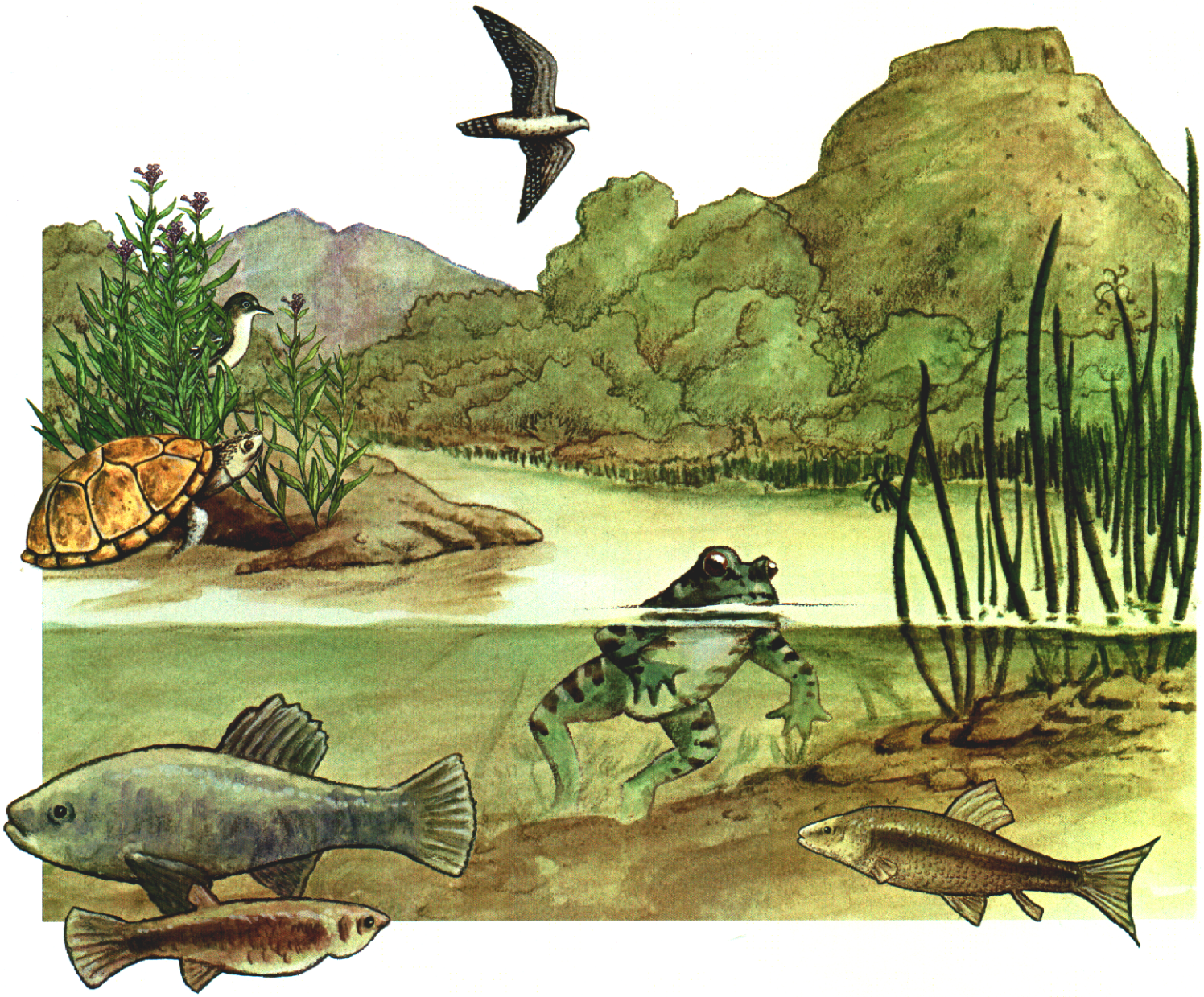
DRAFT

Sonoran Desert Conservation Plan Update



Focus on Riparian Areas

July 1999

MEMORANDUM

Date: July 21, 1999

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

From: C.H. Huckelberry
County Administrator

Re: **Attached Sonoran Desert Conservation Plan Update -- *Focus on Riparian Areas***

Background

The attached report entitled *Sonoran Desert Conservation Plan Update -- Focus on Riparian Areas* describes the progress in planning developments from March through July of 1999. Divided into seven parts, the report covers the following major topics which are summarized in this memorandum: (1) Overview, Recurring Riparian Protection Theme; (2) Pygmy-owl Update; (3) Interim Issues, Liability, Regulation and Acquisition; (4) Steering Committee Update; (5) Technical Advisory Team Updates; (6) Funding Update; and (7) Timeline.

Recurring Theme of the Need for Riparian Restoration

During the course of the past four months, a number of technical reports have been drafted, and the County has contributed to advancing the community's scientific knowledge base by funding studies about the endangered cactus ferruginous pygmy-owl. As the different elements of the Concept Plan are studied and developed, it is becoming increasingly apparent that the riparian connection is among the most critical. It is, in fact, serving as a common denominator among the research efforts. For example:

- In the technical report issued in April on the topic of *Determining Species of Concern*, a major finding was that the number of endangered and sensitive species, and a disproportionate number of extirpated native species are (or were) dependent on aquatic habitat which is now lost. The report to the Science Technical Advisory Team targets riparian habitat for protection under the Sonoran Desert Conservation Plan.

- Likewise, the technical report issued in May on the topic of *Preserving Cultural and Historic Resources* found a strong correlation between many existing cultural sites and riparian areas.

- A July study which performs a *Simple Representational Analysis of GAP Vegetation Mapping* asked the question: what percentage of each vegetation community exists in current public preserves? The answer brings riparian habitat to the forefront once again: "In general, riparian series have the lowest percentage of representation, varying from 67% to 100% unprotected."

- A July discussion paper entitled *Water Resources and the Sonoran Desert Conservation Plan* describes a comprehensive regional policy proposal to achieve meaningful riparian restoration necessary for endangered species compliance. The report outlines five water resource problems that have particular significance to the viability of the conservation plan, and proposes five solutions in the context of the Sonoran Desert Conservation Plan. The basic premises establishing the relation of water policy to conservation planning are that: (1) Continued groundwater mining has caused substantial damage to riparian environments, with an estimated loss of 85 to 95% of quality riparian habitat during the last century; (2) An estimated 85% of wildlife depends on this riparian habitat for some part of its life cycle, including a long list of endangered, extirpated and imperiled species; (3) The ongoing implementation of water programs which undermine the purpose of the Endangered Species Act and significantly impact habitat, might preclude implementation of meaningful conservation under the Sonoran Desert Conservation Plan; (4) Two decades of plans administered under the State's Groundwater Code have failed to bring the Tucson Active Management Area on track with the goal of balancing groundwater withdrawal with recharge (safe yield); and (5) Given the status of the riparian ecosystem, the jurisdictions throughout the region face the realistic prospect that a level of restoration will be a condition of the Section 10 permit issued under the Endangered Species Act.

Relation of Riparian Ecosystem Decline to the Pygmy-Owl: Depletion of water tables and the loss of riparian habitat has impacted cactus ferruginous pygmy-owl habitat. Most of the major documents describing the pygmy-owl connect it to its riparian habitat based origins. In addressing pygmy-owl conservation and recovery initiatives, the Sonoran Desert Conservation Plan will have to prescribe a riparian protection and restoration strategy. Pygmy-owl compliance issues make such strategies a more immediate matter for the community, but the same can be said for conservation and recovery initiatives of all listed and imperiled animals in Pima County which are dependent on riparian habitat. The Sonoran Desert Conservation Plan will work on three levels at the same time: It will address issues related to the listing of the cactus ferruginous pygmy-owl; it will include other listed species and species of concern; and it will protect riparian habitat and other target habitats of concern.

Subarea Planning Based on Watersheds: In recognition of the importance of the Riparian Element, the Sonoran Desert Conservation Plan will be divided into subareas based on watershed and riparian features. Initial proposals for subareas include: (1) San Pedro planning unit; (2) Cienega-Rincon watershed planning unit; (3) Upper Santa Cruz planning unit; (4) Middle Santa Cruz planning unit; (5) Tortolita Fan planning unit; (6) Avra-Altar planning unit; (7) Tohono O'odham planning unit; and (8) Western Pima County's planning unit. The watershed / riparian link to subareas enhances the ecosystem basis of the conservation plan. A draft concept plan will be created for each subarea, and then redrafted after the biological, cultural and economic assessments are completed, and Steering Committee members from the various subareas have formulated conservation and growth accommodation recommendations. These subarea plans, when viewed together, will provide preserve alternatives that will constitute Pima County's conservation plan.

