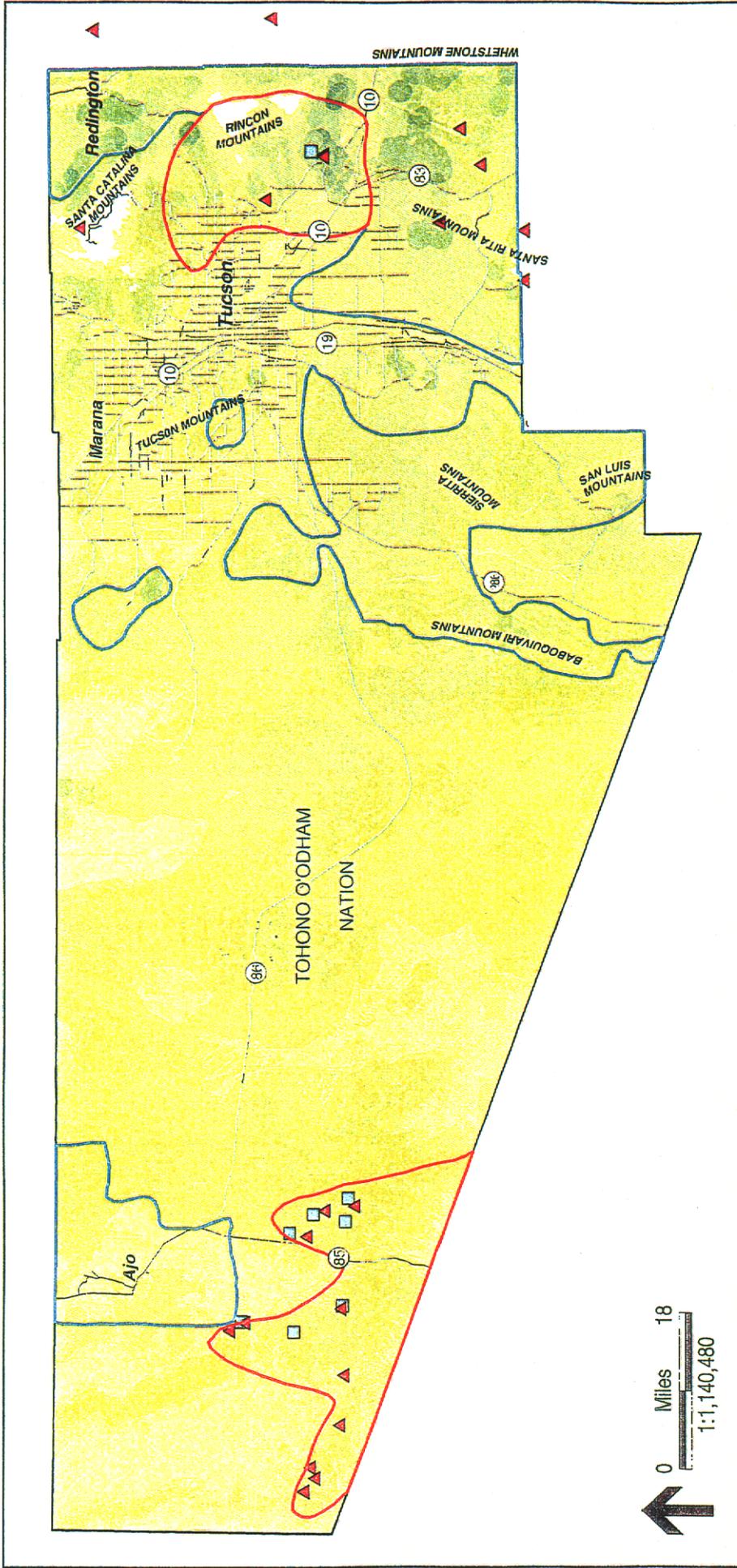


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## Southern Yellow Bat (*Lasiurus xanthinus*) Priority Conservation Areas and Modeled Potential Habitat

- Pima County Boundary
- Major Road or Highway
- Priority Conservation Areas (STAT, March 2001)
- 2 Areas that would be of value to the reserve system
- Modeled Potential Habitat (RECON, January 2001)
  - No Potential
  - Low Potential
  - Medium Potential
  - High Potential
- Known Locations (Sicher, 2000)
- Known Locations (Irwin and Baker, 1967)
- Known Locations (Cockrum 1961)

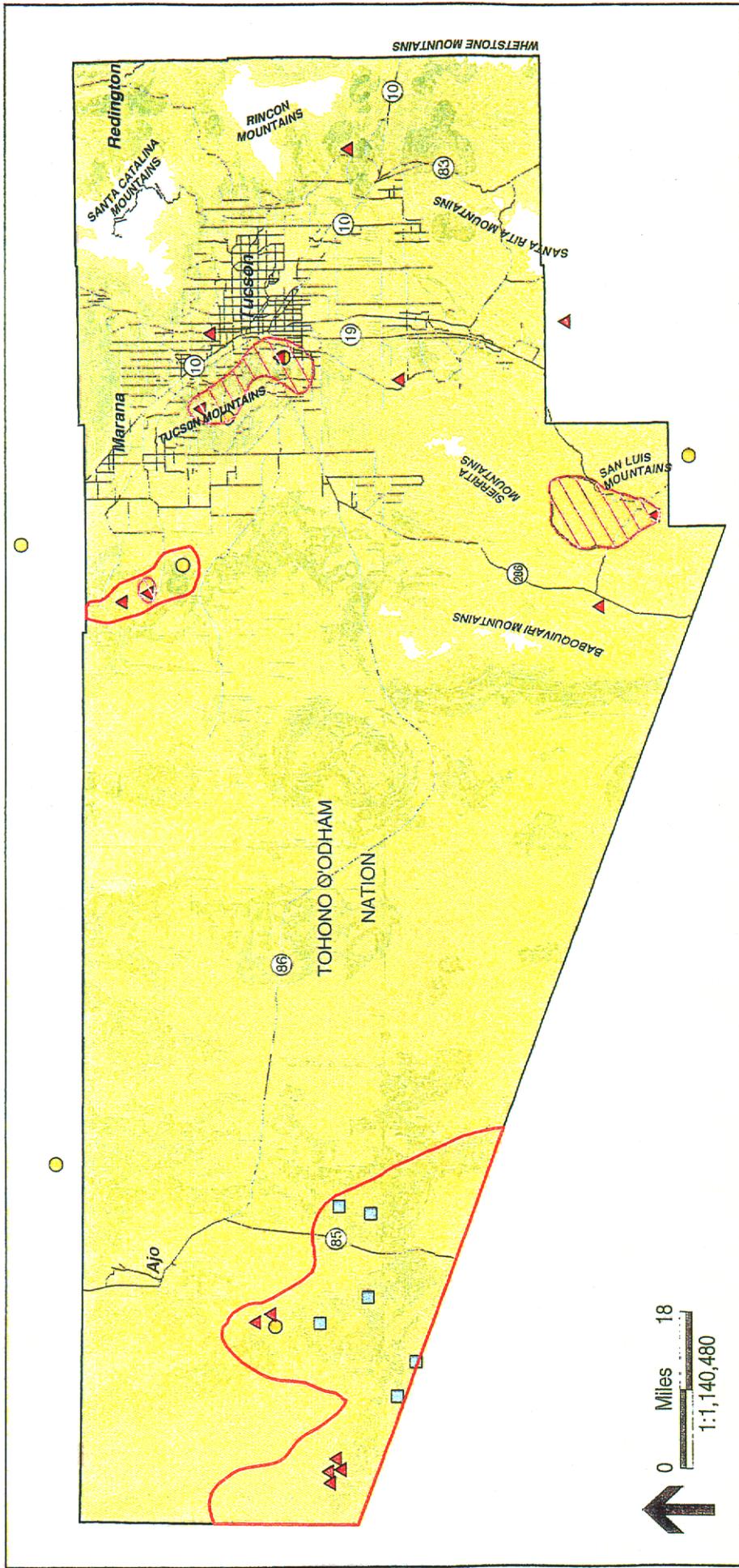
Figure 4



# Lesser Long-nosed Bat (*Leptonycteris curasoae yerbabuena*) Priority Conservation Areas and Modeled Potential Habitat

- Pima County Boundary
- Major Road or Highway
- 1** Priority Conservation Areas (STAT, March 2001)
  - Areas with populations which must be within the reserve system (excluding the Tohono O'odham Nation)
  - Areas that would be of value to the reserve system
- 2** Modeled Potential Habitat (RECON, January 2001)
  - No Potential
  - Low Potential
  - Medium Potential
  - High Potential
- Known Locations**
  - (SWCA, 2000)
  - (HDMS, 2000)

Figure 5

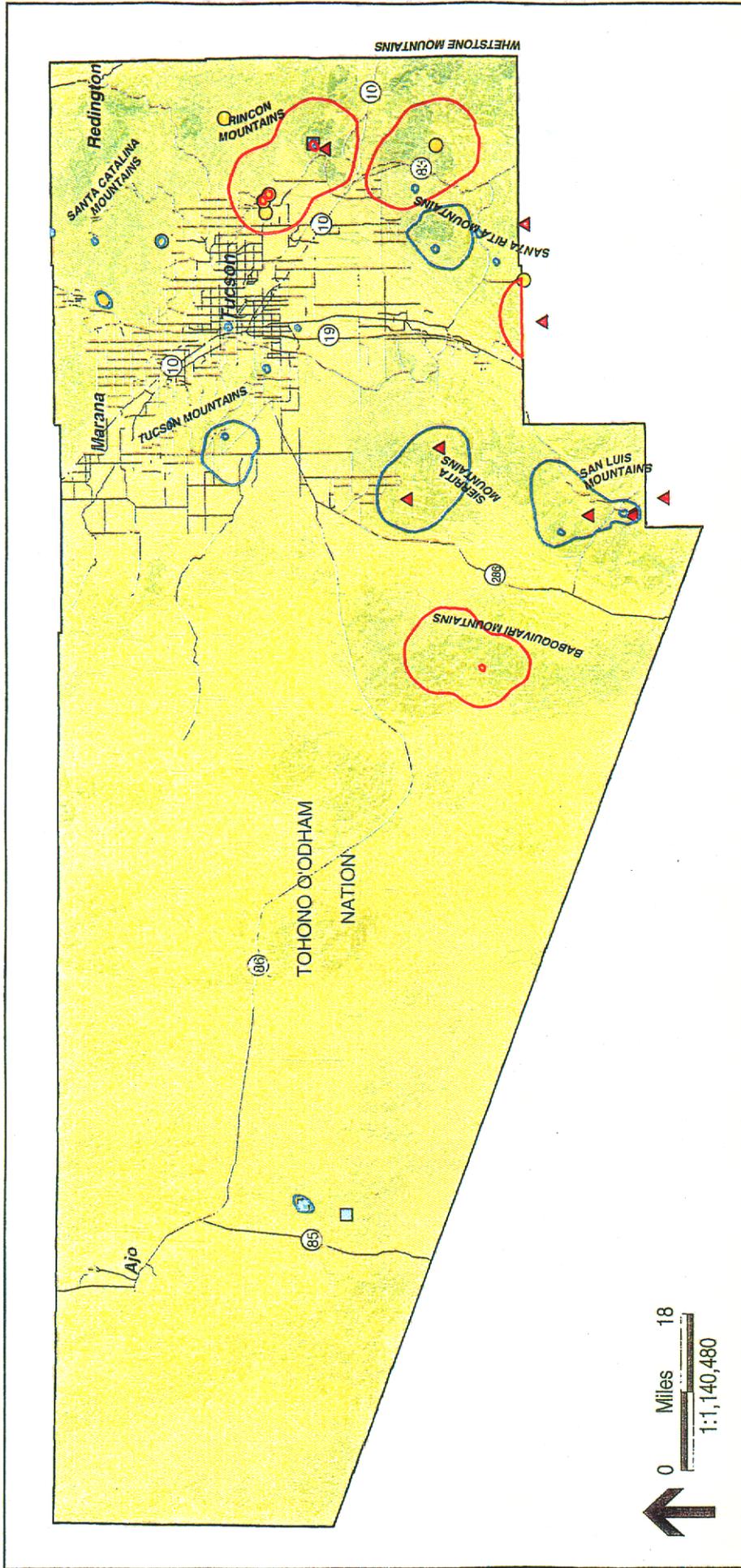


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# California Leaf-nosed Bat (*Macrotus californicus*) Priority Conservation Areas and Modeled Potential Habitat

- Pima County Boundary
- Major Road or Highway
- Priority Conservation Areas (STAT, March 2001)**
  - 1 Areas with populations which must be within the reserve system (excluding the Tohono O'odham Nation)
  - 4 Areas with the potential for restoration or enhancement
- Modeled Potential Habitat (RECON, January 2001)**
  - No Potential
  - Low Potential
  - Medium Potential
  - High Potential
- Known Locations**
  - (SWCA, 2000)
  - (HDMS, 2000)
  - (Sidner, 1983-1992)

Figure 6

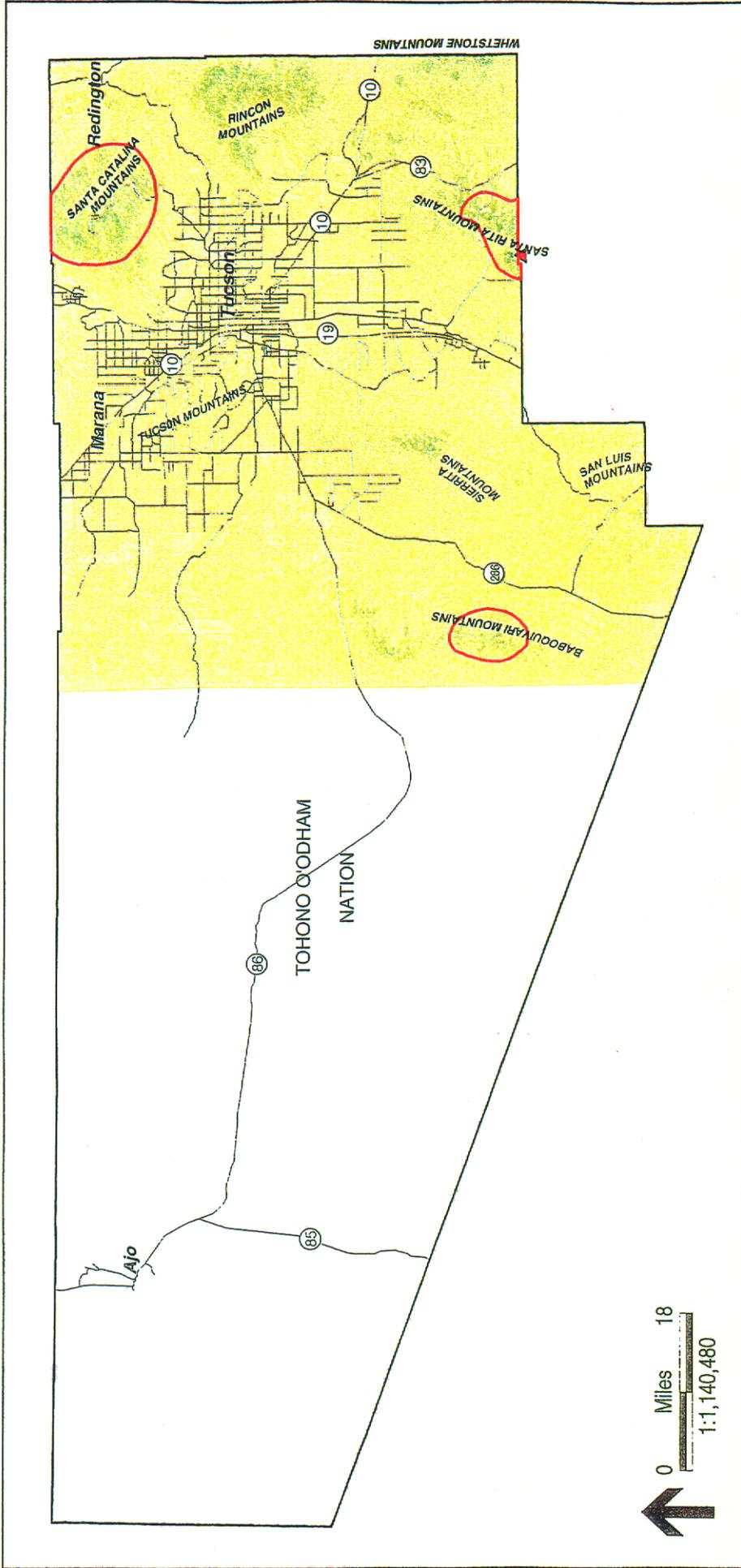


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# Pale Townsend's Big-eared Bat (*Plecotus townsendii pallescens*) Priority Conservation Areas and Modeled Potential Habitat

- Pima County Boundary
- Major Road or Highway
- Priority Conservation Areas (STAT, March 2001)**
  - 1 Areas with populations which must be within the reserve system (excluding the Tohono O'odham Nation)
  - 2 Areas that would be of value to the reserve system
- Modeled Potential Habitat (RECON, January 2001)**
  - No Potential
  - Low Potential
  - Medium Potential
  - High Potential
- Known Locations**
  - (SWCA, 2000)
  - (HDMS, 2000)
  - (Sidner, 1986-1994)

Figure 7

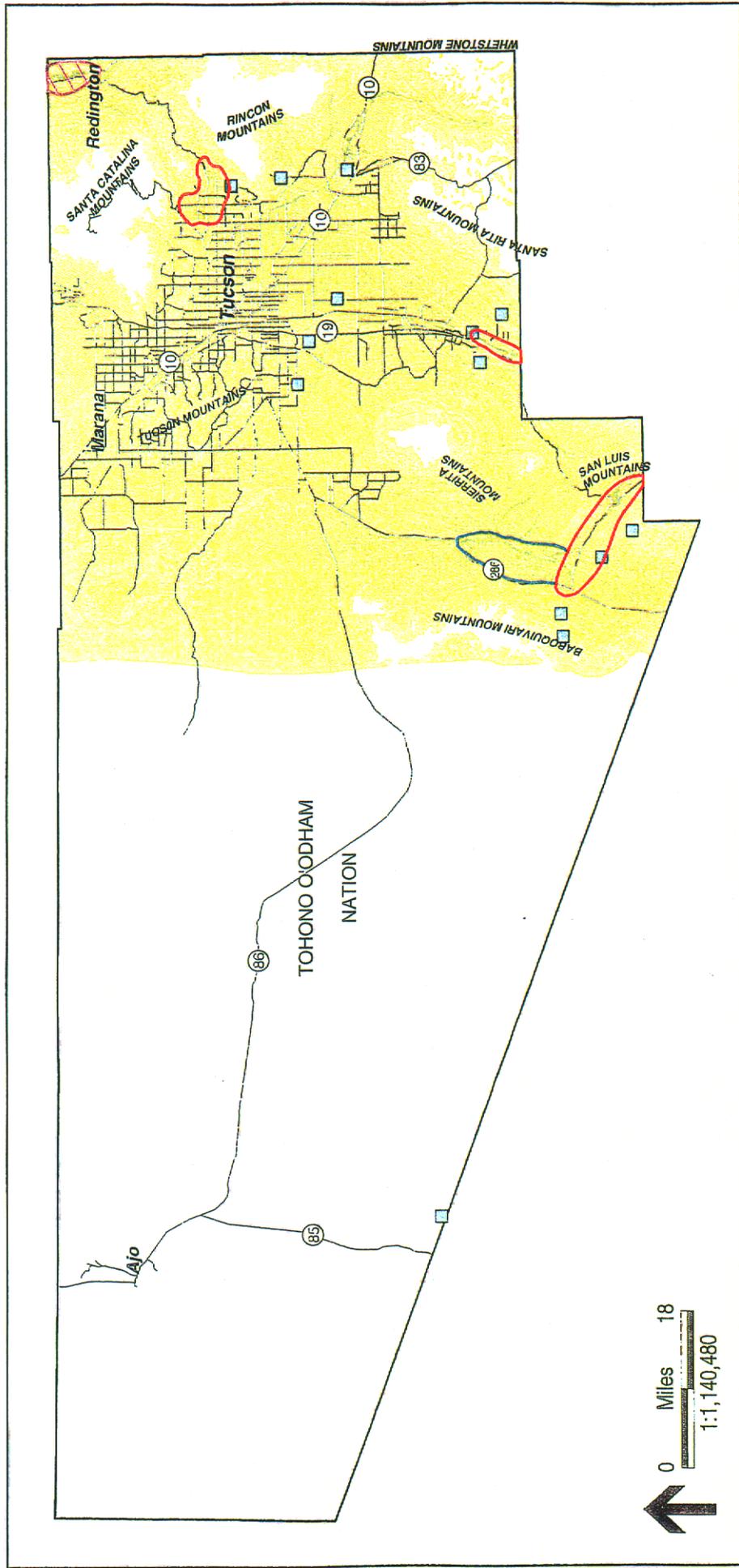


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# Arizona Shrew (*Sorex arizonae*) Priority Conservation Areas and Modeled Potential Habitat

- Pima County Boundary
- Major Road or Highway
- Priority Conservation Areas (STAT, January 2001)  
  - Areas with populations which must be within the reserve system (excluding the Tohono O'odham Nation)
- Modeled Potential Habitat (RECON, January 2001)
  - No Potential
  - Low Potential
  - Medium Potential
  - High Potential
- Known Location (HDMS, 2000)

Figure 8

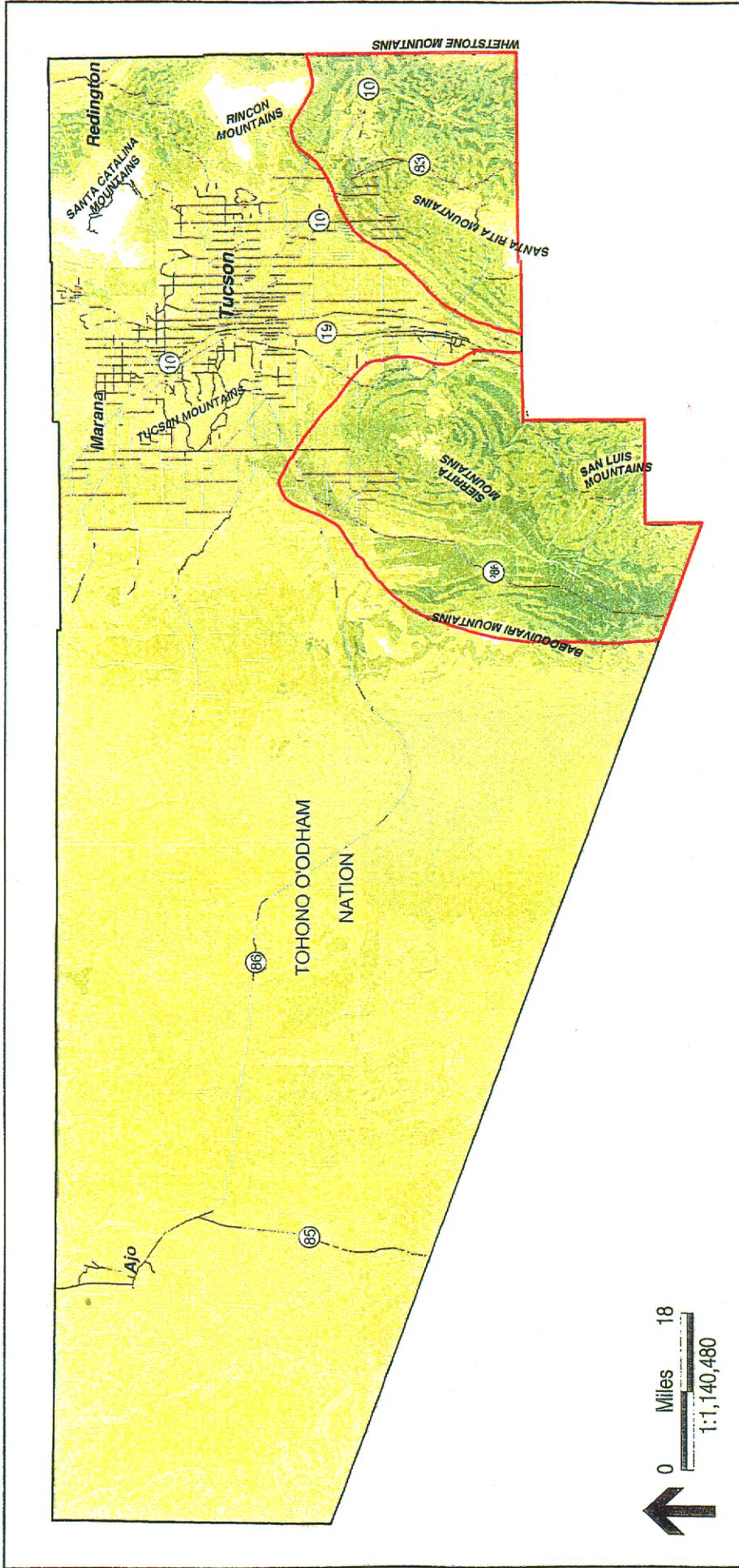


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# Merriam's Mouse (*Peromyscus merriami*) Priority Conservation Areas and Modeled Potential Habitat

- Pima County Boundary
- Major Road or Highway
- Priority Conservation Areas (STAT, March 2001)**
  - 1 Areas with populations which must be within the reserve system (excluding the Tohono O'odham Nation)
  - 2 Areas that would be of value to the reserve system
  - 4 Areas with the potential for restoration or enhancement
- Modeled Potential Habitat (RECON, January 2001)**
  - No Potential
  - Low Potential
  - Medium Potential
  - High Potential
- Known Locations (SWCA, 2000)**
  - Known Locations

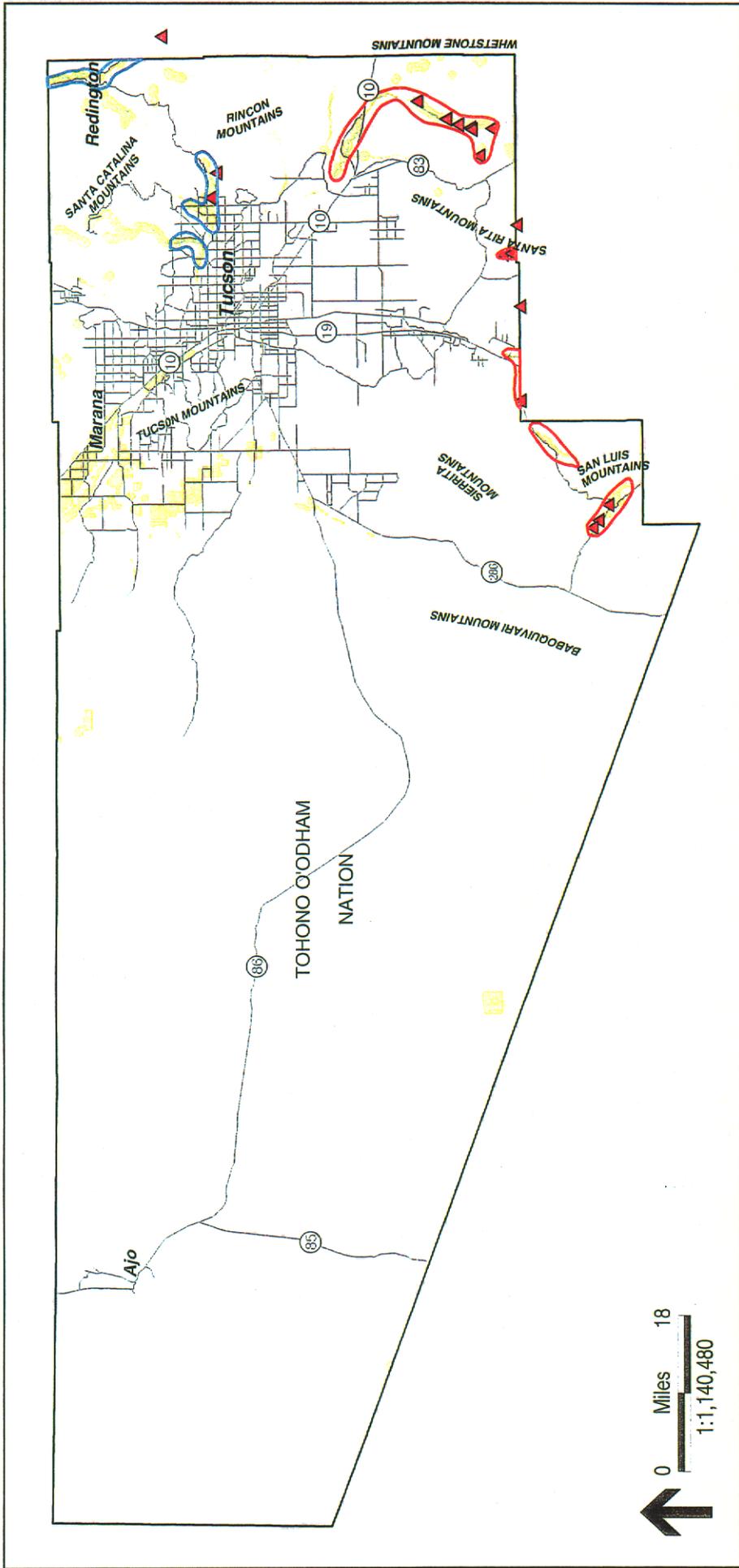
Figure 9



# Swainson's Hawk (*Buteo swainsoni*) Priority Conservation Areas and Modeled Potential Habitat

- Pima County Boundary
- Major Road or Highway
- Priority Conservation Areas (STAT, January 2001)
- 1 Areas with populations which must be within the reserve system (excluding the Tohono O'odham Nation)
- Modeled Potential Habitat (RECON, January 2001)**
  - No Potential
  - Low Potential
  - Medium Potential
  - High Potential

Figure 10

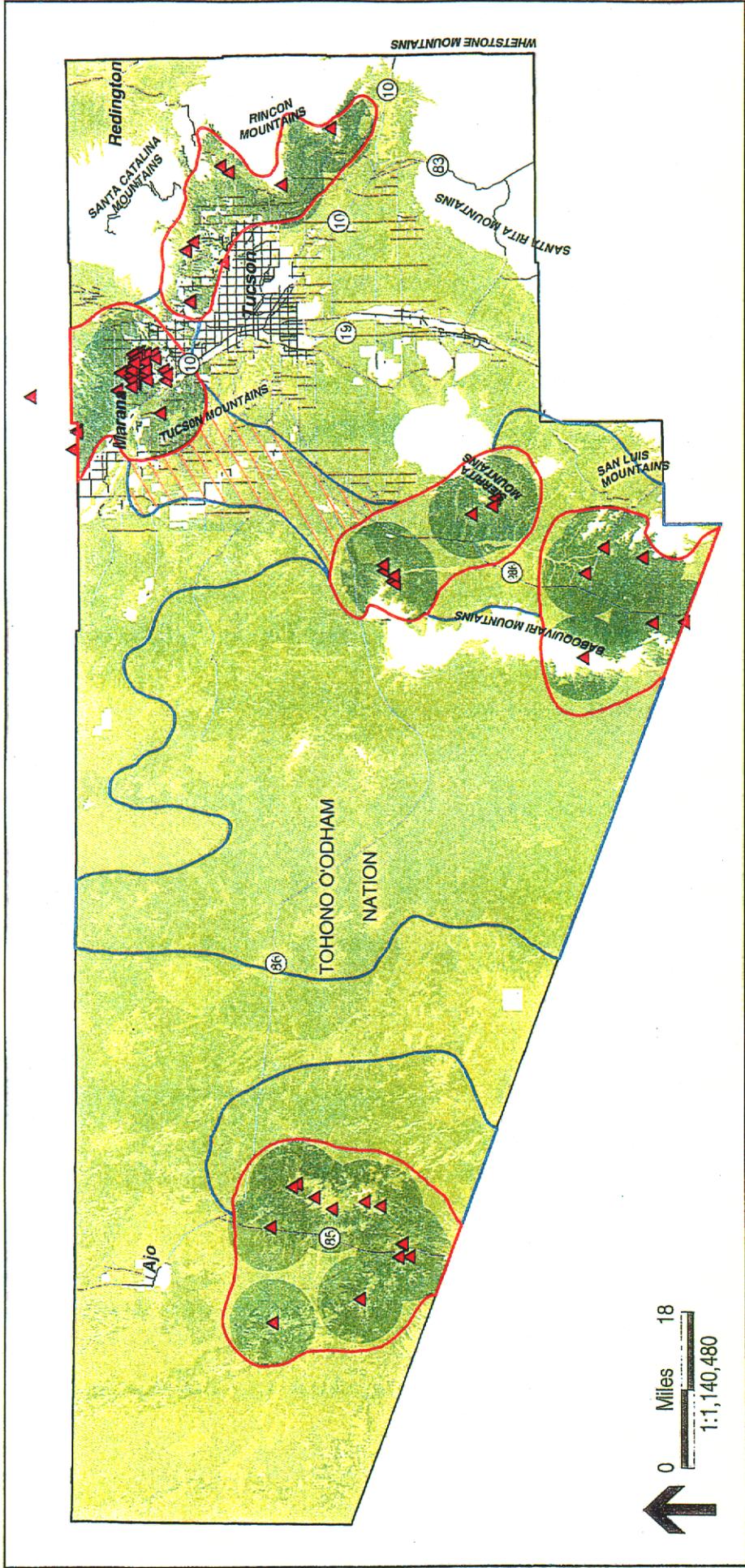


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# Western Yellow-billed Cuckoo (*Coccyzus americanus occidentalis*) Priority Conservation Areas and Modeled Potential Habitat

- Pima County Boundary
- Major Road or Highway
- 1** Priority Conservation Areas (STAT, January 2001)
  - 1** Areas with populations which must be within the reserve system (excluding the Tohono O'odham Nation)
  - 2** Areas that would be of value to the reserve system
- Modeled Potential Habitat (RECON, January 2001)
  - No Potential
  - Low Potential
  - Medium Potential
  - High Potential
- Known Locations (HDMS, 2000)
  - Known Locations (HDMS, 2000)

Figure 11

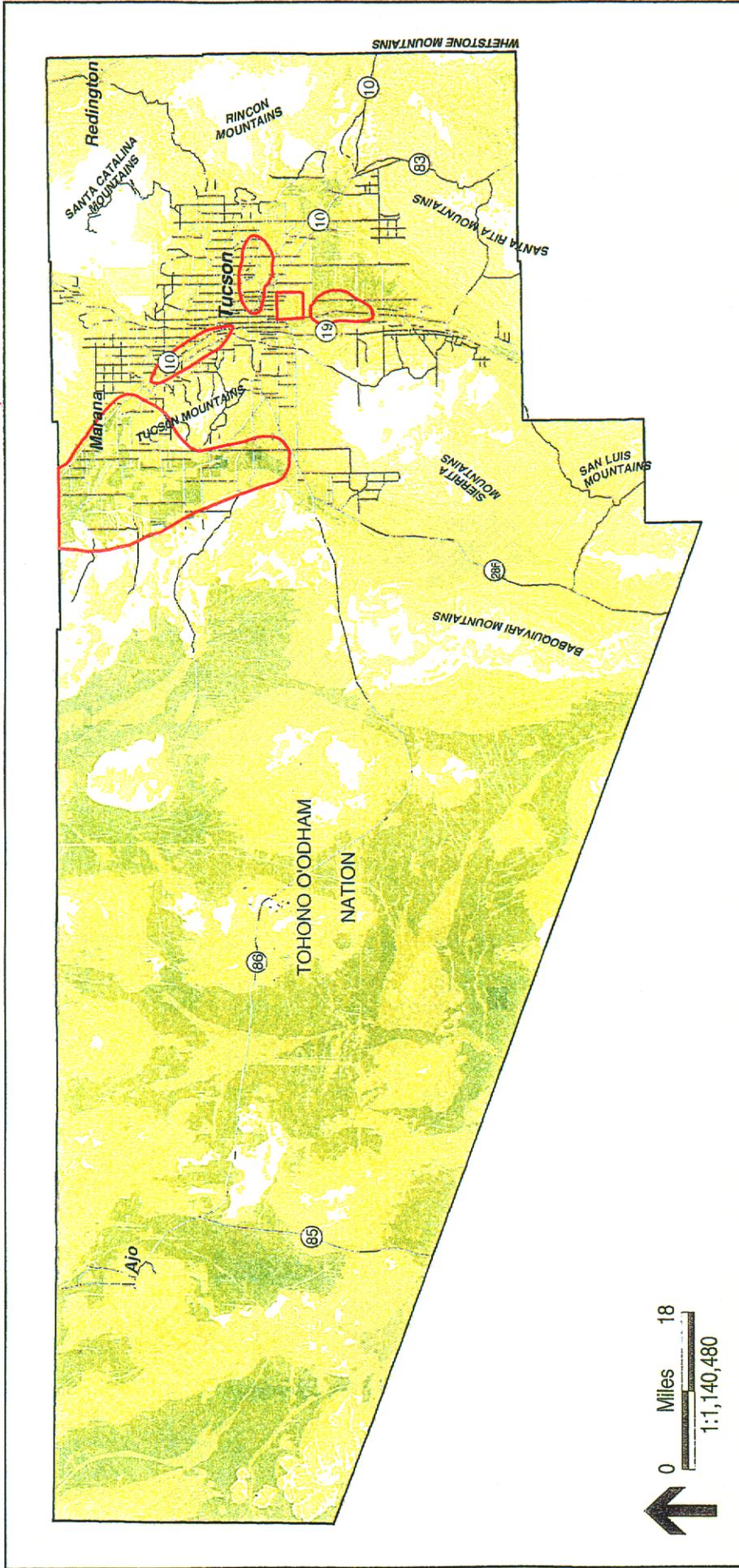


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# Cactus Ferruginous Pygmy-owl (*Glaucidium brasilianum cactorum*) Priority Conservation Areas and Modeled Potential Habitat