Pygmy-owl Update

Pima County's most immediately felt environmental dilemma is related to the listing of the pygmy-owl in March of 1997. Pima County has 18 plants and animals listed under the Endangered Species Act, but no listing has caught the attention of the community like the pygmy-owl. Considered one of the most difficult listings in the United States, the pygmy-owl listing is a vexing dilemma for a number of reasons, including the numbers are extremely low, and very little is known about this tiny, secretive bird. At the time of the listing there were only 12 known individuals. After the 1998 survey season there were around 32 known owls, and during the 1999 survey season 78 owls were identified, although some fledglings were lost. Research conducted during the 1999 survey season will bring us more information about the owl population, its genetic make up, and it tolerance for urban occurrences in part because Pima County has provided $300,000 in study efforts. Yet we are a long way from delisting, downlisting, or even understanding how to protect the pygmy-owl based on its habitat needs and tolerances. A timeline for these and related efforts follows.

- March 1999: Genetics study funded by Pima County begins.
- April 1999: Survey effort funded by Pima County begins.
- May 1999: Telemetry and habitat assessment funded by Pima County begins.
- September 1999: Final report on survey results due to Pima County.
- September 1999: Draft Recovery Plan anticipated from U.S. Fish and Wildlife.
- February 15, 2000: Report on telemetry and habitat assessment due to Pima County.
- March 2000: Final report, genetics study due to Pima County.

Critical Habitat Designation -- On July 12, 1999, the United States Fish and Wildlife Service published in the Federal Register its designation of 731,712 acres as critical habitat for the pygmy-owl. Approximately 260,883 acres are within Pima County. While much has been made of this designation, the fact is that until the County has a Section 10 permit, potential Section 9 liability exists, regardless of the status of habitat designation or other federal guidelines, such as protocol standards. When Pima County receives its Section 10 permit under the Endangered Species Act, the critical habitat designation will be replaced by the terms of the conservation plan. Therefore, the U.S. Fish and Wildlife Service continues to recommend that development of a region-wide, multi-party, comprehensive conservation plan is the preferred long-term option to allow for the survival and ultimate recovery of the pygmy-owl in Arizona.

Interim Issues, Liability, Regulation and Acquisition

The Role of U.S. Fish and Wildlife in Providing Advice about Land Use Decisions -- On June 9, 1999 a letter was sent by the Field Supervisor of the U.S. Fish and Wildlife Service to the Mayors of Marana and Oro Valley. In this letter, Mr. David Harlow advises the towns that: *"rezoning and other town projects could adversely affect [the pygmy-owl] and its habitat. Additionally, actions such as re-zoning may preclude future planning options needed by [the town] for obtaining Endangered Species Act (ESA) 'take' permits. My staff and I are available to assist you in determining if zoning changes might affect this species and to work with you*

to ensure that you are in compliance with the ESA." With this letter the Service raised legitimate concerns at the early stages of development, rather than the late stages when investments are substantial, or when a "take" of species has occurred and the government and/or developer face civil or criminal liability under the federal law. Similar advice has been given to Pima County on an informal level with regard to permitting practices, especially in the wastewater area. Accordingly, a County Attorney's opinion has been requested so that Pima County can take all steps to ensure compliance.

Draft Interim Regulations -- When the Board adopted the Sonoran Desert Conservation Concept Plan on March 2, 1999, staff was directed to draft an interim environmental land use policy -- to apply during the planning period -- based on the comments submitted and the need to deal effectively with endangered species issues in the interim planning period. The draft policy outlined in the report encompasses the following and is submitted for review and comment: (1) a limitation on upzonings in environmentally sensitive areas identified by federal critical habitat rules or the Sonoran Desert Conservation Concept Plan, with exceptions for upzonings which would result in actual conservation; (2) enhanced review criteria on waiver of subdivision platting requirements; (3) enhanced conditional use permit criteria to be more sensitive to conservation areas; and (4) an environmentally compatible standard for rezoning time extensions.

Interim Acquisition Proposal - To ensure protection of the western slopes of the Tortolita Mountains and it alluvial fan, and the Ironwood forest, an Arizona Preserve Initiative (API) application was submitted for 16,185 acres of State Trust Land. This creates the starting point of a potential pygmy-owl preserve under the Sonoran Desert Conservation Plan. Another application was filed to preserve the Tortolita east biological corridor.

Steering Committee Update

On March 2, 1999, the Board invited 89 individuals to participate in a Steering Committee process. To date, 85 of these individuals have continued to show interest by completing paperwork and submitting a loyalty oath to the Clerk of the Board. The high retention rate of Steering Committee members also maintains the initial balance that was achieved between neighborhood, environmental, business, ranch and private property interests.

Education Series -- The Steering Committee will ultimately make a recommendation on a preferred preserve alternative based on its conservation value and in light of the community's fiscal capacity. In order to do this members will have to acquire knowledge in a number of complex subject areas. From May through December of 1999, the Steering Committee is scheduled to attend a series of education sessions to prepare for this responsibility on these topics: (1) Conservation Plans, the ESA, & the Constitution; (2)The Cactus Ferruginous Pygmy-owl; (3) Pima County's People, Economy, Water and Land; (4) Ranching within Pima County; (5) Conservation Biology; (6) Pima County's Cultural and Historic Resources; (7) How to Create a Multi-Species Conservation Plan; and (8)Tohono O'odham Nation Presentation. The first two education sessions have been well attended by Steering Committee members, members of the public, and employees from a number of governmental entities.

Partnership with the Tohono O'odham Nation -- On April 28, 1999, the Chairman of the Tohono O'odham Nation accepted an invitation to partner with Pima County in developing the Sonoran Desert Conservation Plan. Twelve individuals were designated to represent the Nation in the process. In subsequent meetings and conversations, the outlines of this partnership have been sketched out to include mutual interests in at least the elements of the Sonoran Desert Conservation Plan which involve Mountain Parks, Cultural and Historic Resources, and Riparian Protection. Representatives of the Tohono O'odham Nation are invited into every level of the process, including expert committees and education sessions.

Federal Partners -- In May of 1999, representatives from ten federal entities met with Pima County staff to discuss cooperative efforts in carrying out the conservation plan. There was consensus to pursue a cooperative agreement, and a goal was established to have a draft for circulation by September of 1999.

State and Local Government Relationships -- State and local government entities have expressed interest in participating in the Sonoran Desert Conservation Plan process. The County is facilitating technical and inter-governmental relationships through the conservation planning process, and is working with the U.S. Fish and Wildlife Service to secure commitments to the regional approach. David Harlow, in his June 9, 1999 letter, states: *"Pima County is currently involved in developing a regional Habitat Conservation Plan (HCP) that can serve as 'umbrella' ESA compliance for all activities covered by the plan. We are urging all municipalities within Pima County to strongly consider becoming involved in this regional effort, to preclude the need to address ESA issues separately, one project at a time. Obtaining individual ESA permits would be more time-consuming, cumbersome and costly for both the Service and the municipalities involved, compared to using the regional approach. A regional approach would also provide greater opportunities for resolving species conservation and economic development conflicts."* Joint meetings are beginning to be scheduled between staff from the Service, Pima County, and local governments to discuss the possibility of formalizing cooperative relationships.

Technical Advisory Team and Technical Report Updates

Technical Advisory Teams -- The Technical Advisory Teams (comprised of experts in areas of science, law and economics, historic preservation and ranch/range issues) will gather data and work products, produce white papers, and, in general, provide expert information to the Steering Committee. The following Technical Advisory Teams have been seated and County staff members assigned to these Teams are drafting a series of technical reports to introduce to the committees on the state of the subject matter. More members will be added as time goes on, particularly from the Tohono O'odham Nation.

- Science Technical Advisory Team
- Cultural/Historic Resources Technical Advisory Team
- Ranch Conservation Technical Advisory Team
- Geographic Information Systems (GIS) Technical Advisory Team
- Implementation (Law & Economics) Technical Advisory Team

Technical Report Series -- County staff members have been drafting a series of reports which facilitate discussion within the Technical Teams. Reports range from broad examinations of a subject matter, to updates, to narrow studies of specific issues within the field of expertise. Since March of 1999, ten broad status reports have been drafted, or are scheduled for release in the coming months.

1. Report on Public Comment, Update (March 1999)
2. Determining Species of Concern (April 1999)
3. Preserving Cultural and Historic Resources (May 1999)
4. Comparison of Pima County Expenditures (June 1999)
5. Water Resources (July 1999)
6. Sonoran Desert Conservation Concept Plan Update (July 1999)
7. Mountain Parks (August 1999)
8. Land Use Planning (September 1999)
9. Compilation of Ranch Conservation Studies (October 1999)
10. Fiscal Impact of Growth (November 1999)

Also since March of 1999, five issue-specific or more focused reports have been drafted. These are prepared on an as-needed basis, and it is probable that an increasing number of such studies will be released in the coming months as Technical Teams pursue lines of inquiry to develop data layers and other information needed for the Sonoran Desert Conservation Plan.