- Pima County Boundary
- Major Road or Highway
- Priority Conservation Areas (STAT, March 2001)**
  - 1 Areas with populations which must be within the reserve system (excluding the Tohono O'odham Nation)
  - 2 Areas that would be of value to the reserve system
  - 3 Critical landscape linkages
- Modeled Potential Habitat (Pima County, December 2000)**
  - No Potential
  - Low Potential
  - Medium Potential
  - High Potential
- Known Locations (HDMS, 2000)**
  - Known Locations

Figure 12



# Burrowing Owl (*Athene cunicularia hypugaea*) Priority Conservation Areas and Modeled Potential Habitat

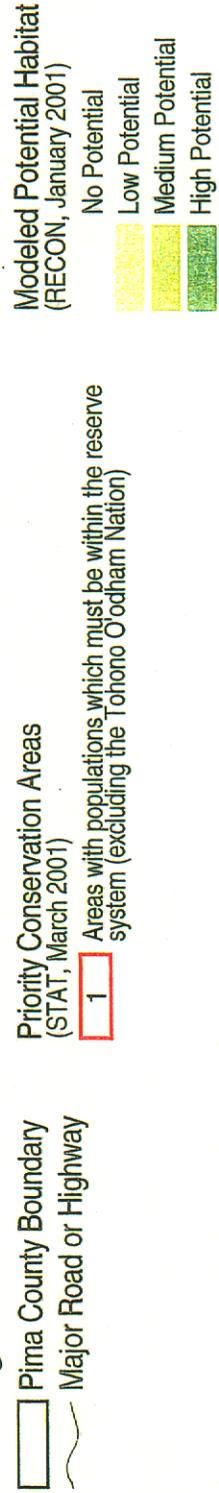
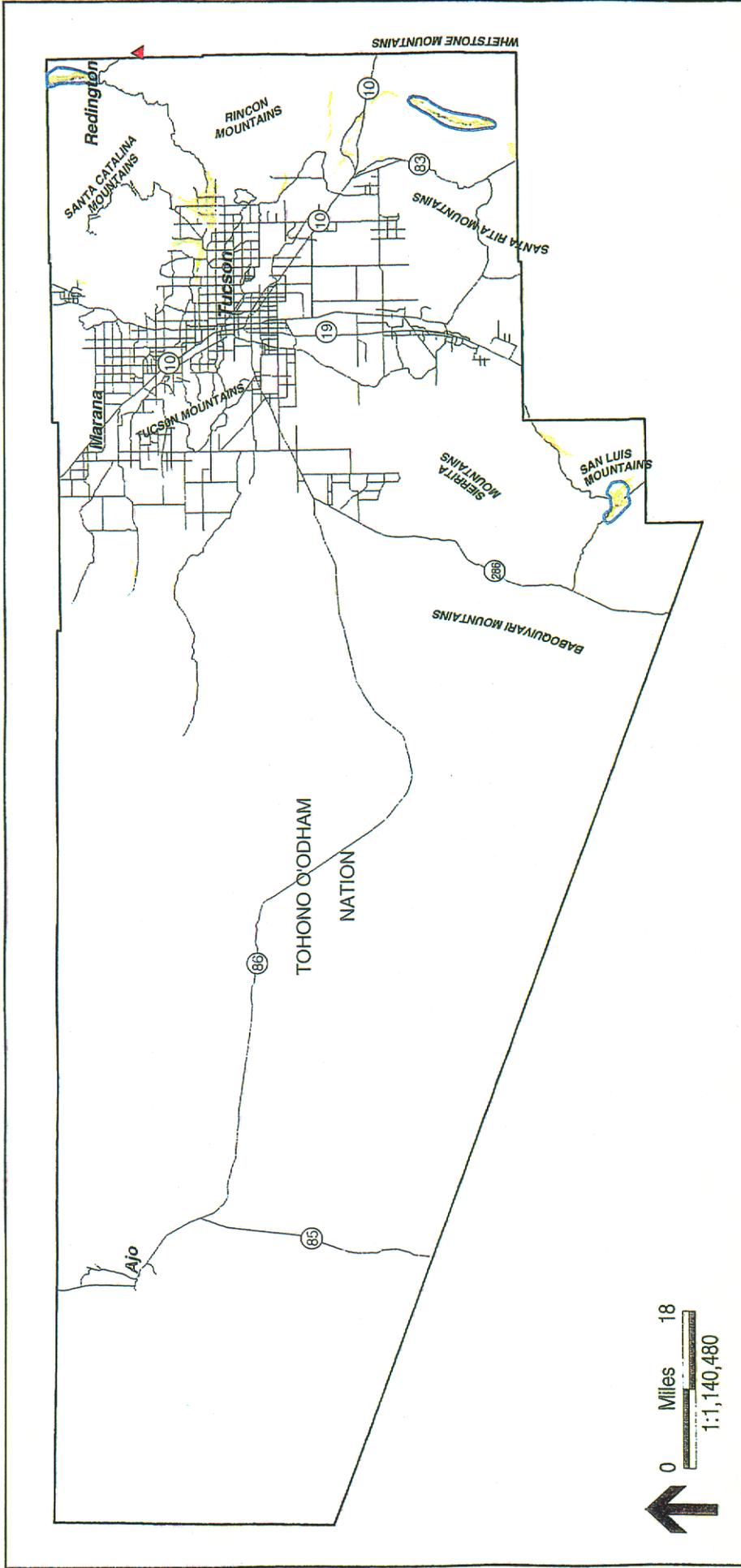


Figure 13

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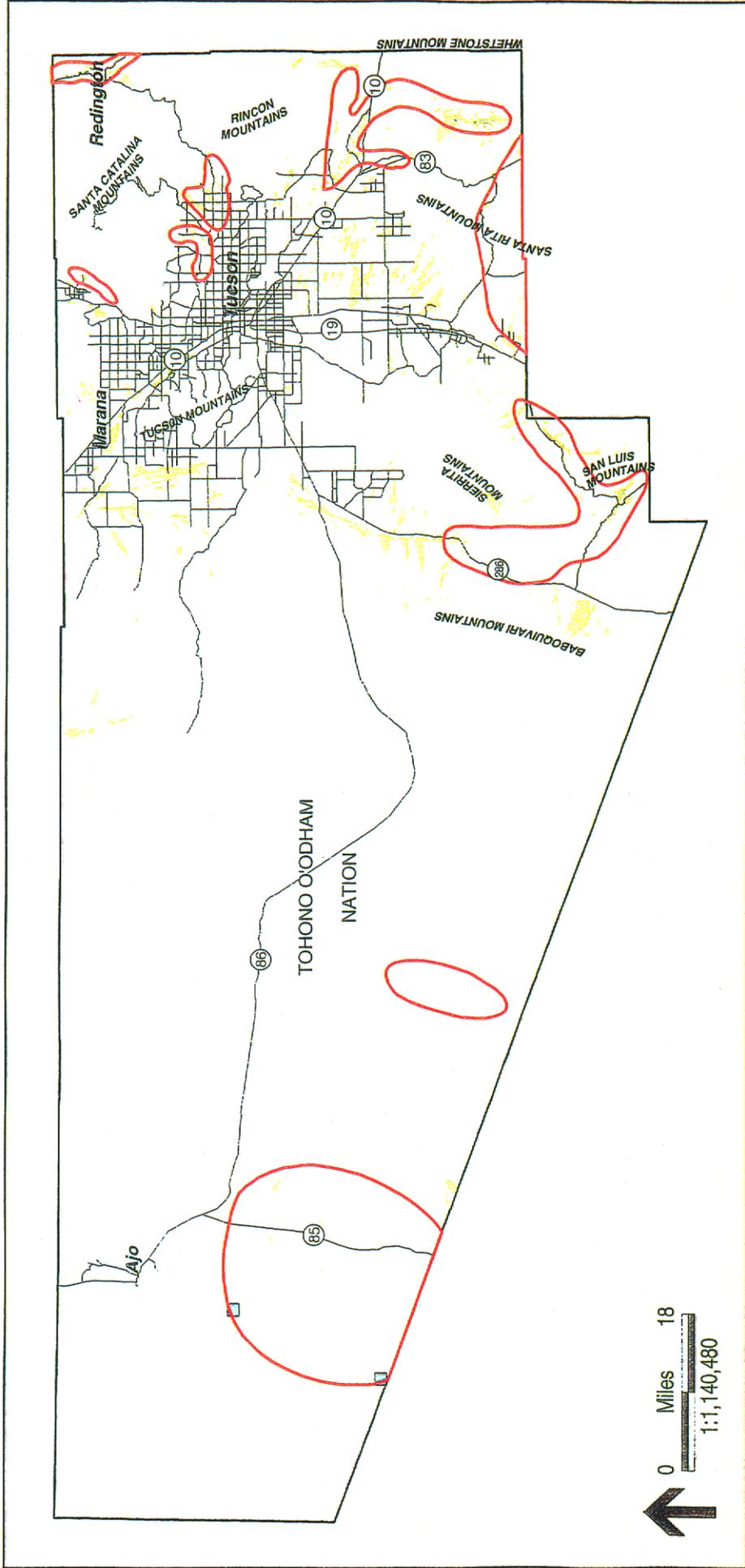


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# Southwestern Willow Flycatcher (*Empidonax traillii extimus*) Priority Conservation Areas and Modeled Potential Habitat

- Pima County Boundary
- Major Road or Highway
- Priority Conservation Areas (STAT, January 2001)
- Known Locations (HDMS, 2000)
- Modeled Potential Habitat (RECON, January 2001)
  - No Potential
  - Low Potential
  - Medium Potential
  - High Potential

Figure 14

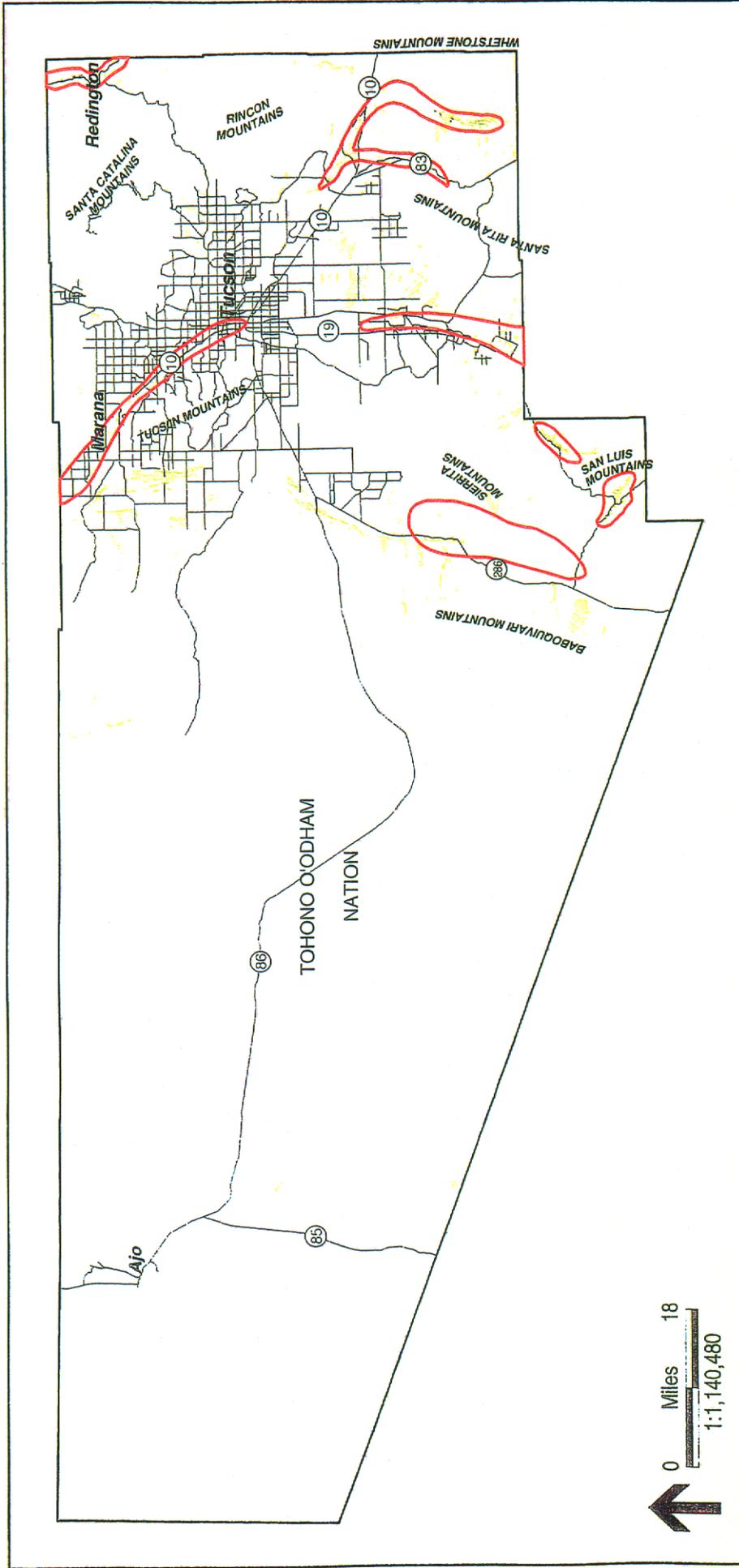


# Bell's Vireo (*Vireo bellii*) Priority Conservation Areas and Modeled Potential Habitat

- Pima County Boundary
- Priority Conservation Areas (STAT, January 2001)
  - 1 Areas with populations which must be within the reserve system (excluding the Tohono O'odham Nation)
- Modeled Potential Habitat (RECON, March 2001)
  - No Potential
  - Low Potential
  - Medium Potential
  - High Potential
- Major Road or Highway
- Known Locations (SWCA, 2000)

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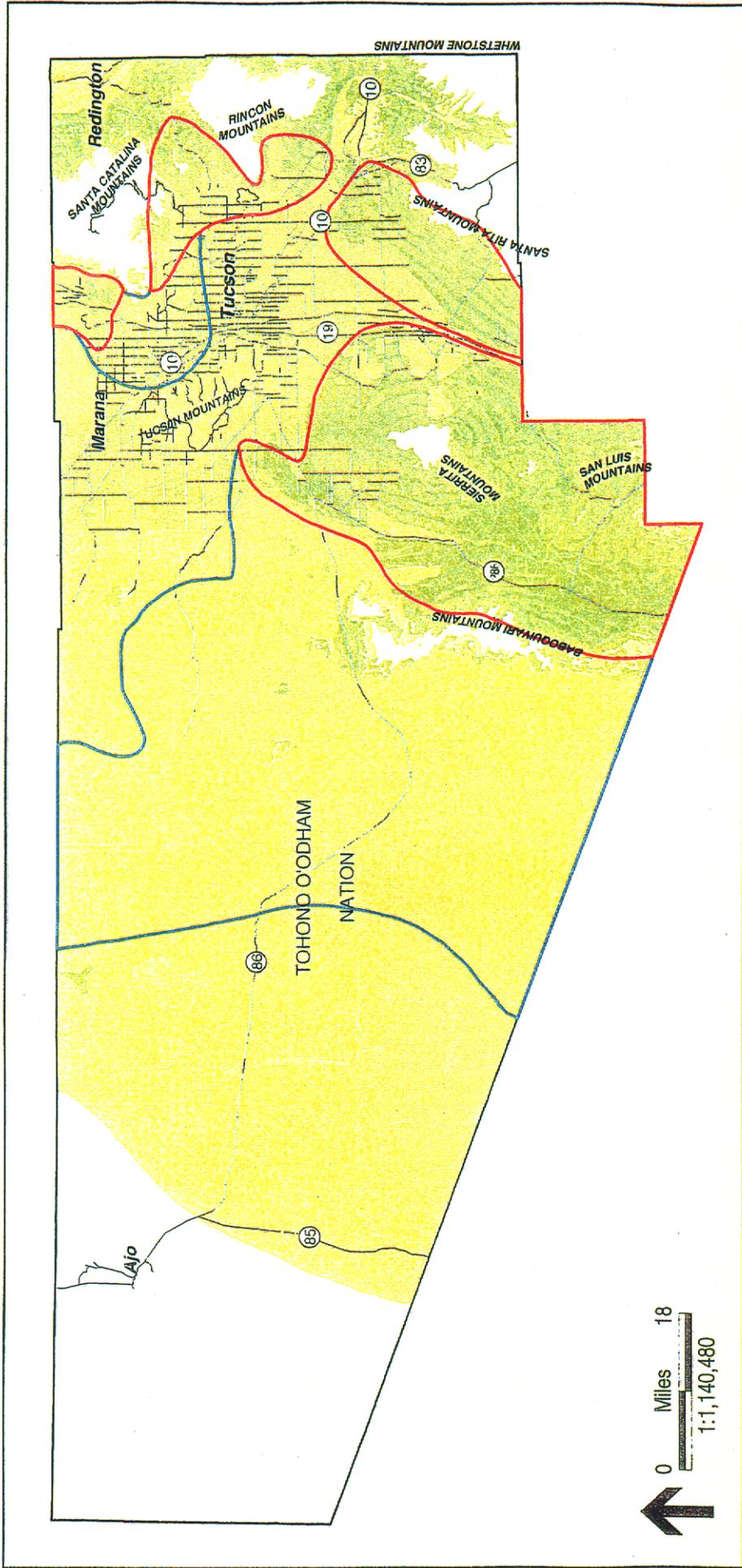
Figure 15



# Abert's Towhee (*Pipilo aberti*) Priority Conservation Areas and Modeled Potential Habitat

-  Pima County Boundary
-  Major Road or Highway
-  Priority Conservation Areas (STAT, January 2001)
-  1 Areas with populations which must be within the reserve system (excluding the Tohono O'odham Nation)
-  Modeled Potential Habitat (RECON, March 2001)
  -  No Potential
  -  Low Potential
  -  Medium Potential
  -  High Potential

Figure 16

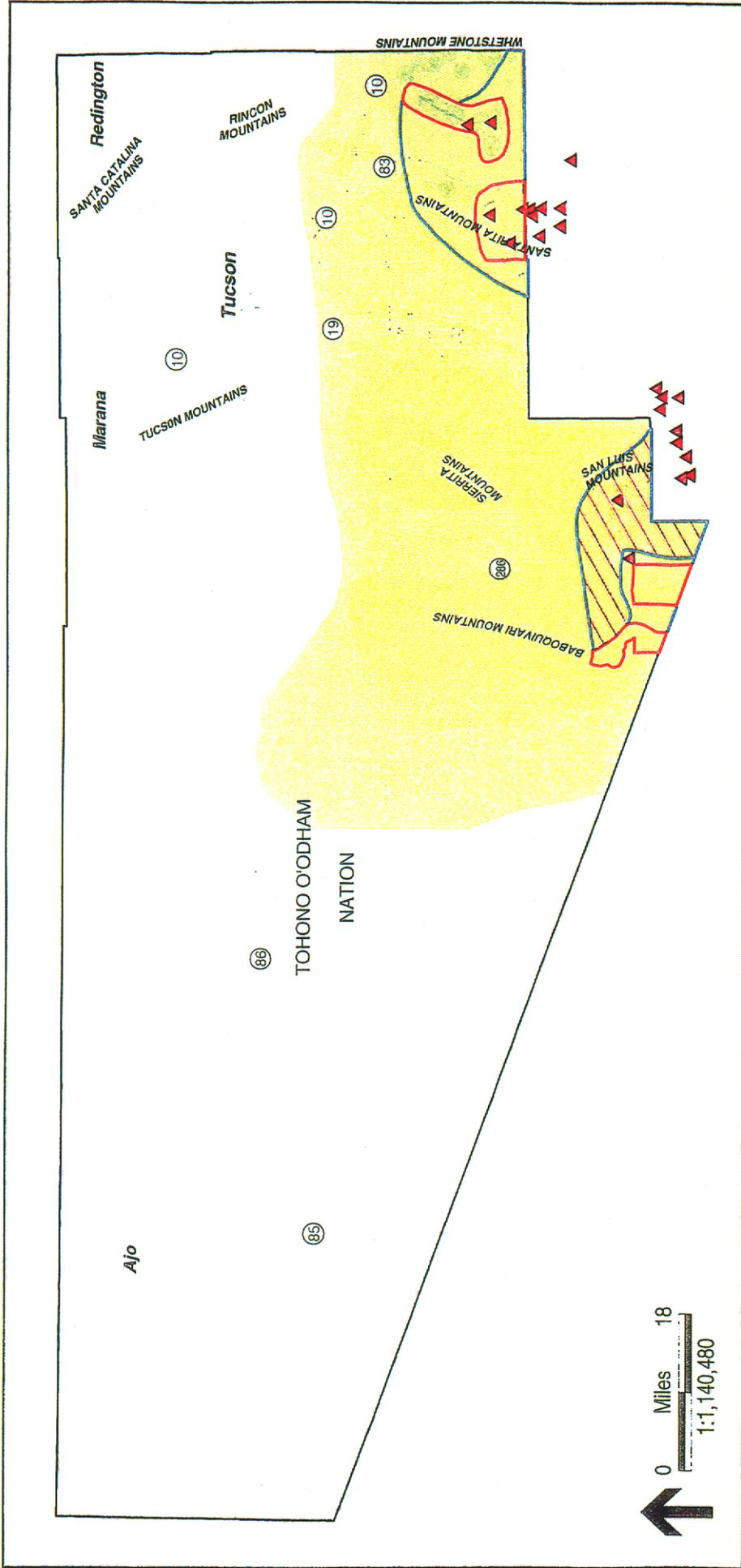


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# Rufous-winged Sparrow (*Amophila carpalis*) Priority Conservation Areas and Modeled Potential Habitat

- Pima County Boundary
- Major Road or Highway
- Priority Conservation Areas (STAT, January 2001)**
  - 1 Areas with populations which must be within the reserve system (excluding the Tohono O'odham Nation)
  - 2 Areas that would be of value to the reserve system
- Modeled Potential Habitat (RECON, January 2001)**
  - No Potential
  - Low Potential
  - Medium Potential
  - High Potential

Figure 17

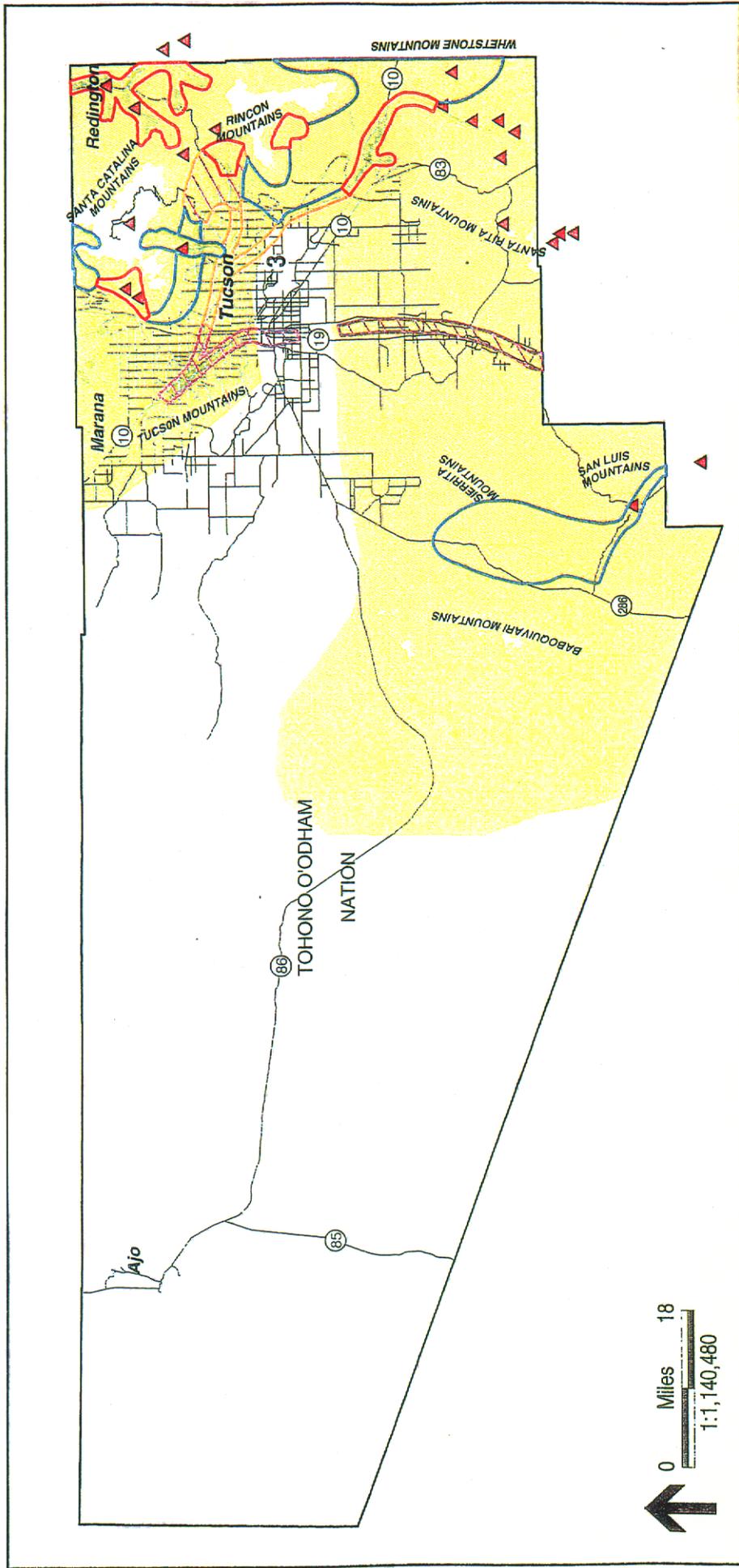


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# Chiricahua Leopard Frog (*Rana chiricahuensis*) Priority Conservation Areas and Modeled Potential Habitat

- Pima County Boundary
- Major Road or Highway
- Priority Conservation Areas (STAT, January 2001)**
  - 1 Areas with populations which must be within the reserve system (excluding the Tohono O'odham Nation)
  - 2 Areas that would be of value to the reserve system
  - 4 Areas with the potential for restoration or enhancement
- Modeled Potential Habitat (RECON, January 2001)**
  - No Potential
  - Low Potential
  - Medium Potential
  - High Potential
- Known Locations (HDMS, 2000)**
  - (HDMS, 2000)

Figure 18



RECON Map\pds32726\gis\mapserver\12\_cactab\_jigs.apr\Fig 19\_Paya\mapshly 04/12/01

# Lowland Leopard Frog (*Rana yavapaiensis*) Priority Conservation Areas and Modeled Potential Habitat

Pima County Boundary  
 Major Road or Highway

**Priority Conservation Areas**  
 (STAT, March 2001)

- 1 Areas with populations which must be within the reserve system (excluding the Tohono O'odham Nation)
- 2 Areas that would be of value to the reserve system
- 3 Critical landscape linkages
- 4 Areas with the potential for restoration or enhancement

**Modeled Potential Habitat**  
 (RECON, January 2001)

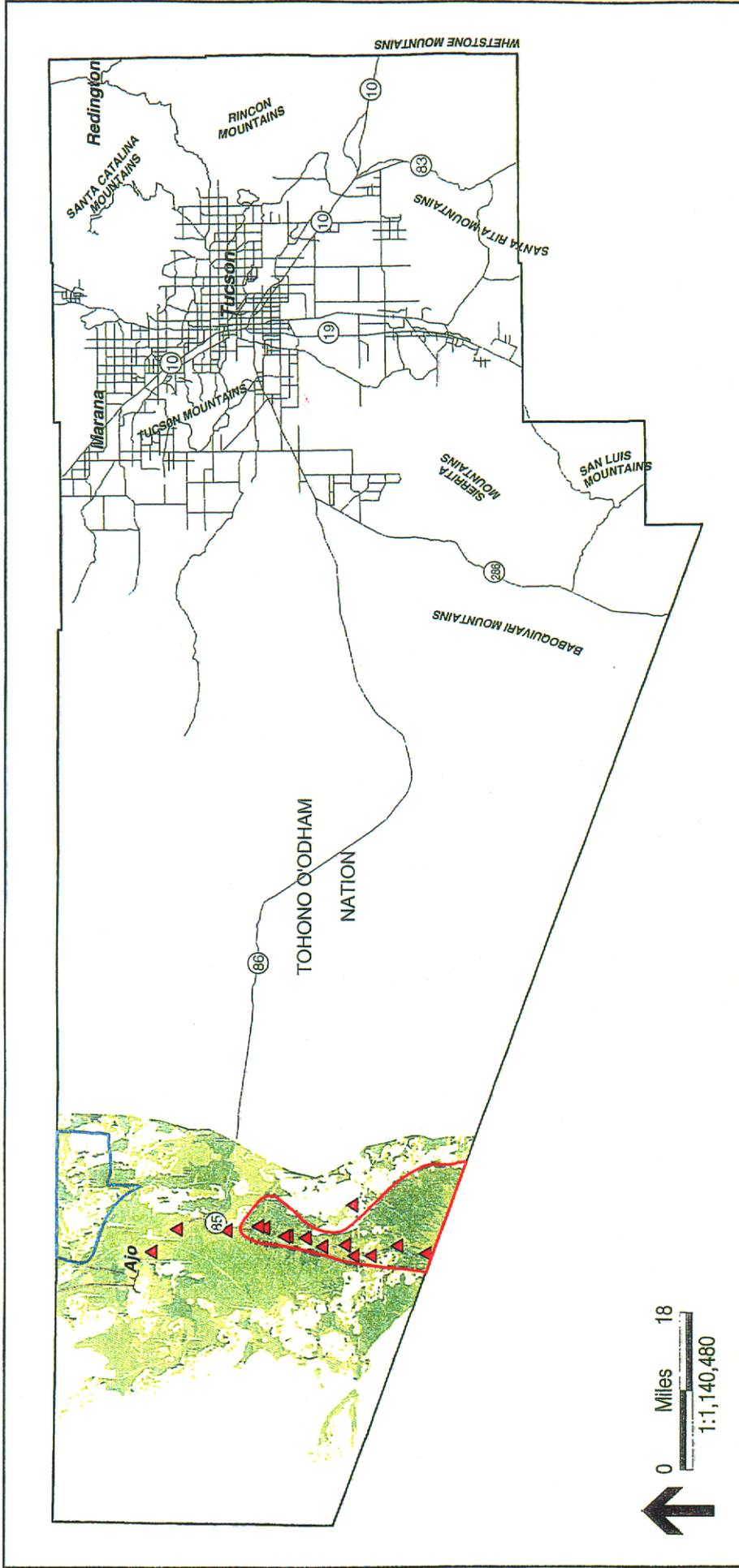
- No Potential
- Low Potential
- Medium Potential
- High Potential

**Known Locations**  
 (HDMS, 2000)

- Known Locations

Figure 19



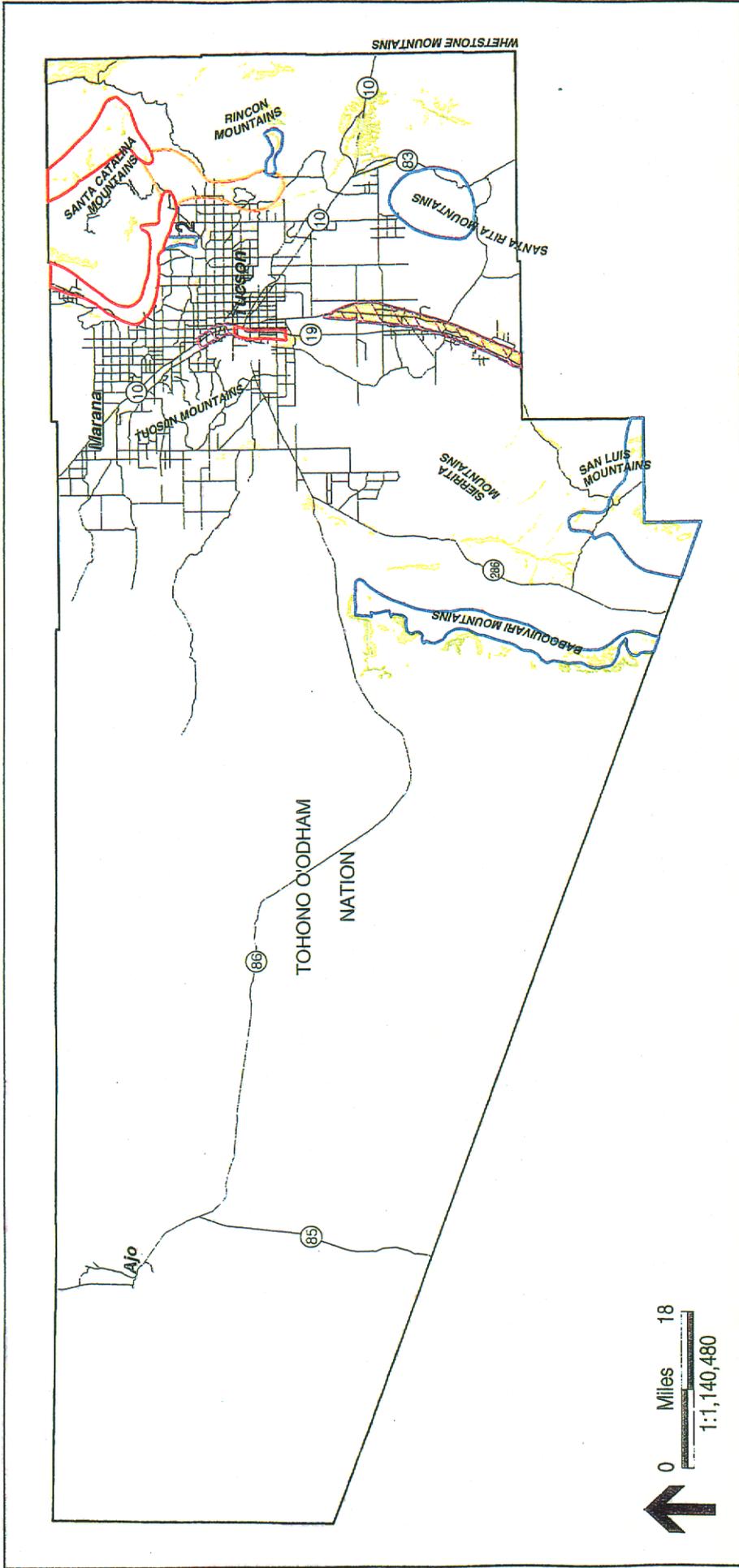


RECON.M:\p0532729\figs\figs\fig12\_pcahab\_llgs.apr\Fig21\_Chaactis(organica)\_04/12/01

# Organ Pipe Shovel-nosed Snake (*Chionactis palarostris organica*) Priority Conservation Areas and Modeled Potential Habitat

- Pima County Boundary
- Major Road or Highway
- 1** Priority Conservation Areas (STAT, January 2001)
  - Areas with populations which must be within the reserve system (excluding the Tohono O'odham Nation)
  - Areas that would be of value to the reserve system
- Modeled Potential Habitat (RECON, January 2001)**
  - No Potential
  - Low Potential
  - Medium Potential
  - High Potential
- Known Locations (HDMS, 2000)**
  - Known Locations

Figure 21

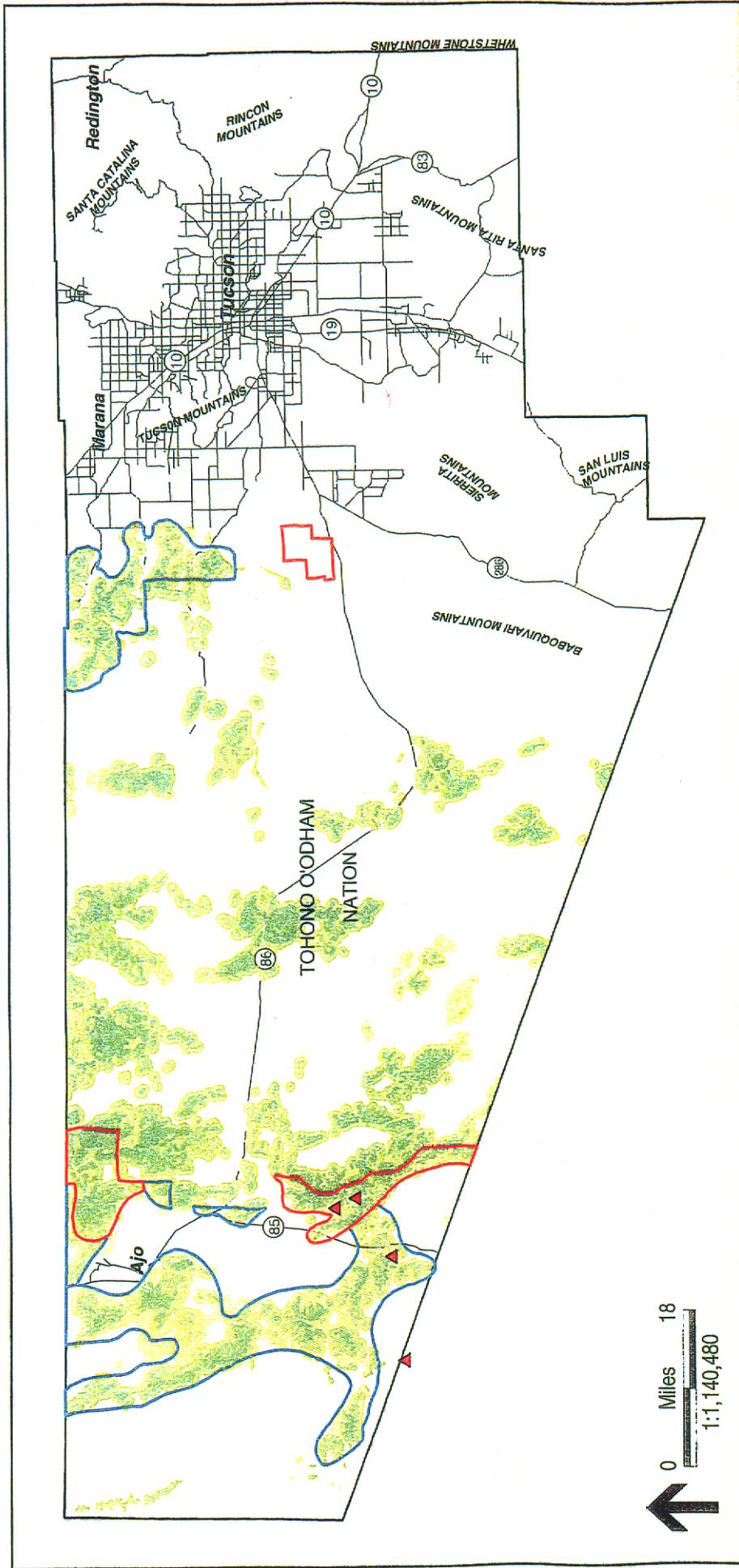


RECON\_Maps32736\gis\maps\apr112\_pcahab\_1\gis\_apr11\fig22\_Cnruet\reprint 04/12/01