1. Paseo de las Iglesias (April 1999)
2. State of the Geographic Information System (April 1999)
3. Evaluation of Previous Vegetation Mapping Efforts (June 1999)
4. Focal Species (July 1999)
5. Simple Representational Analysis of GAP Mapping (July 1999)

Peer Review -- Two independent peer reviewers have been selected by the Science Advisory Team, and both Dr. Reed Noss and Ms. Laura Hood have accepted invitations to serve in this role. Dr. Noss is one of the most well respected and well published scholars in the field of conservation biology, with over 150 books, articles, chapters, reports and proceedings to his name. Ms. Laura Hood, currently with the Washington D.C. office of Defenders of Wildlife, is the author of the influential text about conservation plans entitled *Frayed Safety Nets*. Other reviewers will be selected as the planning process continues.

Science Team Meetings and Workplan -- In May 11, 1999, the Science Technical Advisory Team to the Sonoran Desert Conservation Plan met for the first time to begin discussions about the biological underpinnings for our regional multi-species conservation plan. The Team has met on a monthly basis since that time and has covered topics such as: what species should be included in the conservation plan; the charter of the Team; evaluation of existing vegetation mapping; biological goals; the Request for Proposals for a biological consultant; selection of independent peer reviewers; watershed based subarea planning; GIS decision making models; environmental history; focal species; the representation of vegetation

communities within protected areas; and the status of data collected by Pima County staff. The Science Team has worked on a Request for Proposals and will be prepared to let the RFP when funding is available to contract with a biological consultant.

Cultural Historic Resources Team Meetings and Workplan -- This Team has started to meet and will review the work of a project under contract with the Arizona State Museum to complete the cultural resource geographic data for Eastern Pima County. This project involves 1420 hours to complete site and survey data entry, with an anticipated date of completion of October, 1999

Ranch Conservation Team Meetings and Workplan -- This Team will begin to meet during the summer of 1999 to discuss planning issues including the creation of a data layer for ranch lands, and the first report in the technical series issued by staff. A strong alliance in Altar Valley has already started biological resource data gathering within that watershed.

Geographical Information Services (GIS) Technical Advisory Team Meetings and Workplans -- This Team works through the lead County staff member in the area, John Regan, on all aspects of the Sonoran Desert Conservation Plan which involve the creation of data layers. The Pima County GIS Library is extensive, covering over 175 data layers. During the past months, staff has been accumulating additional data layers in anticipation of mapping and information needs for the Sonoran Desert Conservation Plan. New layers gathered by staff in recent months puts the available layers of information at over 200. Currently, county staff is dividing and analyzing all relevant data layers into subarea units, which will become the basis of the initial subarea draft concept plans issued to land panels in January of 2000.

Creation of a GIS Decision Support Model -- Pima County has entered into a collaborative relationship through the United States Geological Survey with four prominent California conservation biologists and geographic information scientists to create a decision support model for conservation planning as the Sonoran Desert Conservation Plan is developed. County staff submitted a pre-proposal to the National Fish and Wildlife Foundation to seek funding assistance, and now has been asked to submit a full proposal based on the strength of the pre-proposal. The principal investigators working with Pima County in this effort are: Dr. Michael Gilpin, University of California at San Diego; Dr. Ross Gerrard; Dr. Peter Stine, California State University; and Dr. Richard Church, University of California at Santa Barbara. Both Region 1 and Region 2 of the United States Fish and Wildlife Service support this effort, which essentially has an overall goal of developing a computer-based framework for incorporating biological data, socio-economic data, and optimization modeling to support the development of good conservation plans. The approach shows the explicit trade-offs between various levels of conservation, obtained by reserving certain lands, and the economic and social costs of doing so. The effort, if funded, will be administrated by Pima County and the California science team through the National Center for Geographic Information and Analysis (NCGIA). The NCGIA, headquartered on the campus of the University of California at Santa Barbara, has implemented the major U.S. effort in GIS research for over ten years.

Implementation (Law & Economics) Technical Advisory Team Meetings and Workplan - This Team will begin meeting in the Fall to discuss the fiscal, legal, and water resource ramifications of land use planning under Section 10 of the Endangered Species Act. The Team will work with County staff and a consultant to assess and understand issues related to the cost of conservation and the cost of growth accommodation. In addition to identifying constraints, the Team will recommend mechanisms for implementing conservation and growth accommodation programs.

Funding Update -- On February 24, 1999, Congressman Jim Kolbe and Secretary of the Interior Bruce Babbitt discussed the Sonoran Desert Conservation Plan at an Interior Appropriation Subcommittee Hearing. Congressman Kolbe has supported funding for the Conservation Plan by marking $1 million in funds in the next federal budget. This effort has succeeded through the Subcommittee and full Committee processes. Recently the full House approved the Department of Interior Appropriations bill in a 377-47 vote. On June 24, 1999, the Senate Appropriations Committee approved an Interior funding bill which specifically marked the Cooperative Endangered Species Fund with this language: "The Senate encourages the Fish and Wildlife Service to consider carefully the efforts in .... Pima County, Arizona for the Sonoran Desert Conservation Plan." If the funding remains available to Pima County after the budget emerges from the Conference process, Pima County will enter into a transfer agreement with the United States Fish and Wildlife Service so the study process can begin immediately when federal funds are available.

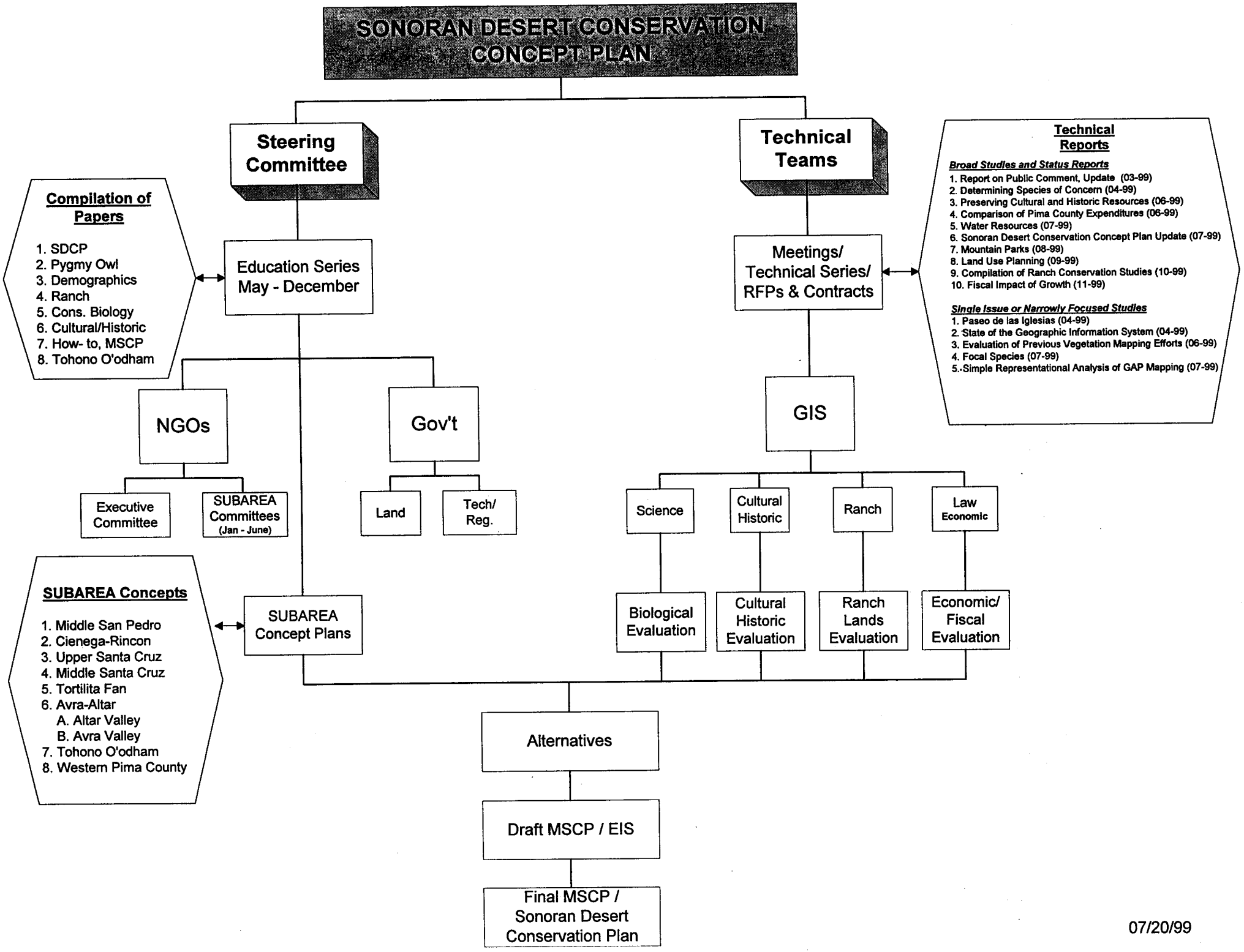
Conclusion and Timeline -- The completion of the Sonoran Desert Conservation Plan depends on funding availability. The following time table shows prior and estimated future dates for completion of various aspects of the conservation planning process, assuming funding availability as described above. The chart on the next page shows the entire process at a glance, with the Steering Committee, public and intergovernmental process running in parallel form to the Technical, information gathering and assessment process.