# Giant Spotted Whiptail (*Cnemidopophorus burti stictogrammus*) Priority Conservation Areas and Modeled Potential Habitat

- Pima County Boundary
- Major Road or Highway
- Priority Conservation Areas (STAT, January 2001)**
  - 1 Areas with populations which must be within the reserve system (excluding the Tohono O'odham Nation)
  - 2 Areas that would be of value to the reserve system
  - 3 Critical landscape linkages
  - 4 Areas with the potential for restoration or enhancement
- Modeled Potential Habitat (RECON, January 2001)**
  - No Potential
  - Low Potential
  - Medium Potential
  - High Potential

Figure 22

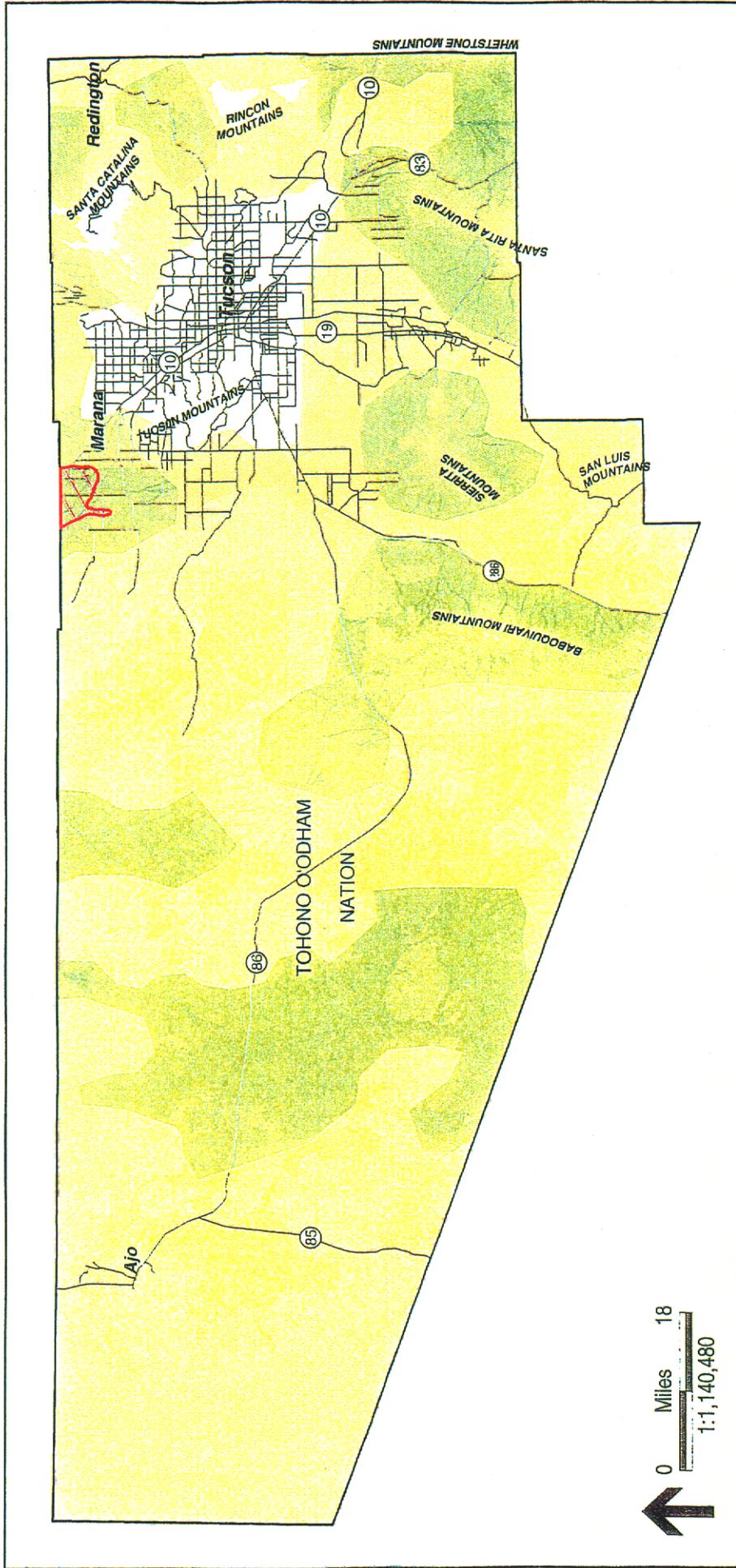


RECON\_Maj\pss32789\gis\lans\April 12\_pca\hab\_1\gis.apr\Fig23\_Cbhuwa\topalia\_041201

# Red-backed Whiptail Lizard (*Cnemidophorus burti xanthonotus*) Priority Conservation Areas and Modeled Potential Habitat

- Pima County Boundary
- Major Road or Highway
- 1** Priority Conservation Areas (STAT, January 2001)
  - 1** Areas with populations which must be within the reserve system (excluding the Tohono O'odham Nation)
  - 2** Areas that would be of value to the reserve system
- Modeled Potential Habitat (RECON, January 2001)
  - No Potential
  - Low Potential
  - Medium Potential
  - High Potential
- Known Locations (HDMS, 2000)

Figure 23

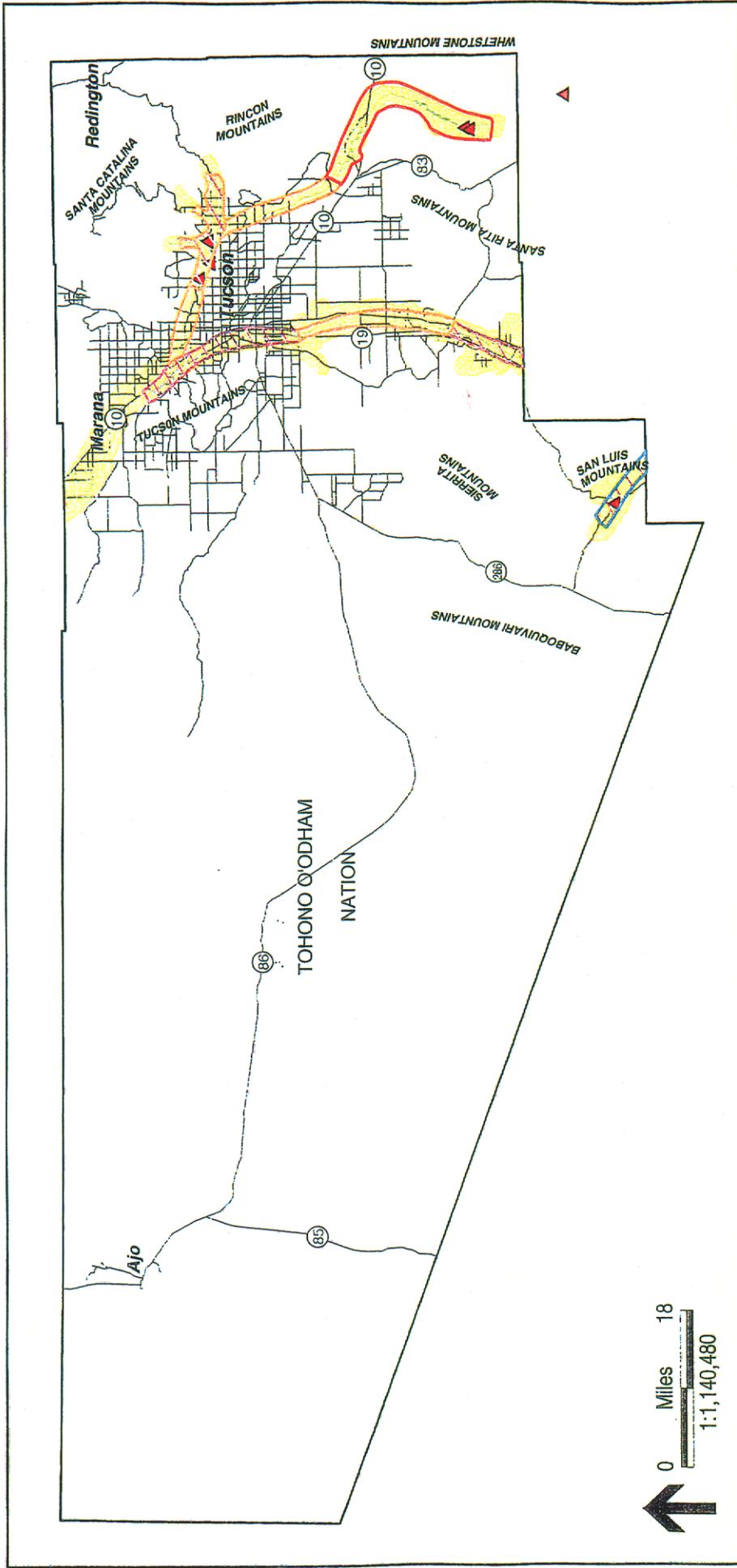


RECON M:\jcs\S2726\gis\spas\apr12\_ccahab\_1\gs.apr\Fig4\_Sosa(rptile) 04/12/01

# Ground Snake (Valley Form) (*Sonora semiannulata*) Priority Conservation Areas and Modeled Potential Habitat

- Pima County Boundary
- Major Road or Highway
- Priority Conservation Areas (STAT, January 2001)**
  - 1 Areas with populations which must be within the reserve system (excluding the Tohono O'odham Nation)
  - 4 Areas with the potential for restoration or enhancement
- Modeled Potential Habitat (RECON, January 2001)**
  - No Potential
  - Low Potential
  - Medium Potential
  - High Potential

Figure 24



RECON M:\p\as\32729\figs\lans\apr112\_pcshab\_fig.apr\Fig25\_Thamne(megalops)\_04/12/01

# Mexican Garter Snake (*Thamnophis eques megalops*) Priority Conservation Areas and Modeled Potential Habitat

Pima County Boundary  
 Major Road or Highway

Priority Conservation Areas  
(STAT, January 2001)

- 1 Areas with populations which must be within the reserve system (excluding the Tohono O'odham Nation)
- 2 Areas that would be of value to the reserve system
- 3 Critical landscape linkages
- 4 Areas with the potential for restoration or enhancement

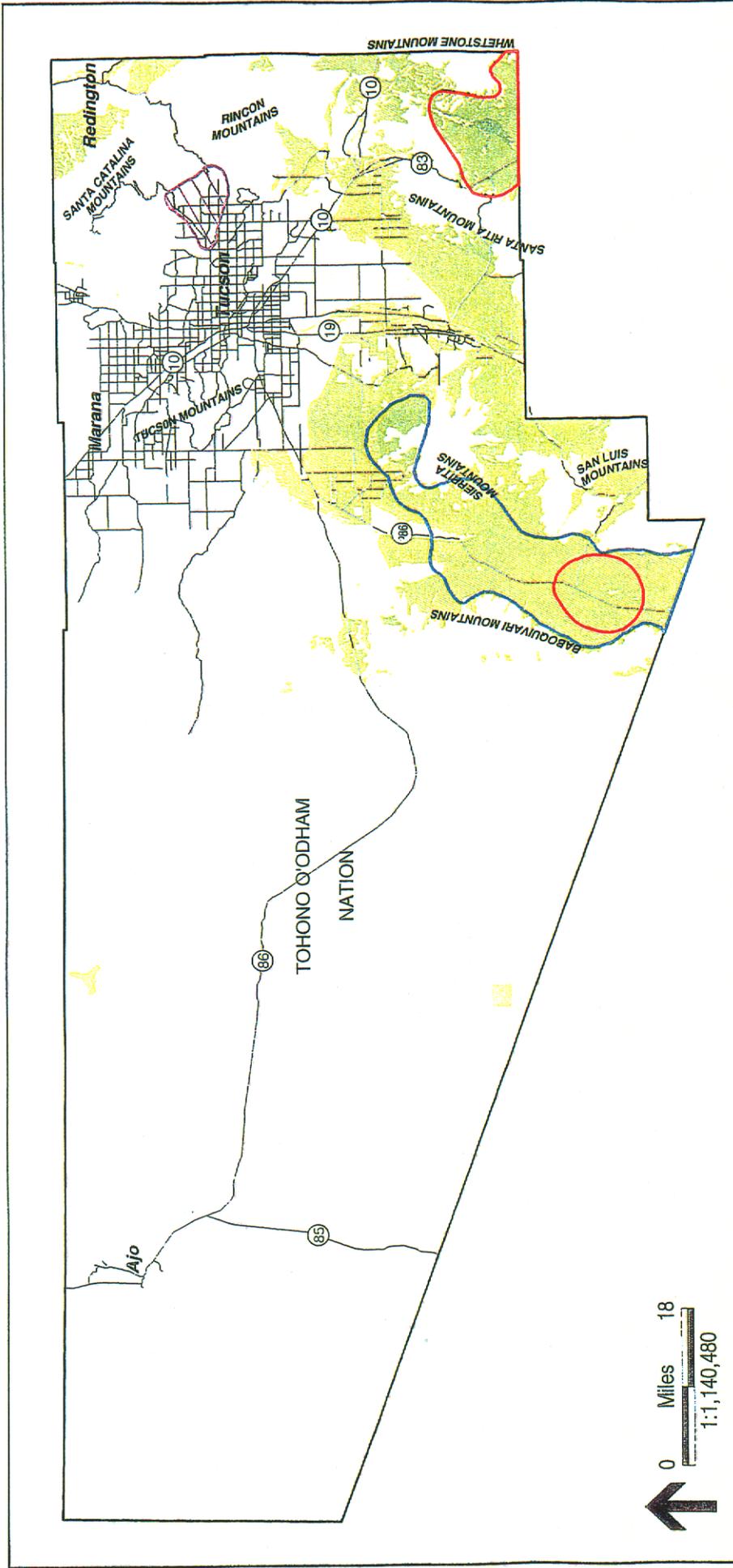
Modeled Potential Habitat  
(RECON, January 2001)

- No Potential
- Low Potential
- Medium Potential
- High Potential

Known Locations  
(HDMS, 2000)

- ▲

Figure 25

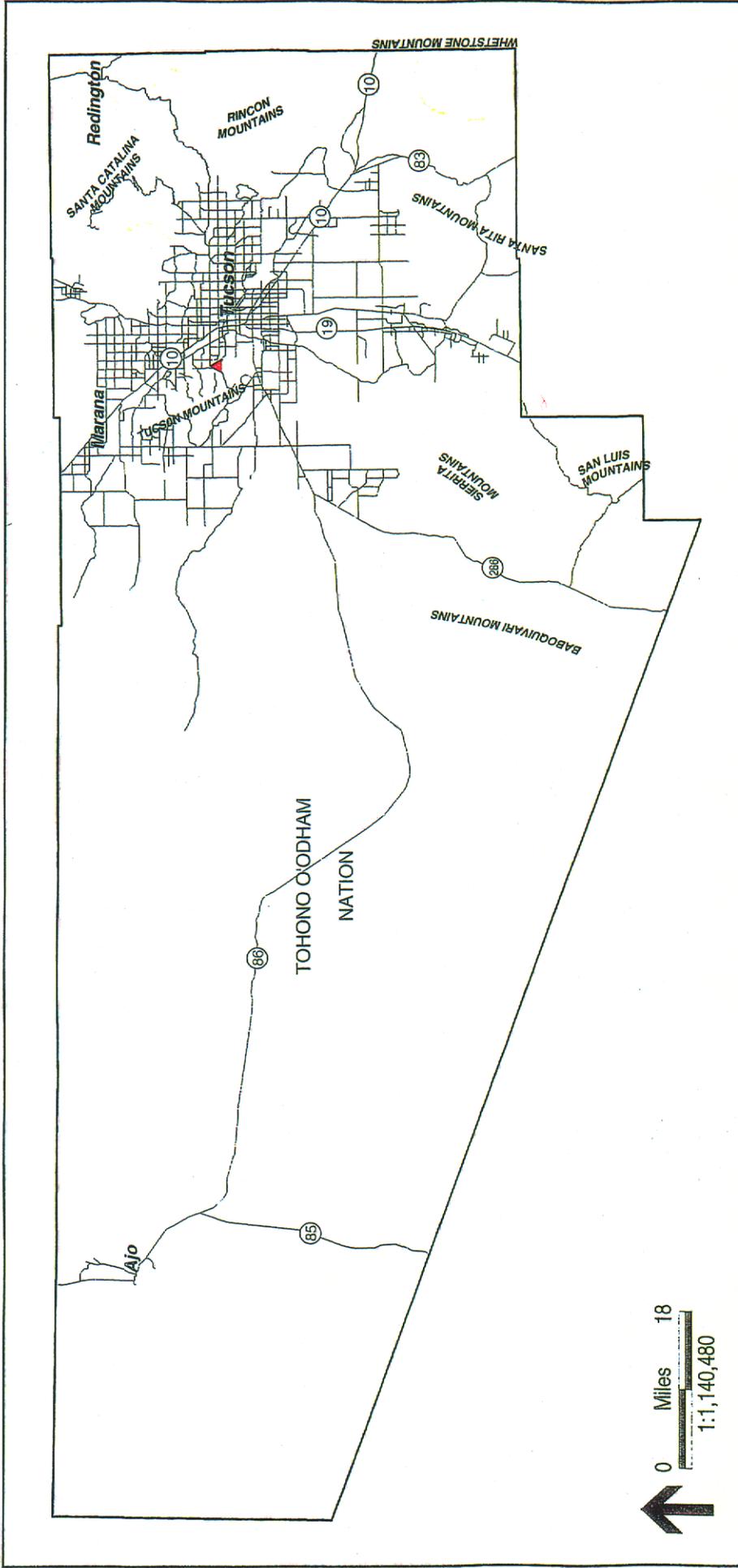


RECON M:\koba\32730\jstap\april12\_pca\hab\_1\figs-april\Fig26\_Terrap(ropilla)\_041201

# Desert Box Turtle (*Terrapene ornata luteola*) Priority Conservation Areas and Modeled Potential Habitat

- Pima County Boundary
- Major Road or Highway
- Priority Conservation Areas (STAT, January 2001)**
  - 1 Areas with populations which must be within the reserve system (excluding the Tohono O'odham Nation)
  - 2 Areas that would be of value to the reserve system
  - 4 Areas with the potential for restoration or enhancement
- Modeled Potential Habitat (RECON, January 2001)**
  - No Potential
  - Low Potential
  - Medium Potential
  - High Potential

Figure 26

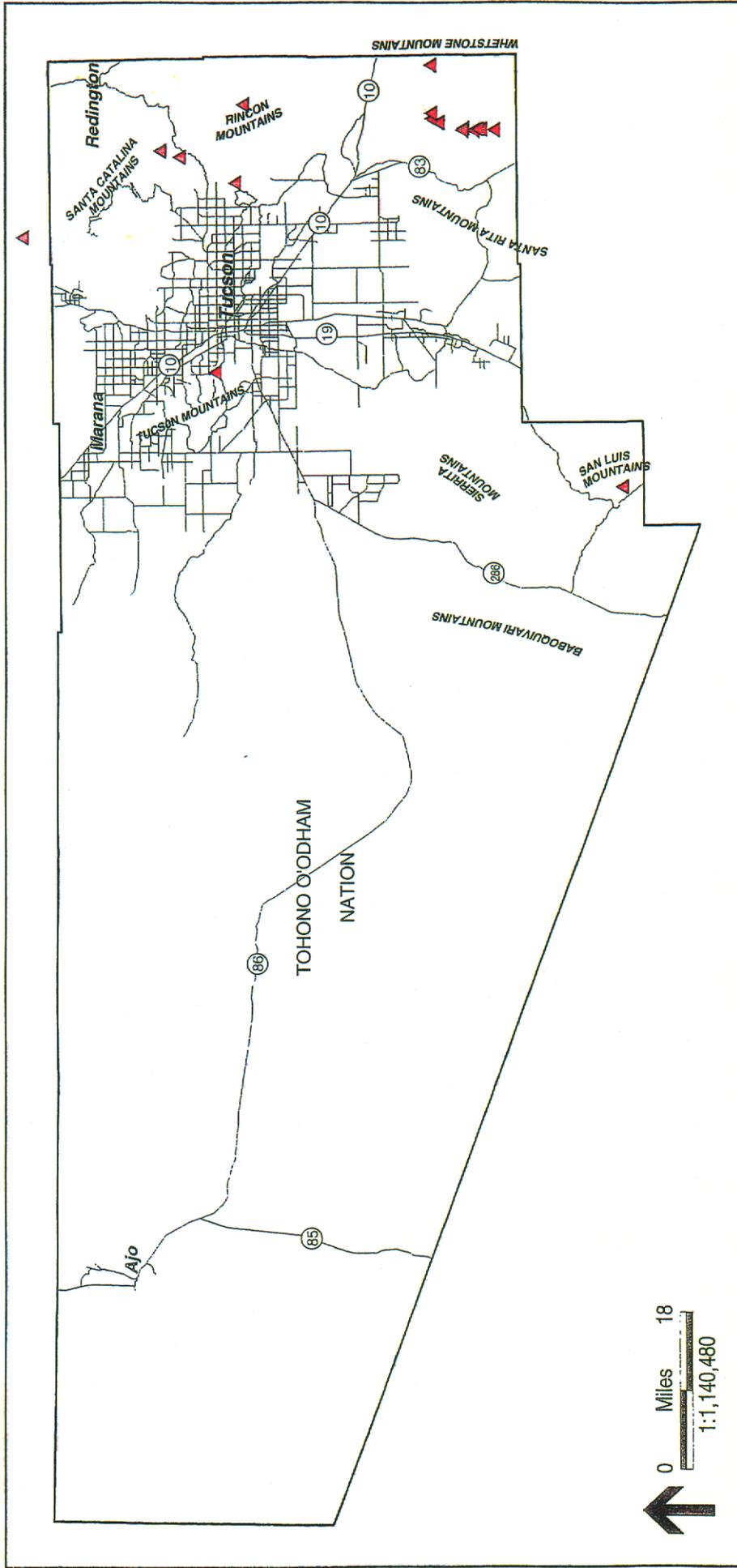


RECON\_M410bs132720\gis\spvs\lapr112\_pchab\_hgs\_apr\Fig27\_Cymana\lsh\_041201

## Desert Pupfish (*Cyprinodon macularius macularius*) Priority Conservation Areas and Modeled Potential Habitat

- Pima County Boundary
- Priority Conservation Areas - - No areas mapped
- Modeled Potential Habitat (RECON, January 2001)
  - No Potential
  - Low Potential
  - Medium Potential
  - High Potential
- Known Location (HDMS, 2000)
- Major Road or Highway

Figure 27

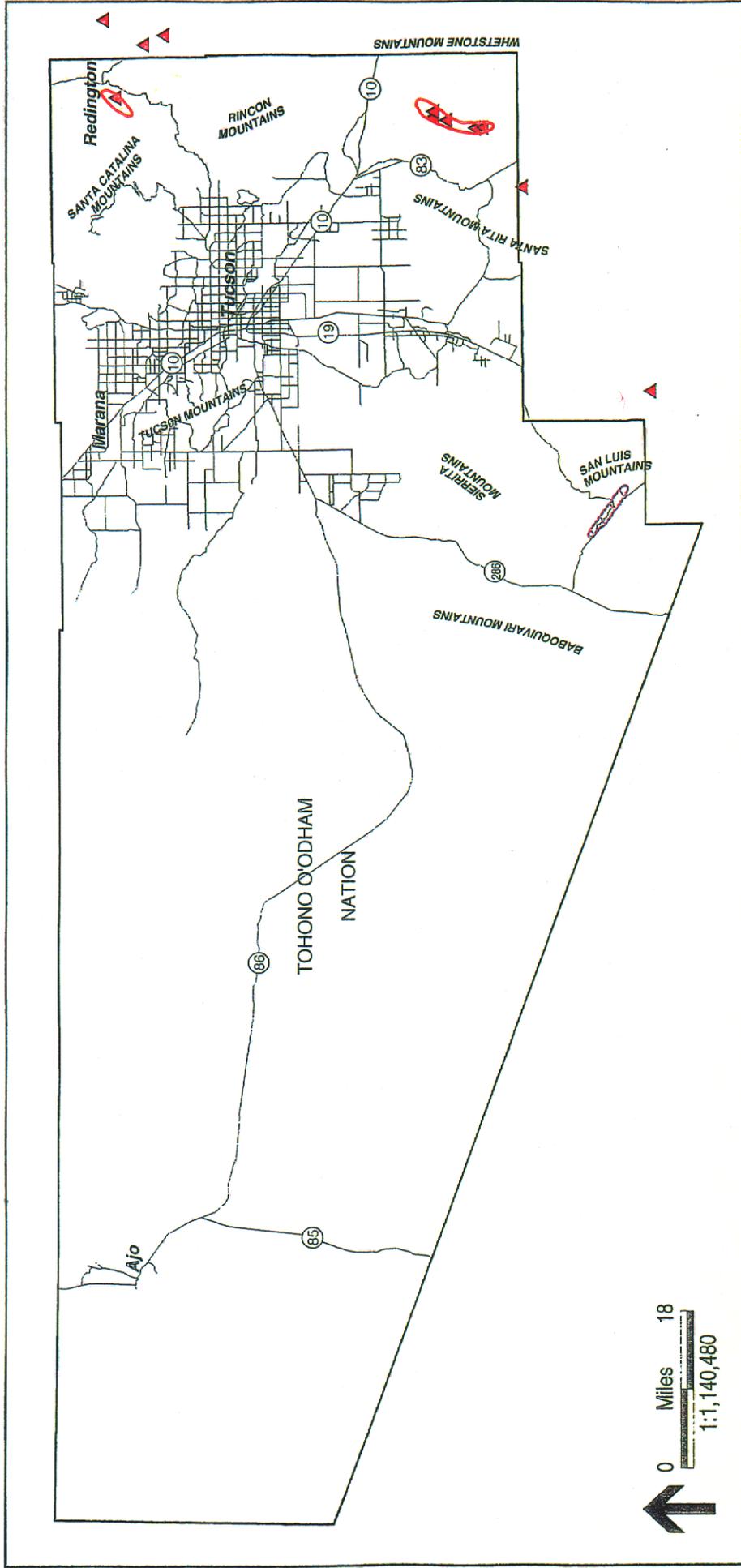


RECON M:\Jobs\3272\gis\figs\apr112\_pchab\_1\figs\apr112\_Poecocf\fig\_04/1201

## Gila Topminnow (*Poeciliopsis occidentalis occidentalis*) Priority Conservation Areas and Modeled Potential Habitat

- Pima County Boundary
- Priority Conservation Areas -- No areas mapped
- Major Road or Highway
- Known Locations (HDMS, 2000)
- Modeled Potential Habitat (RECON, January 2001)
  - No Potential
  - Low Potential
  - Medium Potential
  - High Potential

Figure 28



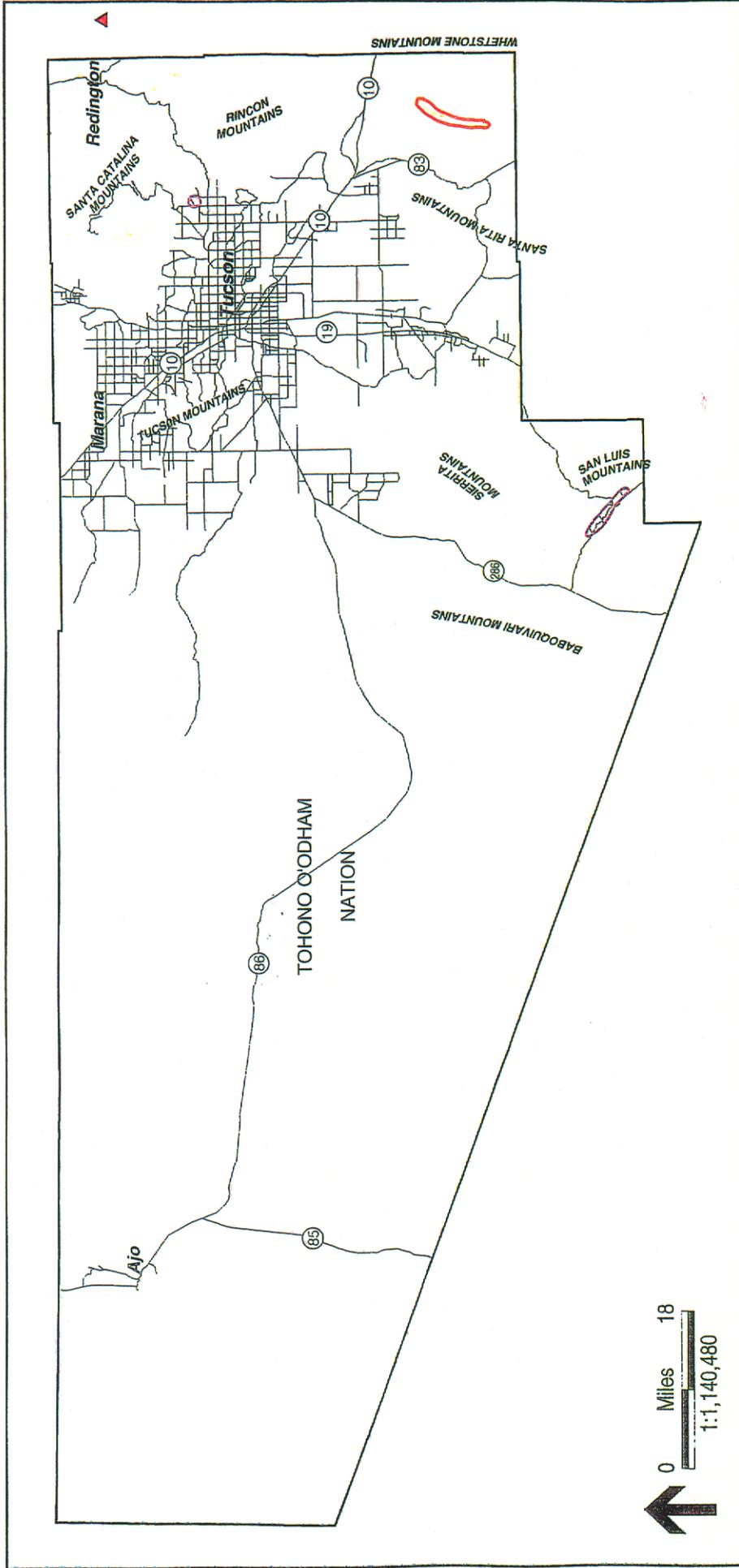
# Longfin Dace (*Agosia chrysogaster*)

## Priority Conservation Areas and Modeled Potential Habitat

- Pima County Boundary
- Major Road or Highway
- Priority Conservation Areas (STAT, January 2001)
  - Areas with populations which must be within the reserve system (excluding the Tohono O'odham Nation)
  - Areas with the potential for restoration or enhancement
- Modeled Potential Habitat (RECON, January 2001)
  - No Potential
  - Low Potential
  - Medium Potential
  - High Potential
- Known Locations (HDMS, 2000)

Figure 29



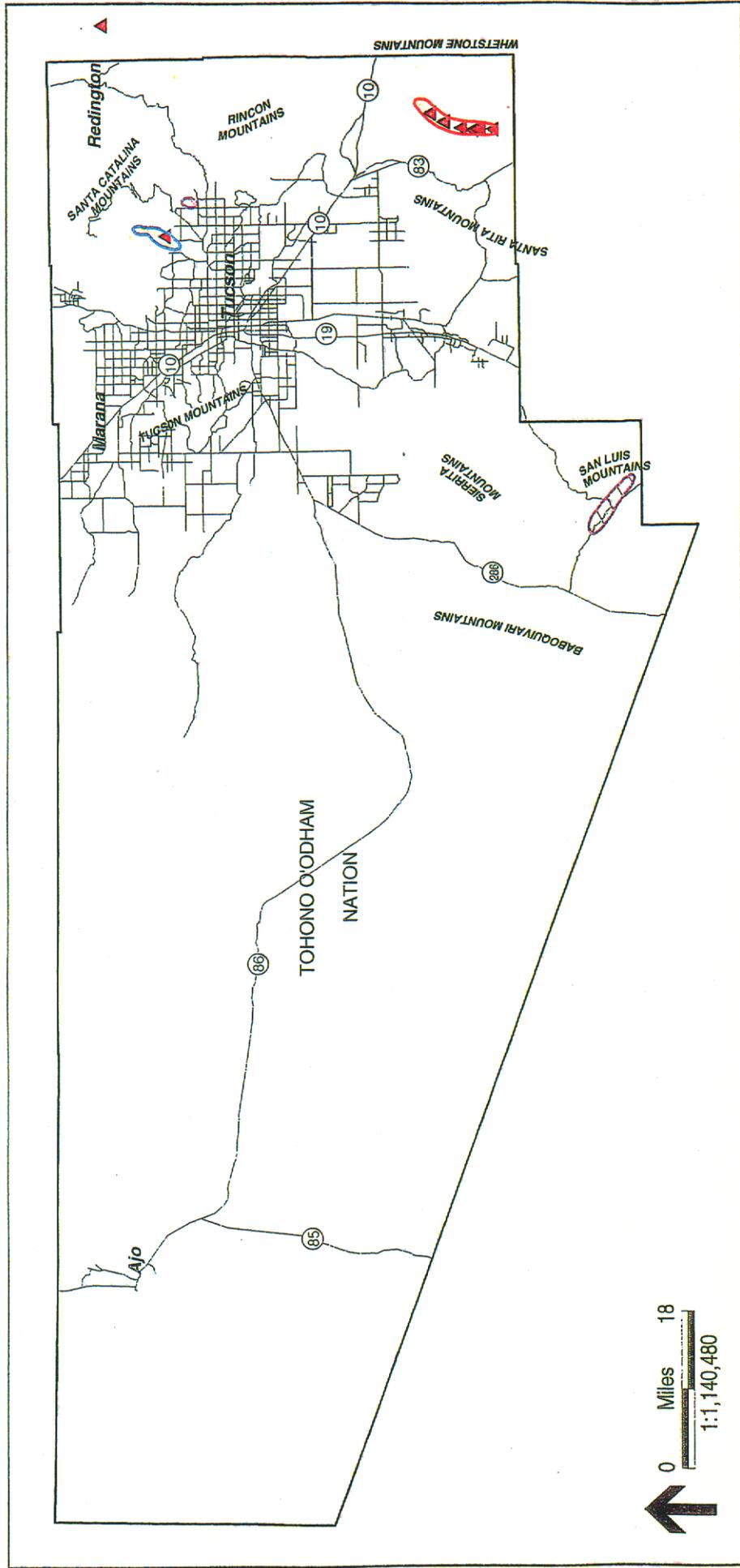


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# Sonoran Sucker (*Catostomus insignis*) Priority Conservation Areas and Modeled Potential Habitat

- Pima County Boundary
- Major Road or Highway
- 1** Priority Conservation Areas (STAT, January 2001)
  - Areas with populations which must be within the reserve system (excluding the Tohono O'odham Nation)
  - Areas with the potential for restoration or enhancement
- Modeled Potential Habitat (RECON, January 2001)**
  - No Potential
  - Low Potential
  - Medium Potential
  - High Potential
- Known Locations (HDMS, 2000)**
  - Known Locations