October 1998 - March 1999: The project began with the publication of the draft Sonoran Desert Conservation Concept Plan in October of 1998. After a 3 month public comment period, the Board adopted the Plan in concept form in March of 1999.

April 1999 - December 1999: The Steering Committee was seated and members are attending a series of education sessions. Five Technical Teams were formed, and a series of reports introduce and develop the major subject matter areas of the plan.

January 2000-July 2000: The Steering Committee will break into subarea land panels and discuss the resources and constraints available in each watershed based subarea. This effort will be informed by members of the Technical Teams, who will be working with staff and consultants to complete GIS mapping and alternative production.

July 2000 - until completion: The draft Sonoran Desert Conservation Plan, Environmental Impact Statement production, permit application, negotiations, and completion of the Plan will follow.


SONORAN DESERT CONSERVATION CONCEPT PLAN
Steering Committee
Technical Teams
Compilation of Papers
1. SDCP
2. Pygmy Owl
3. Demographics
4. Ranch
5. Cons. Biology
6. Cultural/Historic
7. How- to, MSCP
8. Tohono O'odham
Education Series May - December
Meetings/ Technical Series/ RFPs & Contracts
Technical Reports
Broad Studies and Status Reports
1. Report on Public Comment, Update (03-99)
2. Determining Species of Concern (04-99)
3. Preserving Cultural and Historic Resources (06-99)
4. Comparison of Pima County Expenditures (06-99)
5. Water Resources (07-99)
6. Sonoran Desert Conservation Concept Plan Update (07-99)
7. Mountain Parks (08-99)
8. Land Use Planning (09-99)
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Single Issue or Narrowly Focused Studies
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NGOs
Gov't
GIS
Executive Committee
SUBAREA Committees (Jan - June)
Land
Tech/ Reg.
Science
Cultural Historic
Ranch
Law Economic
SUBAREA Concepts
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2. Cienega-Rincon
3. Upper Santa Cruz
4. Middle Santa Cruz
5. Tortilita Fan
6. Avra-Altar
A. Altar Valley
B. Avra Valley
7. Tohono O'odham
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SUBAREA Concept Plans
Biological Evaluation
Cultural Historic Evaluation
Ranch Lands Evaluation
Economic/ Fiscal Evaluation
Alternatives
Draft MSCP / EIS
Final MSCP / Sonoran Desert Conservation Plan
07/20/99

JULY 1999

SONORAN DESERT CONSERVATION PLAN

Progress Report on the Sonoran Desert Conservation Concept Plan

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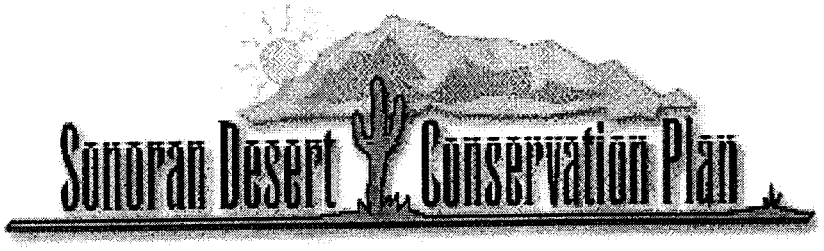

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I. Overview -- Recurring Theme of the Need for Riparian Restoration

On March 2, 1999, the Board of Supervisors adopted the Sonoran Desert Conservation Plan in concept form to establish a framework for more detailed planning. This report provides an update of activities that have taken place in the last four months to carry out the Board's direction and focuses on emerging issues related to the Riparian Restoration Element of the Sonoran Desert Conservation Plan.

The Riparian Link -- A Common Denominator of the Technical Reports: As the different elements of the Concept Plan are studied and developed, it is becoming increasingly apparent that the riparian connection is among the most critical.

- In the technical report issued in April on the topic of *Determining Species of Concern*, a major finding was that the number of endangered and sensitive species, and a disproportionate number of extirpated native species are (or were) dependent on aquatic habitat which is now lost. The report to the Science Technical Advisory Team targets riparian habitat for protection under the Sonoran Desert Conservation Plan.

- Likewise, the technical report issued in May on the topic of *Preserving Cultural and Historic Resources* found a strong correlation between many existing cultural sites and riparian areas.

- A July study which performs a *Simple Representational Analysis of GAP Vegetation Mapping* asked the question: what percentage of each vegetation community exists in current public preserves? The answer brings riparian habitat to the forefront once again: "In general, riparian series have the lowest percentage of representation, varying from 67% to 100% unprotected." One of the conclusions of the study is: "the riparian plant communities are of limited distribution and are poorly protected. ... Given the deficient knowledge of their present-day occurrence and a record of historic losses, all riparian vegetation communities should be considered underrepresented, with the possible exception of cattail marshland."

- A July discussion paper entitled *Water Resources and the Sonoran Desert Conservation Plan* describes a comprehensive regional policy proposal to achieve meaningful riparian restoration necessary for endangered species compliance. The report outlines five water resource problems that have particular significance to the viability of the conservation plan, and proposes five solutions in the context of the Sonoran Desert Conservation Plan. The basic premises establishing the relation of water policy to conservation planning are that:

  (1) Continued groundwater mining has caused substantial damage to riparian environments, with an estimated loss of 85 to 95% of quality riparian habitat during the last century;

  (2) An estimated 85% of wildlife depends on this riparian habitat for some part of its life cycle, including a long list of endangered, extirpated and imperiled species;

  (3) The ongoing implementation of water programs which undermine the purpose of the Endangered Species Act and significantly impact habitat, might preclude implementation of meaningful conservation under the Sonoran Desert Conservation Plan;

(4) Two decades of plans administered under the State's Groundwater Code have failed to bring the Tucson Active Management Area on track with the goal of balancing groundwater withdrawal with recharge (safe yield); and

(5) Given the status of the riparian ecosystem, the jurisdictions throughout the region face the realistic prospect that a level of restoration will be a condition of the Section 10 permit issued under the Endangered Species Act.

Relation of Riparian Ecosystem Decline to the Pygmy-Owl: Depletion of water tables and the loss of riparian habitat has impacted cactus ferruginous pygmy-owl habitat. Most of the major documents describing the pygmy-owl connect it to its riparian habitat based origins.

- On March 10, 1997, the pygmy-owl was listed as endangered. There were only 12 known individuals, making the listing one of the most difficult in the United States. The Federal Register states that the "pygmy-owl occurs in a variety of subtropical, scrub, and woodland communities, including riverbottom woodlands."

- Following the listing, Russell Duncan and Lisa Harris conducted a study of *The Ferruginous Pygmy-owl in Arizona: Historical Context, 1972-1998*. Citing Roy Johnson et al, the study found in part that "the range contraction [of the pygmy-owl in Arizona] is the result of numerous direct and indirect human-related impacts including dam construction for diversion and flood control purposes beginning in the early 1900s; conversion of both riparian and upland (non-riparian) desertscrub habitats to croplands; urban development; lowering of groundwater tables for urban and agricultural uses; and other causes."

- In advising local landowners about survey protocol and take guidance, the United States Fish and Wildlife Service included riparian vegetation such as cottonwoods, willows, and mesquites growing along watercourses within the scope of the guidelines.

- In 1999, 731,712 acres of riverine habitat and upland habitat across Pima, Pinal, Maricopa and Cochise Counties were designated as critical habitat for the pygmy-owl.

- Critical habitat is defined in the U.S. Code as: "the specific areas within a geographic area occupied by the species at the time of listing ... on which are found physical or biological features essential to the conservation of the species and which may require special management considerations or protection; and specific areas outside the geographic area occupied by the species at the time it is listed ... upon a determination of the Secretary that such areas are essential for the conservation of the species."

In addressing pygmy-owl conservation and recovery initiatives, the Sonoran Desert Conservation Plan will have to prescribe a riparian protection and restoration strategy. Pygmy-owl compliance issues make such strategies a more immediate matter for the community, but the same can be said for conservation and recovery initiatives of all listed and imperiled animals in Pima County which are dependent on riparian habitat.