Figure 31

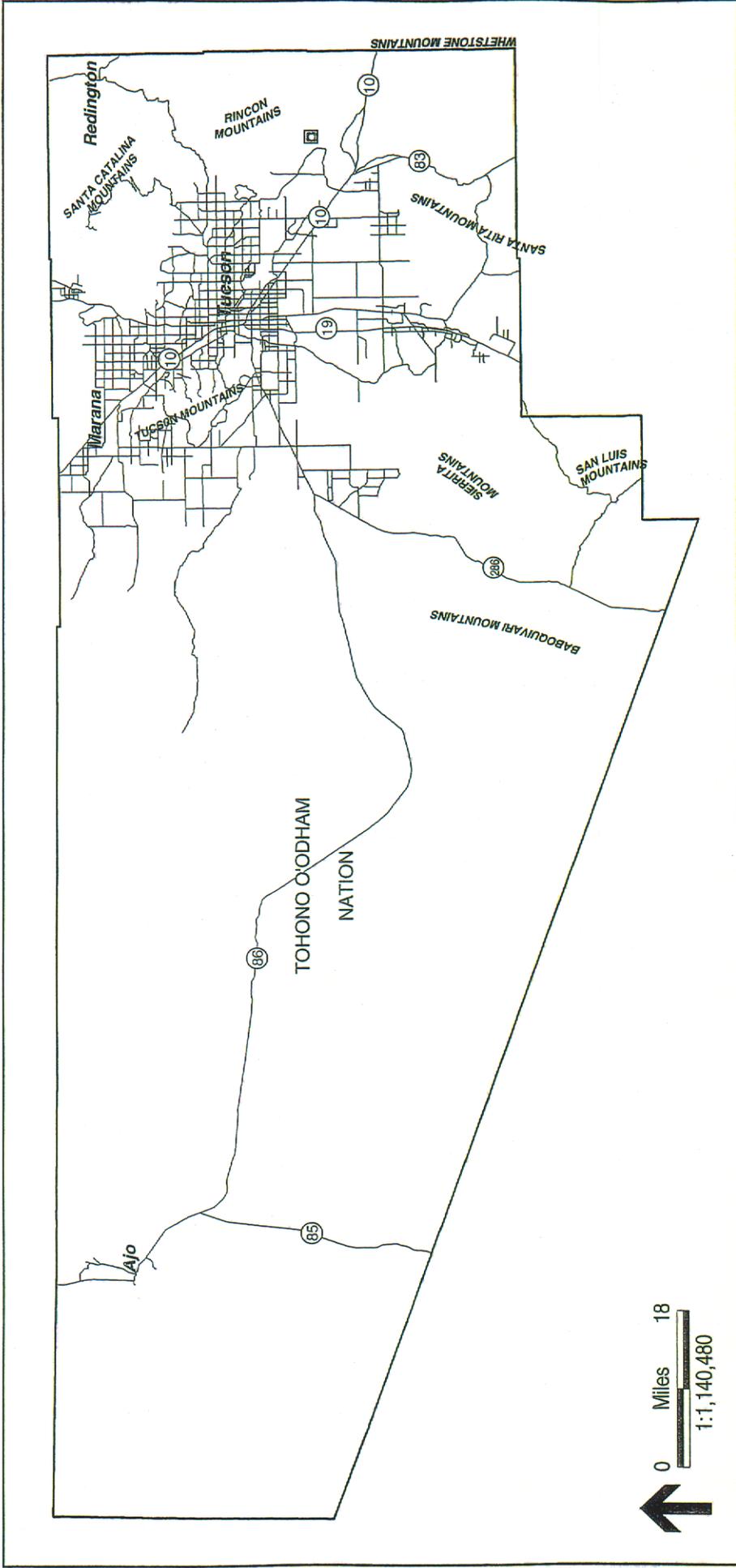


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# Gila Chub (*Gila intermedia*) Priority Conservation Areas and Modeled Potential Habitat

- Pima County Boundary
- Major Road or Highway
- Priority Conservation Areas (STAT, January 2001)**
  - 1 Areas with populations which must be within the reserve system (excluding the Tohono O'odham Nation)
  - 2 Areas that would be of value to the reserve system
  - 4 Areas with the potential for restoration or enhancement
- Modeled Potential Habitat (RECON, January 2001)**
  - No Potential
  - Low Potential
  - Medium Potential
  - High Potential
- Known Locations (HDMS, 2000)**
  - Known Locations

Figure 32

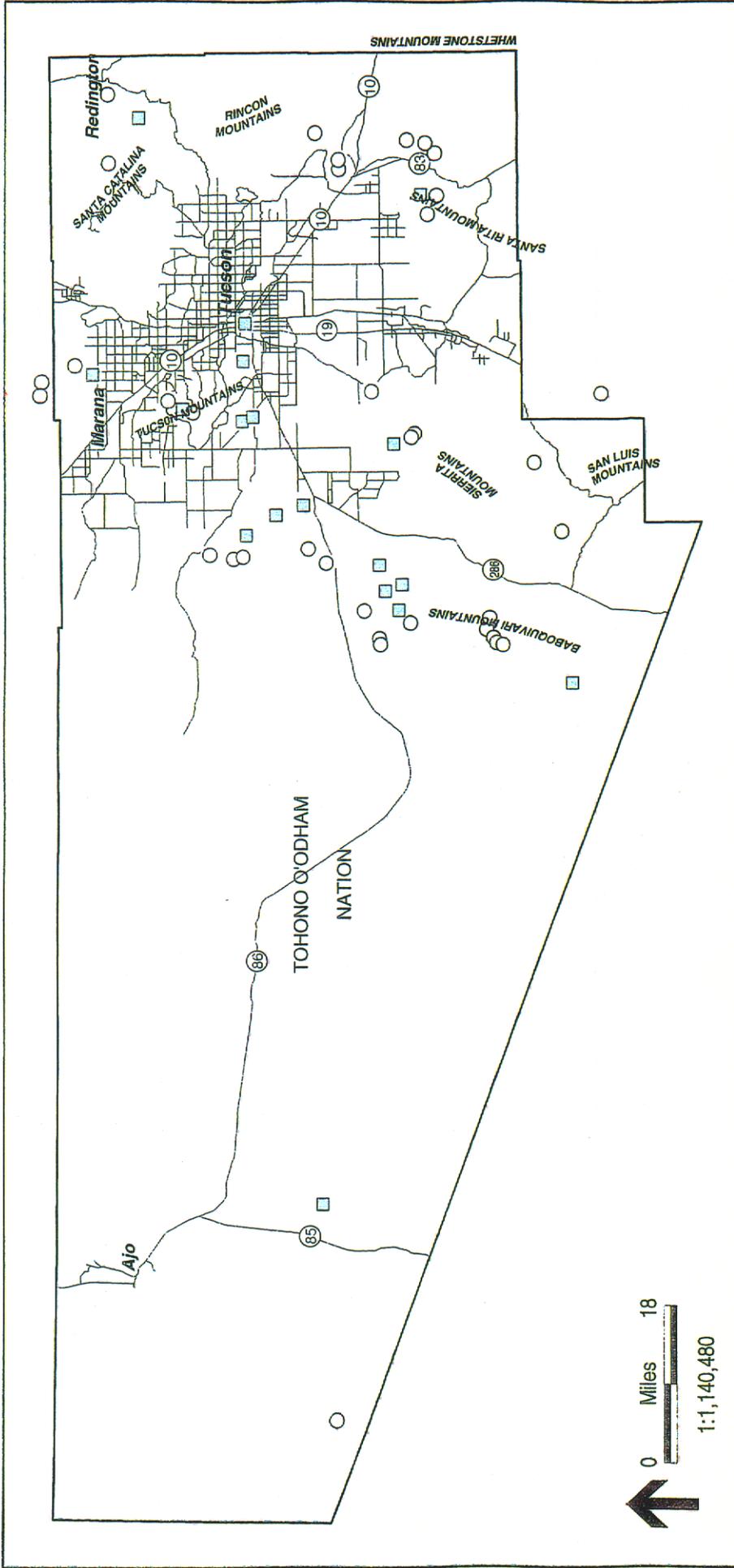


RECON M:\Jobs\32739\gis\apr\apr12\_pannah\_1igs-apt\fig33\_Albiorix\main1 04/12/01

# Arkenstone Cave Pseudoscorpion (*Albiorix anophthalmus*) Priority Conservation Areas and Known Location

- Pima County Boundary
- Major Road or Highway
- Priority Conservation Areas (STAT, January 2001)
- Areas with populations which must be within the reserve system (excluding the Tohono O'odham Nation)
- Known Location (SWCA, 2000)

Figure 33

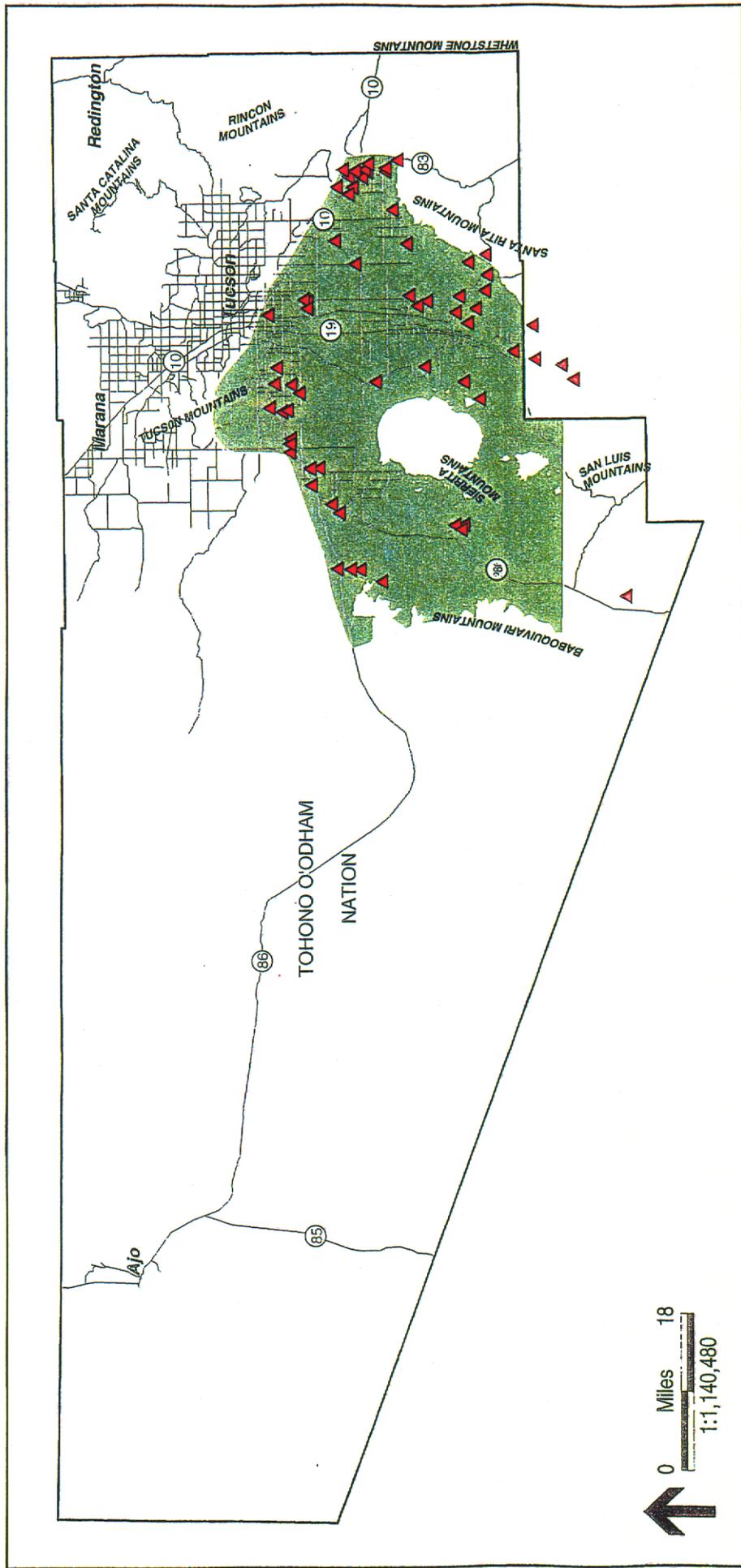


## Talus Snails (*Sonorella* spp.) Priority Conservation Areas and Known Locations

- Pima County Boundary
- Priority Conservation Areas - - No areas mapped
- Major Road or Highway
- Known Locations (SWCA, 2000)
- Known Locations (Arizona Department of Agriculture, June 1999)

RECON M:\p05\8272\figs\apost\apn112\_pcahab\_fig.apr\Fig04\_Snails(mwr) 04/12/01

Figure 34

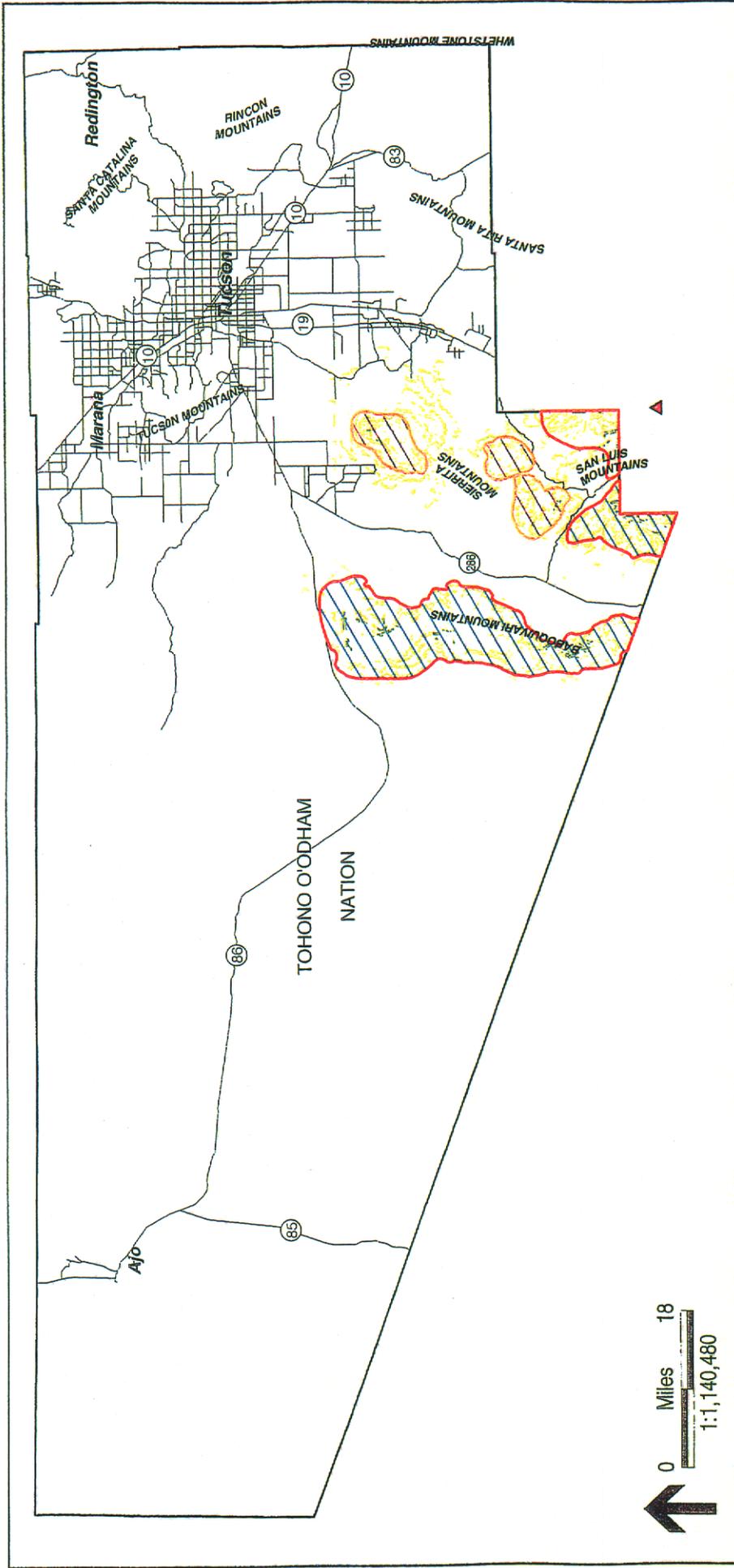


RECON 14\jobs\32739\gis\reports\apr112\_cpnaha\_1\figs\apr11\fig35\_Coscoq\plan1 04/12/01

# Pima Pineapple Cactus (*Coryphantha scheeri robustispina*) Priority Conservation Areas and Modeled Potential Habitat

- Pima County Boundary
- - Priority Conservation Areas - - No areas mapped
- Major Road or Highway
- Modeled Potential Habitat (HDMS, February 2001) High Potential
- ▲ Known Locations (HDMS, 2000)

Figure 35



RECON #4\05532730\figs\figs\apr11\2\_pcanab\_fig36.apr\Fig36\_Dalea(plant)\_04/12/01

# Gentry Indigo Bush (*Dalea tentaculooides*) Priority Conservation Areas and Modeled Potential Habitat

Pima County Boundary  
 Major Road or Highway

Priority Conservation Areas (STAT, January 2001)

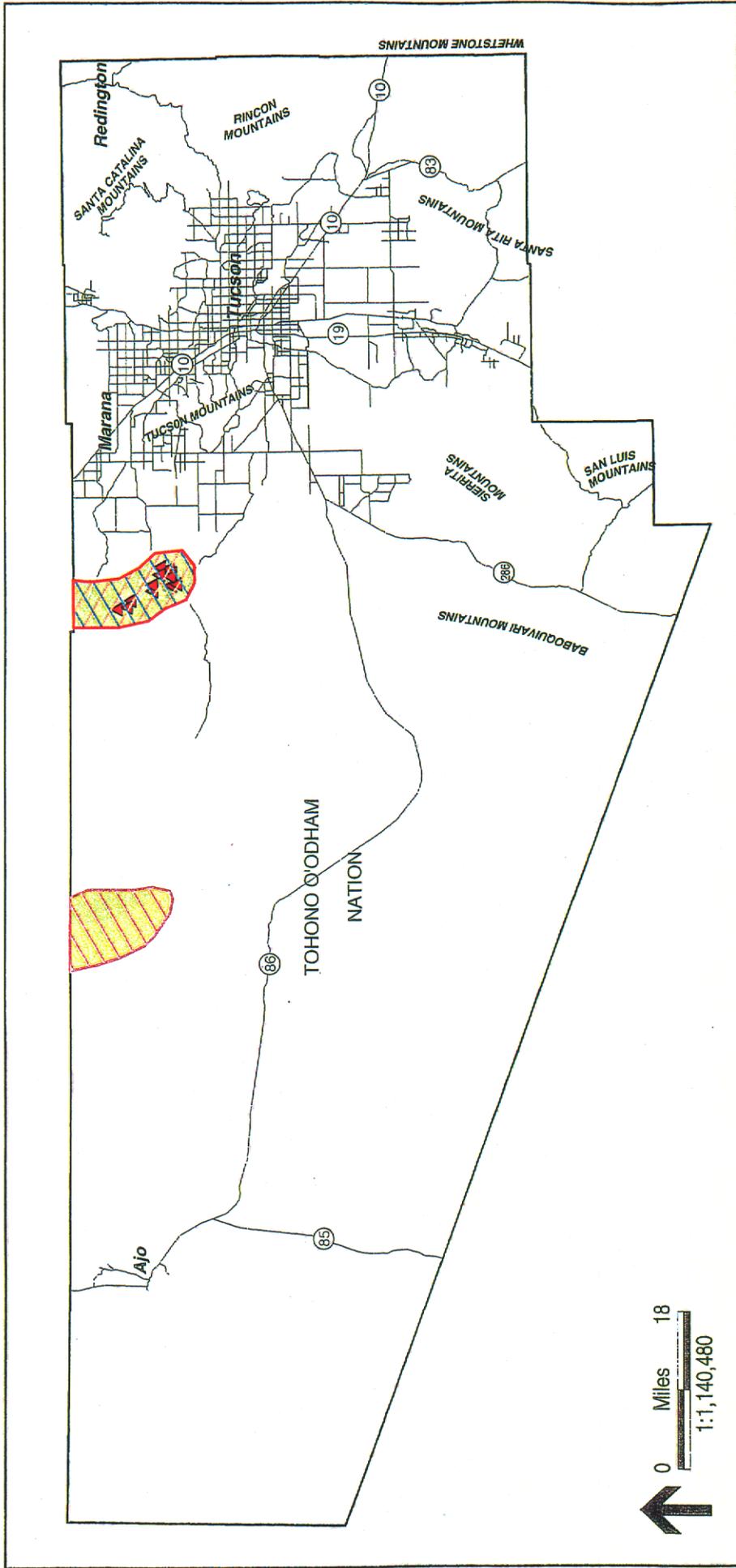
- 1 Areas with populations which must be within the reserve system (excluding the Tohono O'odham Nation)
- 2 Areas that would be of value to the reserve system
- 3 Critical landscape linkages
- 4 Areas with the potential for restoration or enhancement

Modeled Potential Habitat (RECON, January 2001)

- No Potential
- Low Potential
- Medium Potential
- High Potential

Known Location (HDMS, 2000)

Figure 36



# Nichol's Turk's Head Cactus (*Echinocactus horizontalonius* var. *nicholii*) Priority Conservation Areas and Modeled Potential Habitat

□ Pima County Boundary  
 ~ Major Road or Highway

Priority Conservation Areas  
 (STAT, January 2001)

- 1 Areas with populations which must be within the reserve system (excluding the Tohono O'odham Nation)
- 2 Areas that would be of value to the reserve system
- 3 Critical landscape linkages
- 4 Areas with the potential for restoration or enhancement

Modeled Potential Habitat  
 (RECON, January 2001)

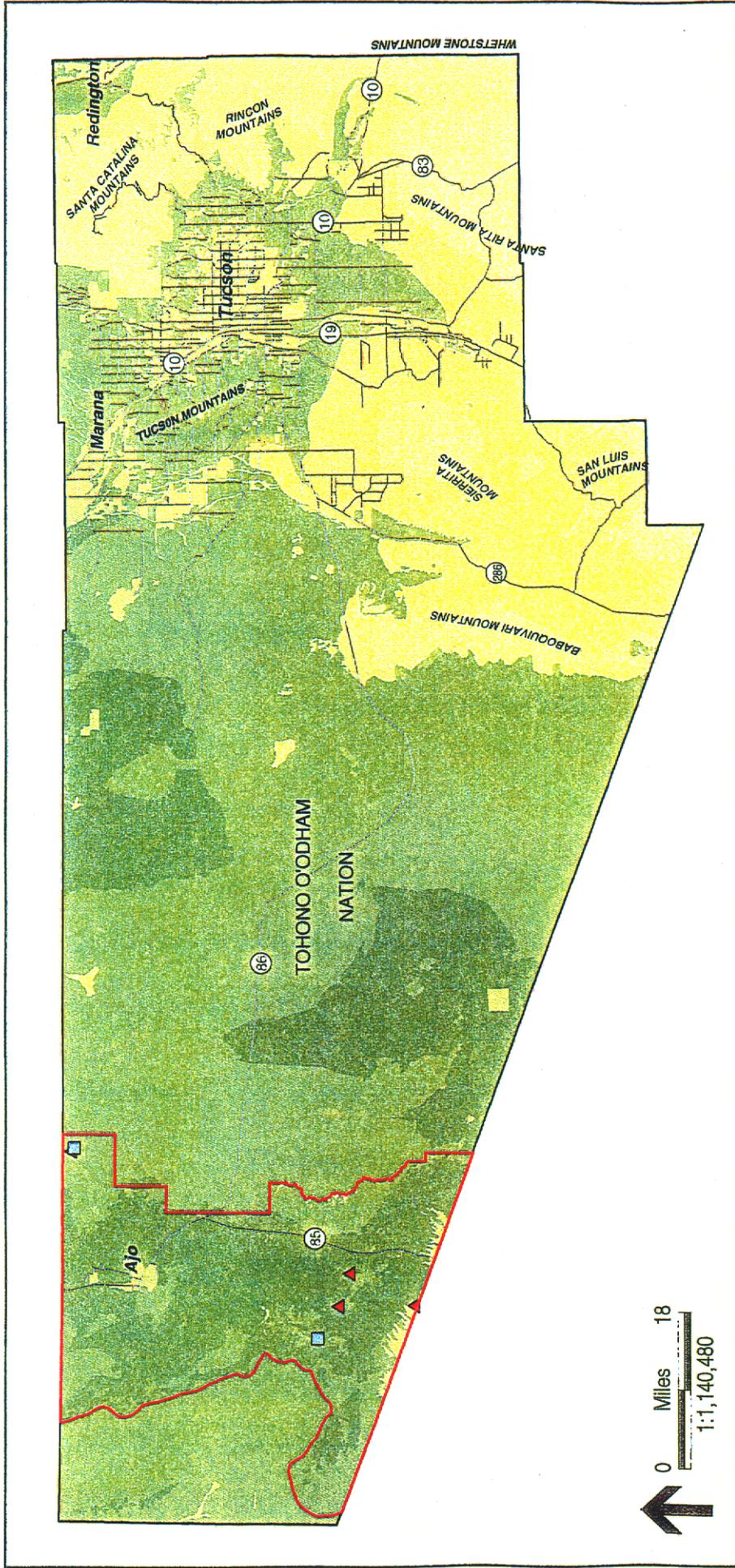
- No Potential
- Low Potential
- Medium Potential
- High Potential

Known Locations  
 ▲ (HDMS, 2000)



RECON\_M:\yabs3273\figs\mapstapn12\_pcahab\_1figs.apr\Fig37\_Echoni06ant 04/12/01

Figure 37

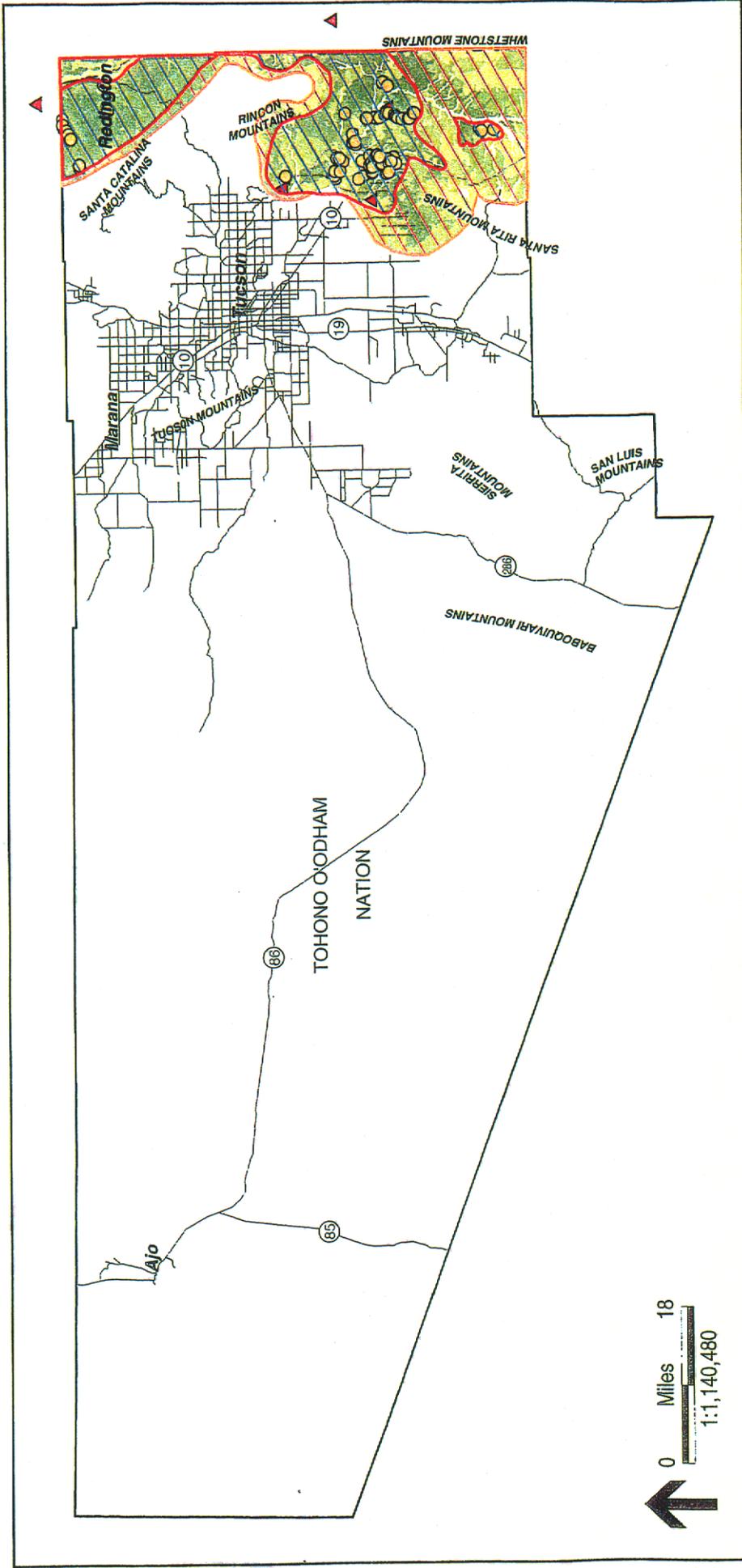


RECON M:\Jobs\32739\figs\maps\apr112\_cactahab\_llgs.apr\Fig38\_Ecarea.plant 04/12/01

# Acuña Cactus (*Echinomastus erectocentrus acueñsis*) Priority Conservation Areas and Modeled Potential Habitat

- Priority Conservation Areas (STAT, January 2001)
- Known Locations (SWCA, 2000)
- Known Locations (HDMS, 2000)
- Modeled Potential Habitat (RECON, January 2001) - No Potential
- Modeled Potential Habitat (RECON, January 2001) - Low Potential
- Modeled Potential Habitat (RECON, January 2001) - Medium Potential
- Modeled Potential Habitat (RECON, January 2001) - High Potential
- Areas with populations which must be within the reserve system (excluding the Tohono O'odham Nation)
- 1

Figure 38

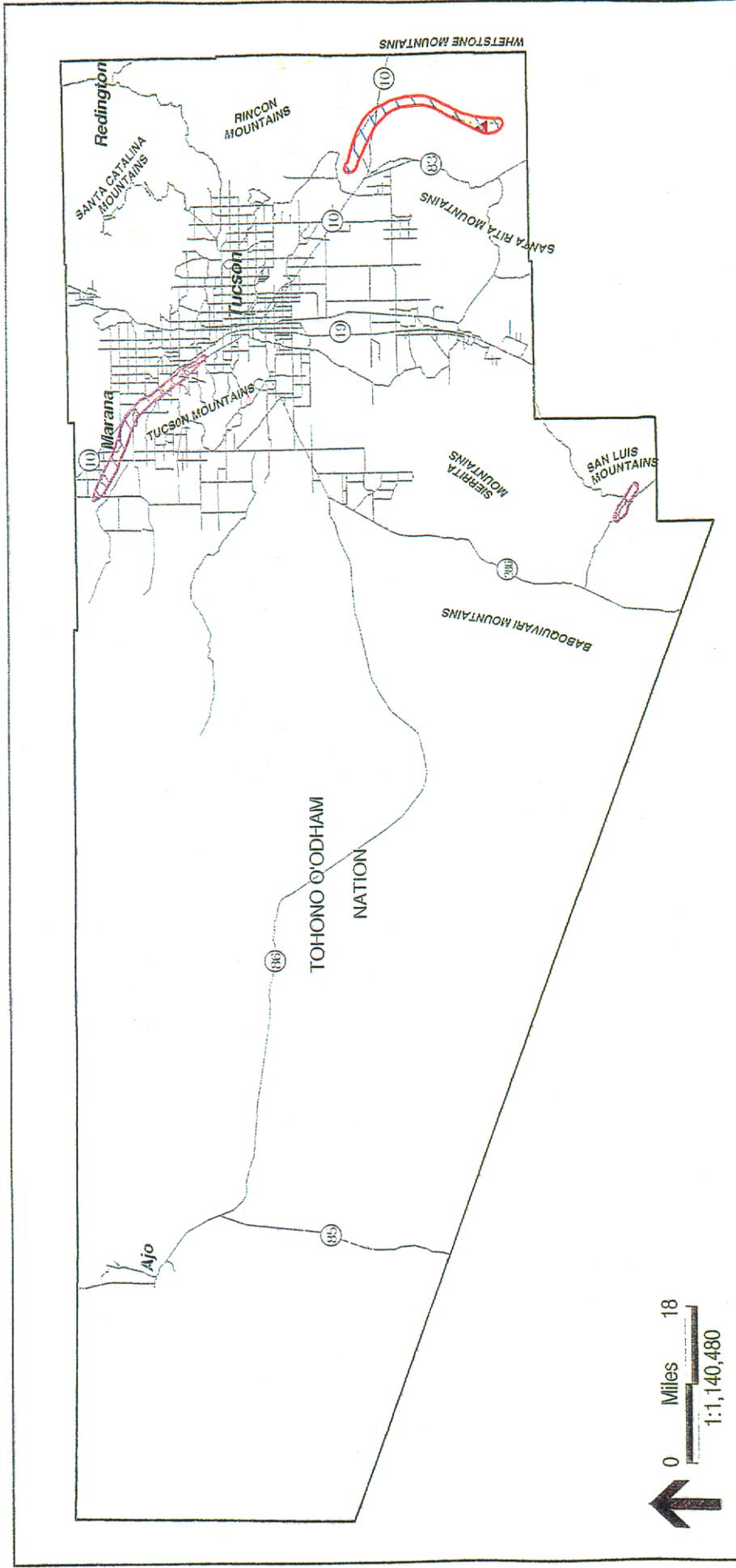


RECON: M:\figs\3279\figs\map\apr12\_pcahab\_fig.apr\Fig39\_Ecave(plant)\_04/12/01

# Needle-spined Pineapple Cactus (*Echinomastus erectocentrus*) Priority Conservation Areas and Modeled Potential Habitat

- Pima County Boundary
- Major Road or Highway
- Priority Conservation Areas (STAT, January 2001)**
  - 1: Areas with populations which must be within the reserve system (excluding the Tohono O'odham Nation)
  - 2: Areas that would be of value to the reserve system
  - 3: Critical landscape linkages
  - 4: Areas with the potential for restoration or enhancement
- Modeled Potential Habitat (RECON, January 2001)**
  - No Potential
  - Low Potential
  - Medium Potential
  - High Potential
- Known Locations (HDMs, 2000)**
  - (Arizona Department of Agriculture, June 1999)

Figure 39

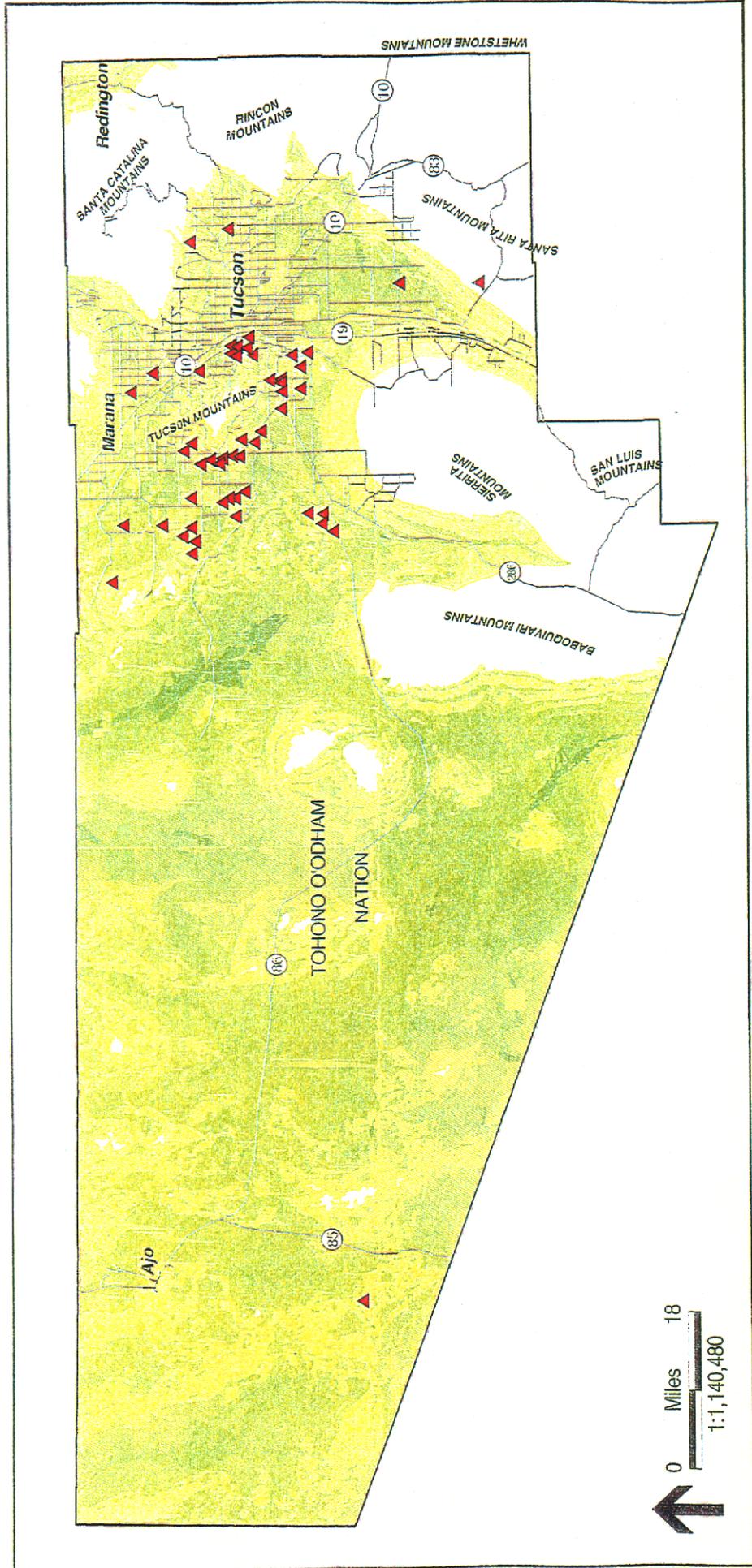


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# Huachuca Water Umbel (*Lilaeopsis schaffneriana recurvata*) Priority Conservation Areas and Modeled Potential Habitat

- Pima County Boundary
- Major Road or Highway
- Priority Conservation Areas (STAT, January 2001)**
  - 1 Areas with populations which must be within the reserve system (excluding the Tohono O'odham Nation)
  - 2 Areas that would be of value to the reserve system
  - 4 Areas with the potential for restoration or enhancement
- Modeled Potential Habitat (RECON, January 2001)**
  - No Potential
  - Low Potential
  - Medium Potential
  - High Potential
- Known Locations (HDMS, 2000)**
  - Known Locations

Figure 40



RECON M:\3053270\gsprst\p112\_pcatlab\_fig5.apr\Fig41\_Tumamoc\ham 04/12/01

**Tumamoc Globeberry (*Tumamoca macdougallii*)**  
**Priority Conservation Areas and Modeled Potential Habitat**

Figure 41