The Sonoran Desert Conservation Plan will work on three levels at the same time: It will address issues related to the listing of the cactus ferruginous pygmy-owl; it will include other listed species and species of concern; and it will protect riparian habitat and other target habitats of concern.

Subarea Planning Based on Watersheds: Past comprehensive plans have divided the community into subareas for planning purposes based on boundaries that were not defined by natural features. The Sonoran Desert Conservation Plan will be divided into subareas based on watershed and riparian features. Initial proposals for subareas include:

1. The San Pedro planning unit, which includes Buehman Canyon and the San Pedro River in the vicinity of Redington.

2. The Cienega-Rincon watershed planning unit, which includes the Empire-Cienega Ranch and proposed National Conservation Area, as well as the Vail and Rocking K communities.

3. The Upper Santa Cruz planning unit, which extends north from the Santa Cruz county line to Martinez Hill. It includes Green Valley, Sahuarita, Amado and the Santa Rita Experimental Ranch.

4. The Middle Santa Cruz planning unit, which encompasses the Santa Cruz River from Martinez Hill north to the confluence of the Canada del Oro Wash. The unit includes the foothills of the Tucson and Catalina Mountains, and the Tanque Verde Creek.

5. The Tortolita Fan planning unit, which includes all the watersheds that drain the Tortolitas, as well as the communities of Tortolita, Catalina, Oro Valley and portions of Marana along the Santa Cruz River.

6. The Avra-Altar planning unit, which includes all of the Avra or Brawley Wash, as well as portions of north-ward flowing watersheds near the Silverbell Mountains, and southward-flowing watersheds near Sasabe. This planning unit will be broken into two subunits, recognizing that the Altar Valley ranches have organized their own watershed association.

7. The Tohono O'odham planning unit, which includes the Aguirre and Santa Rosa Valleys, and the San Simon watershed.

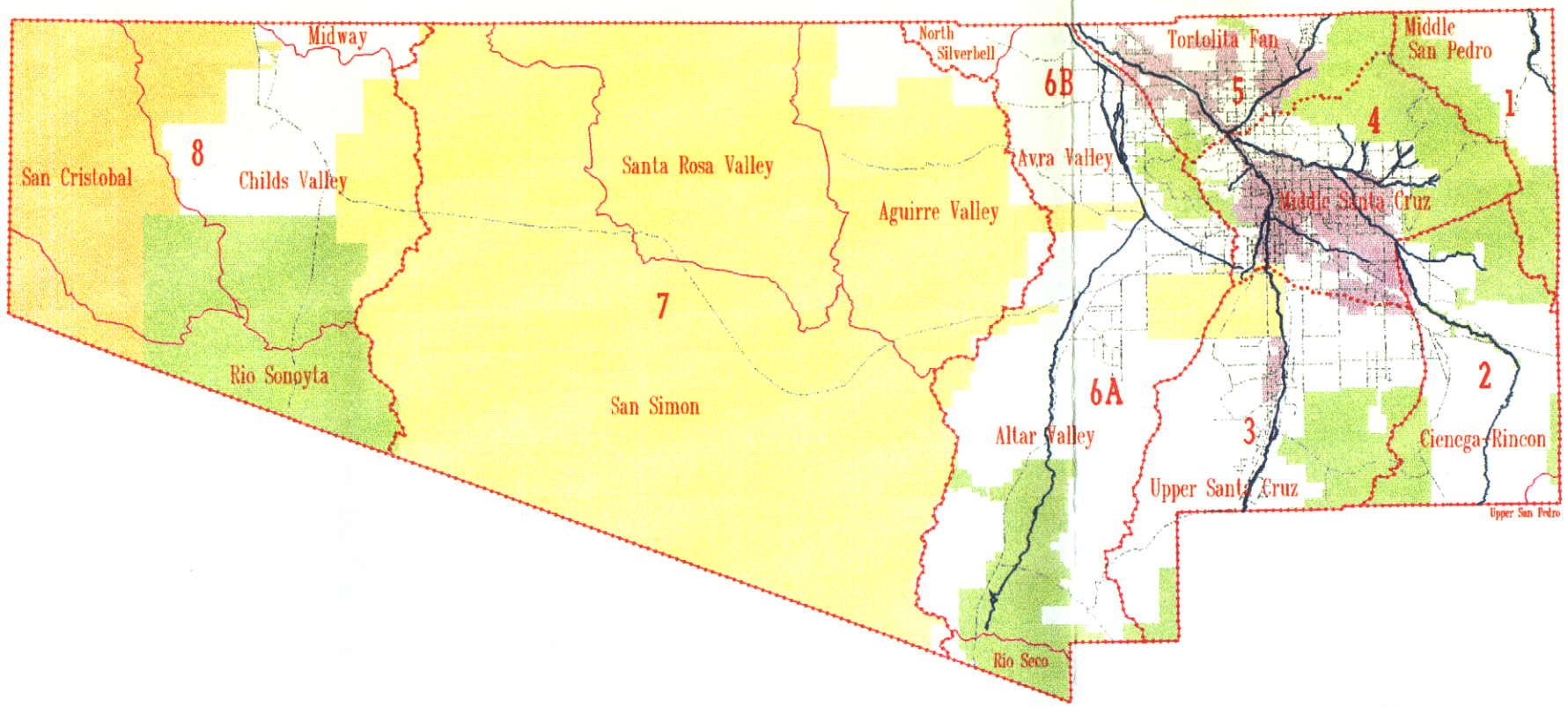
8. Western Pima County's planning unit, which includes four separate watersheds: the Midway, Childs Valley, San Cristobal and Rio Sonoyta.

The watershed / riparian link to subareas enhances the ecosystem basis of the conservation plan.

A draft concept plan will be created for each subarea, and then redrafted after the biological, cultural and economic assessments are completed, and Steering Committee members from the various subareas have formulated conservation and growth accommodation recommendations.

These subarea plans, when viewed together, will provide preserve alternatives that will constitute Pima County's conservation plan.

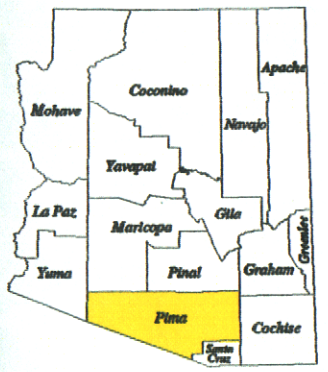
Watershed Planning Units of Pima County



- Planning Unit Boundaries
- Watershed Boundaries
- Major Streets
- Major Washes
- Tribal Lands
- Incorporated Cities
- National Parks / Monuments
- Military Range

Planning Units

1. Middle San Pedro
2. Cienega-Rincon
3. Upper Santa Cruz
4. Middle Santa Cruz
5. Tortolita Fan
6. Avra-Altar
   - A. Altar valley
   - B. Avra Valley
7. Tohono O'odham
8. Western Pima County



Index Map Scale 1:4,000,000

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/daffy/markp/drain/julia2.aml

Plotted: 5/27/99

II. Pygmy-owl Update

1. Background:

Pima County's most immediately felt environmental dilemma is related to the listing of the pygmy-owl in March of 1997. Pima County has 18 plants and animals listed under the Endangered Species Act, but no listing has caught the attention of the community like the pygmy-owl. Considered one of the most difficult listings in the United States, the pygmy-owl listing is a vexing dilemma for a number of reasons, including:

The numbers are extremely low, and very little is known about this tiny, secretive bird. At the time of the listing there were only 12 known individuals. After the 1998 survey season there were around 32 known owls, and during the 1999 survey season 78 owls were identified, although some fledglings were lost. Research conducted during the 1999 survey season will bring us more information about the owl population, its genetic make up, and it tolerance for urban occurrences in part because Pima County has poured $300,000 into study efforts. Yet we are a long way from delisting, downlisting, or even understanding how to protect the pygmy-owl based on its habitat needs and tolerances.

Many of the known individuals are located in the fastest growing areas of Tucson, which places their habitat in conflict with large and intensive development projects.

This development is occurring at the urban/rural interface and so is embroiled within divided community sentiment about whether urban or rural land uses should prevail. Our first round of pygmy-owl litigation has asked the community to choose between building a new a high school or preserving owl habitat. Confounding this debate is the fact that owl habitat in this area includes an ancient forest of Ironwood, a species that can live to be 1,200 years old.

In a regulatory sense, Pima County's environmental dilemma turns on the issue of potential liability under Section 9 of the Endangered Species Act, which prohibits the "take" -- hurt, harm, harass, or significant alteration of habitat -- of a pygmy-owl. The County is exposed to criminal or civil liability under Section 9 for activities as various as carrying out our $1.1 billion dollars worth of bond projects or conducting our daily road maintenance activities, in the event of "take."

Section 9 of the Endangered Species Act can be summarized in one word -- "no." The prohibition on take is a surprising and draconian provision in the law -- sometimes called the pit bull of environmental rules. What it means in action is that if one individual endangered animal is in conflict with any land use that leads to take, that individual trumps the land use. The presence of 2 ½ ounce pygmy-owls living in a county park has caused the Pima County Board of Supervisors to abandon plans to allow building of a community college and a YMCA on that land. The passage of dispersing owls over roadways in Northwest Tucson has delayed plans to widen these roads.

Section 9, by itself, can significantly alter land use, and therefore the economic expectations tied to that land use. However, its neighboring provision in the text of the Endangered Species Act, Section 10, provides a mechanism for balancing protection of listed species with other land use. The Sonoran Desert Conservation Plan, which is keyed to Section 10, will define the level of conservation measures needed for the species, and in doing so, provide allowance for other land uses, and assurances that these uses will not be subject to Section 9 liability.

2. Pima County Efforts:

In order to advance the science of the pygmy-owl, the Board directed staff to initiate a study series on March 2, 1999 consisting of three types of research: (1) a broad survey effort; (2) genetics work; and (3) telemetry and habitat assessments. A timeline for these and related efforts follows.

- March 1999: Genetics study funded by Pima County begins.
- April 1999: Survey effort funded by Pima County begins.
- May 1999: Telemetry and habitat assessment funded by Pima County begins.
- September 1999: Final report on survey results due to Pima County.
- September 1999: Draft Recovery Plan anticipated from U.S. Fish and Wildlife.
- February 15, 2000: Report on telemetry and habitat assessment due to Pima County.
- March 2000: Final report, genetics study due to Pima County.

A. Survey Effort -- Following the Board meeting of March 2, 1999, Pima County issued a request for proposals for pygmy-owl survey work and contracted with Harris Environmental Group, consistent with the advice of the review panel made up of University and agency scientists. This broad survey effort covered over 225,000 acres. A final report describing results of the effort is due in September. Pima County also obtained site specific survey results from the survey effort conducted on bond projects. Other information was generated by the Arizona Game and Fish Department's work during the survey season, and work contracted for by the U.S. Fish and Wildlife Service, the Forest Service and the Bureau of Land Management. A preliminary estimate of the number of pygmy-owls found through the combined efforts of the jurisdictions is 78: 41 adults and 37 offspring. A few fledgling owls have not survived dispersal. A formal count of pygmy-owls will be published by the wildlife agencies in the near future.

B. Telemetry and Habitat Assessments -- The workplan accepted by the Board includes telemetry studies to gather information necessary to tailoring recovery and conservation plans to protect the owl and the economy. Questions that are being addressed include: Where do pygmy-owls go upon dispersal? How far do they travel? Is there exchange with other populations? Are they residents of specific areas, rather than migratory? How tolerant are they of various urban occurrences? How adaptable are they? Habitat assessments are also being conducted to better describe the habitat needs of the pygmy-owl and to move toward the ability to prescribe the habitat where pygmy-owls could breed, nest, feed and rest. Arizona Game and Fish, under a contract for $60,000, is tracking this data during the ongoing dispersal of baby owls and will issue a final report to the County by February 15, 2000.

C. Genetics Studies -- In March, the County entered into a contract with Mr. Glenn Proudfoot through the University of Texas A&M for studies of DNA sequence data which will address two issues regarding genetic viability of Ferruginous Pygmy-Owl populations in Arizona, and the feasibility of reintroduction, and thus serve as a framework for future management efforts: (1) Are Arizona pygmy-owls lacking genetic variation relative to healthy populations, and (2) Are populations genetically differentiated from each other? A contract ceiling of $37,000 was set to cover the entire cost to Pima County (travel, labor and equipment) of 110 genetics studies (10 studies with the Arizona pygmy-owl population and 100 comparative studies with Texas and Mexico pygmy-owls). The total project cost is $58,577, with the balance paid for by Texas A&M University. Work in ongoing and a final report is due to Pima County by March of 2000.

3. Federal Government Issues

A. Critical Habitat Designation -- On July 12, 1999, the United States Fish and Wildlife Service published in the Federal Register its designation of 731,712 acres as critical habitat for the cactus ferruginous pygmy-owl (pygmy-owl). The table below describes the land ownership of proposed critical habitat within Pima County as published in the July 1999 rule.

Federal Register Table of Approximate Critical Habitat Acreage in Pima County

Forest	0
BLM	21,913
State	158,974
Private	61,830
Other	18,166
TOTAL	**260,883**

What is Critical Habitat? Critical habitat is defined in the U.S. Code as: "the specific areas within a geographic area occupied by the species at the time of listing ... on which are found physical or biological features essential to the conservation of the species and which may require special management considerations or protection; and specific areas outside the geographic area occupied by the species at the time it is listed ... upon a determination of the Secretary that such areas are essential for the conservation of the species."

What Factors Went into Determining Critical Habitat? In the December 1998 Federal Register notice, the Service described factors that went into determining areas that are essential for the survival and recovery of the species, including:

(1) "In an effort to map areas essential to the conservation of the species, we used data on known pygmy-owl locations to initially identify important areas. We then connected these areas based on the topographic and vegetative features believed most likely to support resident pygmy-owls and / or facilitate movement of birds between known habitat areas."

(2) "We did not propose all pygmy-owl historical habitat as critical habitat. We proposed only those areas that we believe are essential for the conservation of the pygmy-owl and in need of special management or protection."

(3) "We used the best scientific information obtainable in the time allowed by the court."

How is Critical Habitat Applied? The designation of critical habitat applies to federal projects and entails these factors, according to literature from the Service: Critical habitat is a "classification used to identify areas in which Federal agencies need to exercise special care to avoid damage to federally listed endangered and threatened species." A critical habitat designation "does not affect State actions or lands, private actions or lands, [or] local government actions UNLESS those actions involve Federal funds or authorizations." "Federal projects and activities [within critical habitat] are individually evaluated by the implementing agency and the U.S. Fish and Wildlife Service ...." In other words, landowners with projects in critical habitat that have a federal nexus will have to consult with the Fish and Wildlife Service. It does not mean that projects will be stopped. And it should not represent a change in practices for those who understand their liability under the Endangered Species Act.

What Critical Habitat Standards or Rules May be Issued During the Interim Period? Currently there are two federal processes ongoing that might result in changes to critical habitat policy. Also, a decision about federal landowner take guidance and survey protocol will be issued during the interim period while the Sonoran Desert Conservation Plan is being developed.

(1) Clarification of the Role of Habitat in Endangered Species Conservation -- On June 14, 1999, the Department of the Interior published a notice in the Federal Register announcing its intent to develop guidance and consider revision of regulations which clarify the role of habitat protection under the Endangered Species Act. Public comments have been requested and will be accepted through August 13, 1999. Once comments are received, the Service will announce proposed guidance.

(2) Proposed Senate Bill 1100 -- At the same time the Service is reexamining the existing approach to designation of critical habitat, a bill is moving in the United States Senate which would require designation of critical habitat at the time a recovery plan is developed (instead of at the time of listing), and require recovery plans to be developed within 36 months of listing.

What Are the Next Steps for Pima County? Until the County has a Section 10 permit, potential Section 9 liability exists, regardless of the status of habitat designation or protocol standards. When Pima County receives its Section 10 permit under the Endangered Species Act, the critical habitat designation will be replaced by the terms of the conservation plan.

Therefore, the U.S. Fish and Wildlife Service continues to recommend that development of a region-wide, multi-party, comprehensive conservation plan is the preferred long-term option to allow for the survival and ultimate recovery of the pygmy-owl in Arizona.

B. Recovery Team -- The Rule May Change Again -- In the text of the Federal Register Rule, the Service described the compressed time frame they were working under to meet the deadline set by Court order, and explained that the recommendations from the Recovery Team process, now underway, will allow the Service to reevaluate the current designation:

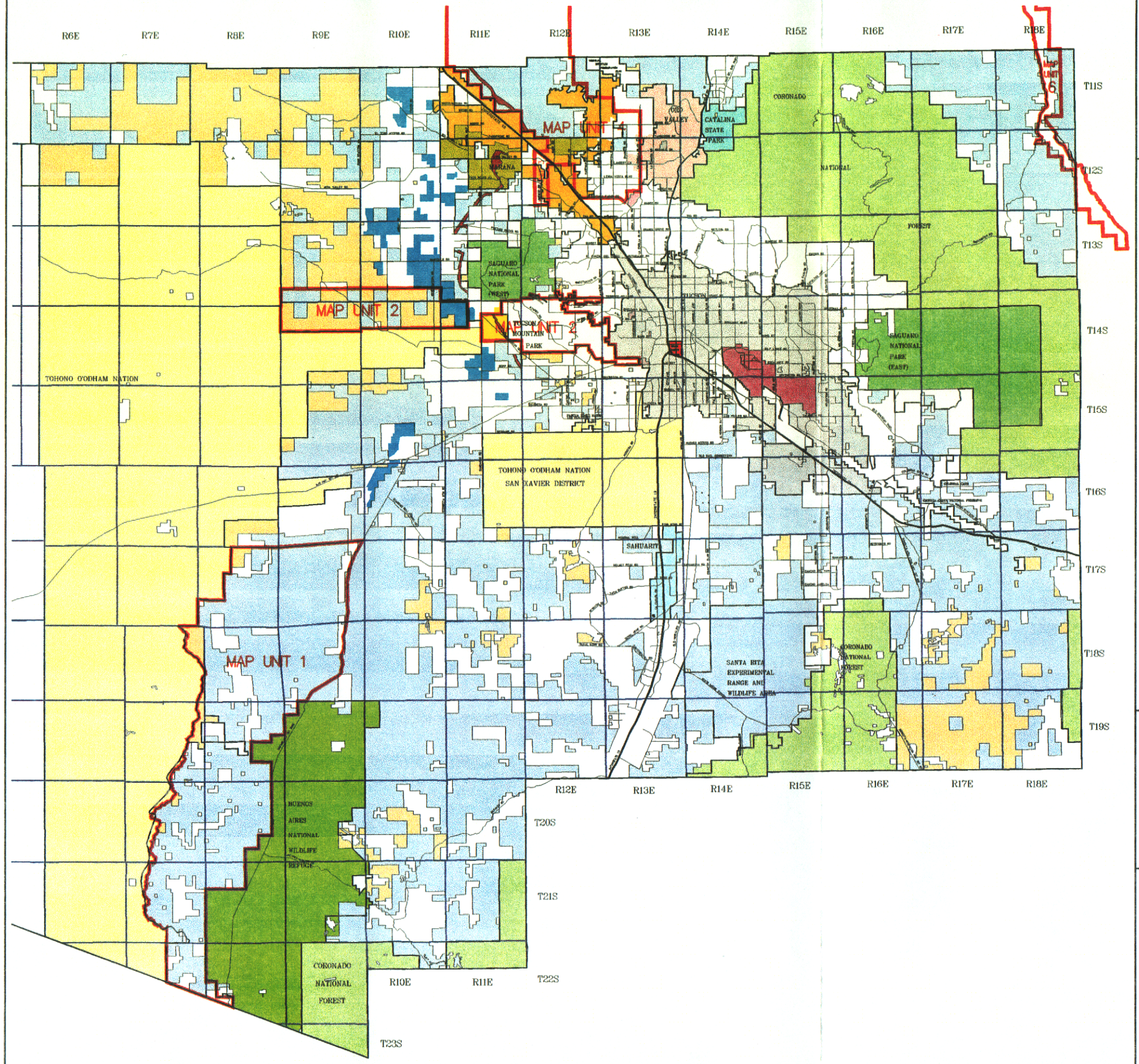
> "In summary, the critical habitat areas described below, and protected areas either known or suspected to contain some of the primary constituent elements but not designated as critical habitat (e.g., National Park land, National Wildlife Refuge lands, etc.), constitute our best assessment of areas needed for the species' conservation.
>
> Also, we have appointed a Cactus Ferruginous Pygmy-owl Recovery Team that will develop a recovery plan for the species. The experts on this team will conduct a far more thorough analysis than we were able to conduct in the short amount of time allowed by the Court Order. Upon the team's completion of a recovery plan, we will evaluate the plan's recommendations and reexamine areas designated as critical habitat."

The draft Recovery Plan is due from the United States Fish and Wildlife Recovery Team this September.

Designated Critical Habitat for the Cactus Ferruginous Pygmy Owl In Pima County Map Units 1-4 And 6

U.S. Fish And Wildlife Service

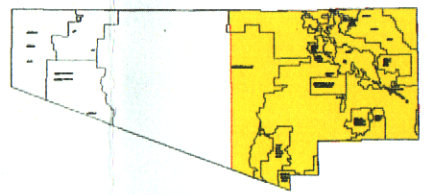
As Published In The Federal Register 07/12/99



- Map Unit Boundaries
- Major Roads And Streets
- Township And Range Lines
- Administrative Boundaries

- Bureau Of Land Management (BLM)
- Bureau Of Reclamation
- Bureau Of Reclamation Addition
- Catalina State Park
- Existing Pima County Mountain Parks
- Indian Nation
- Military Reservation
- National Forest Land
- National Parks And Monuments
- National Wildlife Refuge
- Non-Federal Parks
- Private Lands
- State Trust Lands
- Tucson Water Land
- Other
- Tucson
- South Tucson
- Marana
- Sahuarita
- Oro Valley

Pima County Index Map



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Scale 1: 150,000

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THE SEAL OF PIMA COUNTY ARIZONA

/mach33/special/parks/proposed/amls/pygmy3.aml

Plotted: 7/19/99

C. Protocol and Take Guidance -- On August 13, 1998 the United States Fish and Wildlife Service and the Arizona Game and Fish Department jointly announced by publication in the Federal Register two notices of availability and the opening of a comment period for: (1) new guidance for determining if "take" of a cactus ferruginous pygmy-owl has occurred and (2) new survey protocol for the pygmy-owl. The comment period was subsequently extended and closed on March 14, 1999.

Sometime this summer it is expected that the Service will exercise one of several options: the newly proposed protocol and guidance could become the advisory standard; the existing guidance could remain in place as the advisory standard; or the Service could decide not to issue any advisory standard to assist landowners in assessing their risk of liability under Section 9 of the Endangered Species Act, which prohibits "take" of an endangered animal,[1] or a revised standard may be issued.

Read together, the newly proposed take guidance and survey protocol differ from the past in at least the following ways:

(1) The "take" guidance adds several counties to the covered geographic area. Now, in addition to Pima County, the guidance applies within defined areas of Maricopa County, Southeastern Yuma County, Graham, Greenlee, and Gila Counties, Santa Cruz County, and Cochise County. The affected area of Pima County does not include the "Tucson urban area," defined according the guidance flowchart as follows: "The urban area of Tucson is defined as south of River Road, west of Harrison Road, north of Irvington Road, and east of Interstate 10."

(2) The "take" guidance adds riparian habitat. In the past, only desertscrub habitat was included. Now riparian vegetation such as cottonwoods, willows, and mesquites growing along watercourses are included within the scope of the guidelines.

(3) Both the "take" guidance and the proposed survey protocol describe that there is an expansion of the survey effort "from one year to two years prior to actions that may impact the owl or its habitats."

(4) Other proposed survey protocol changes include:

The survey period will be 6 months (January to June) instead of 9 months.

The survey frequency will be increased from one survey (during one year) to three surveys per year (for two consecutive years). A minimum of fifteen days must separate surveys, although 30 days is recommended. One survey must take place between February 15 and April 15, during pygmy-owl breeding season.

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2 When the pygmy-owl was listed as endangered on March 10, 1997, the U.S. Fish and Wildlife Service identified actions that might result in the "take" of an owl. "Take" is a term from the Endangered Species Act which means harass, harm, pursue, hunt, shoot, wound, kill, trap, collect or attempt to do any of these acts in relation to a listed species. Under the Endangered Species Act, "take" is a violation of federal law.

III. Interim Issues -- Liability, Regulation and Acquisition

1. Liability in the Absence of a Section 10 Permit

A. The Role of U.S. Fish and Wildlife in Providing Advice about Land Use Decisions -- On June 9, 1999 a letter was sent by the Field Supervisor of the U.S. Fish and Wildlife Service to the Mayors of Marana and Oro Valley. In this letter, Mr. David Harlow advises the towns that: *"rezoning and other town projects could adversely affect [the pygmy-owl] and its habitat. Additionally, actions such as re-zoning may preclude future planning options needed by [the town] for obtaining Endangered Species Act (ESA) 'take' permits. My staff and I are available to assist you in determining if zoning changes might affect this species and to work with you to ensure that you are in compliance with the ESA."* With this letter the Service raised legitimate concerns at the early stages of development, rather than the late stages when investments are substantial, or when a "take" of species has occurred and the government and/or developer face civil or criminal liability under the federal law. Similar advice has been given to Pima County on an informal level with regard to permitting practices, especially in the wastewater area. Accordingly, a County Attorney's opinion has been requested so that Pima County can take all steps to ensure compliance.

B. Status of Litigation Related to Local Government Permitting -- A few recent decisions have found local governments liable for issuing permits that result in the take of a listed animal after the holder of the permit harms or kills an individual animal during the course of otherwise lawful activity.

(1) Whales and Massachusetts Officials: The First Circuit upheld an injunction against Massachusetts officials for issuing permits that led to the harm and mortality of Northern Right whales that became entangled in fishing gear. The Supreme Court denied cert on this case, so the decision stands.

(2) Piping Plovers and the Town of Plymouth: In May of 1998, the United States Fish and Wildlife Service successfully obtained an injunction against the Town of Plymouth when the elected officials failed to take steps consistent with the Endangered Species Act, and town officials rejected a Memorandum of Agreement (MOA) which town staff entered into with the U.S. Fish and Wildlife Service to protect a listed species. The species in this case is the piping plover, which is listed as threatened. Approximately 1200 breeding pairs populate the Atlantic Coast. The Town of Plymouth sells between 1000 and 2500 permits to recreational vehicles to drive on the beach. These vehicles were thought to be the cause of the "take" of several piping plovers, especially newly hatched and dispersing chicks. Some of the circumstances which led the United States government to pursue an injunction against the Town include: the Town Manager entered into a Memorandum of Agreement (MOA) with the U.S. Fish and Wildlife Service to avoid civil penalties for take, and to protect the piping plover population, but at a meeting of the elected officials, the MOA was rescinded after "piping mad citizens" packed the meeting, the Town Manager was criticized, staff was "lambasted," and the community actions were contrary to notions of protecting the listed species. The Judge outlined his reasons for issuing the injunction after concluding that the elected officials "will not authorize the Town Manager to take appropriate measures to protect the piping plover." These include the attitude of the residents; the "roasting" of the Town Manager who was "attempting to work with authorities; the firing of a staff member who was trying to comply with the law; and "the decision to rescind the Memorandum of Agreement" with U.S. Fish and Wildlife.

(3) Loggerhead Turtles and the Volusia County Council Members Failure to Regulate: A few months ago the Supreme Court rejected an appeal from a Florida county government that sought relief from liability under the Endangered Species Act because the County did not sufficiently regulate the activities of private citizens. The facts of this case involve lighting and endangered baby turtles. When loggerhead turtles are born they instinctively race toward the brightest light source, which in an undeveloped environment is the moon. With the moon as a guide, the baby turtles have an increased chance of making it to the relative safety of the ocean. In developed areas, however, artificial light sources attract the baby turtles and they have a greater chance of being killed in their efforts to disperse to the ocean water. The 11th Circuit upheld the standing of two citizens who brought suit against the county for failure to regulate light users on the beach. The Supreme Court let this decision stand in April of 1999.

2. Draft Interim Regulations

When the Board adopted the Sonoran Desert Conservation Concept Plan on March 2, 1999, staff was directed to draft an interim environmental land use policy -- to apply during the planning period -- based on the comments submitted and the need to deal effectively with endangered species issues in the interim planning period. The draft policy described in the next five pages encompasses the following and is submitted for review and comment:

a) A limitation on upzonings in environmentally sensitive areas identified by federal critical habitat rules or the Sonoran Desert Conservation Concept Plan, with exceptions for upzonings which would result in actual conservation;

b) Enhanced review criteria on waiver of subdivision platting requirements;

c) Enhanced conditional use permit criteria to be more sensitive to conservation areas;

d) An environmentally compatible standard for rezoning time extensions.

County staff members are also conducting research in response to Board direction to develop the following:

e) Review the resource conservation definition within the Zoning Code for applicability to proposed conservation lands identified within the Concept document;

f) Revise and integrate grading and landscape standards into a unified policy proposal for Board consideration which encompasses recent changes to existing conservation ordinances, and which states as a specific Comprehensive Plan policy how the linkages of private land development adjacent to public preserves and our compliance with the Endangered Species Act respond to the conservation of the desert environment while encouraging responsible urban development;

g) Develop an environmental enhancement fees to be used to maintain and expand public preserves as a standard condition of upzoning of any lands within designated elements of the Sonoran Desert Conservation Plan; and

h) Develop and propose transfer and purchase of development rights programs and environmental land banking and mitigation banking programs.

PIMA COUNTY, ARIZONA
BOARD OF SUPERVISORS POLICY

Subject:	Policy Number	Page
SONORAN DESERT CONSERVATION PLAN'S INTERIM LAND USE POLICY [May 28, 1999]	**DRAFT**	1

PURPOSE

To initiate an interim policy regarding rezonings, specific plans, Comprehensive Plan amendments and conditional-use permits in order to deal effectively with endangered species and historic areas in the Sonoran Desert Conservation Plan's review period.

BACKGROUND

On October 21, 1998, the County Administrator submitted the Draft Sonoran Desert Conservation Plan to the Board of Supervisors. The draft contained a set of land use policies whose intent were to ensure zoning changes that allow a more intense use on properties do not undermine the conservation efforts of the draft plan. At the same time, the policies should recognize and encourage uses that support the objectives of the plan. On March 2, 1999, the County Administrator directed staff to prepare an interim land use policy which will apply during the review period of the Sonoran Desert Conservation Plan.

To ensure that zoning changes coming forward during the review period of the plan are evaluated for compatibility with the plan's objectives this policy is set forth for adoption as an interim policy.

POLICY

1. Declaration

The Pima County Board of Supervisors finds that an interim policy is needed to ensure that new rezonings, specific plans, Comprehensive Plan amendments and conditional-use permits approved in the Sonoran Desert Conservation Plan's review period for land located within environmentally sensitive areas shall demonstrate actual conservation.

2. Applicability

The following applications for development approval within environmentally sensitive areas are governed by this policy:

- New rezoning and specific plan requests
- Time extension requests for rezonings
- Requests for modifications or waivers of rezoning or specific plan conditions, including substantial changes
- Requests for Comprehensive Plan amendments
- Type II and Type III conditional-use permit requests
- Requests for waivers of the subdivision plat requirement of a zoning plan

3. Guidelines

It is the policy of the Board of Supervisors that new applications subject to this policy shall be evaluated against the following criteria to determine their appropriateness:

- The development proposal is not on land that is under consideration for designation or acquisition as a conservation area
- The development proposal enhances one or more features of the Sonoran Desert Conservation Plan applicable to the subject site
- The site is adjoining a public preserve or biological corridor and the development proposal provides a natural set-aside feature that provides for adequate continuity and protection of the preserve or corridor
- The site includes environmentally sensitive resources not connected to a public preserve or biological corridor, is in a rural or low-intensity urban area, and the development proposal provides for the protection or preservation of significant habitat features through set-aside or in-place preservation of the resources
- The site includes environmentally sensitive resources not connected to a public preserve or biological corridor, is in a medium- or high-intensity urban area adjacent to an urban transportation corridor, and the development provides for the preservation of protected vegetation through set-aside or in-place preservation of the resources. A transplant or replacement strategy may contribute toward resource preservation if the development proposal reduces vehicle miles traveled or creates a more efficient mix of land uses in the area
- The development proposal provides for actual conservation of the environmentally sensitive or historic resources of the subject site
- The development proposal uses a cluster option or is a rezoning to the Major Resort (MR) zone, unless such proposal is deemed to ne incompatible with a designated conservation area as addressed by a special area policy of the Pima County Comprehensive Plan.

4. Actual Conservation Defined

Actual conservation means the demonstration of in-place preservation, or, if disturbed, acceptable mitigation, of environmentally sensitive areas and historic areas as defined above or as otherwise approved by the Board of Supervisors.

5. Environmentally Sensitive Areas Defined

Environmentally sensitive areas are those identified by federal critical habitat rules or the Sonoran Desert Conservation Plan, as follow:

- Designated mountain parks
- Ranches designated for conservation
- Biological corridors and links
- Riparian corridors
- Designated natural preserves
- Wildlife mitigation corridors and links
- Major extensions of riparian habitat from protected areas
- Major segments of riparian habitat not linked with protected areas
- Deciduous riparian woodland
- Mesquite bosque
- Mix of vegetation types
- Palo verde - saguaro Sonoran Desert community
- Ironwood plant community
- Grasslands conservation areas.

Designated environmentally sensitive areas are depicted on attached Exhibit A.

6. Historic Areas Defined

Historic areas are those identified by the Sonoran Desert Conservation Plan, as follow:

- Designated local, state or national historic districts
- Designated local, state or national historic landmarks
- Designated local, state or national historic rural landscapes
- Designated local, state or national archaeological districts
- Designated local, state or national archaeological sites.

Designated historic areas are depicted on attached Exhibit B [reserved].

7. Documentation of Affected Resources and Demonstration of Conservation

New rezoning applications that require submittal of a Rezoning Site Analysis shall include supplemental information in the site analysis document that provides:

- mapped and descriptive documentation of the natural resources comprising the environmentally sensitive areas applicable to the site
- mapped and descriptive explanations as to what extent natural resource disturbance will occur, if at all, and how actual conservation will occur as part of the development
- a conceptual mapped and narrative demonstration of compliance with the Native Plant Preservation requirements of the Pima County Zoning Code.

All applications subject to this policy shall include a Development Impact Statement that provides:

- an evaluation of the plan of development's response to identified environmentally sensitive areas
- an explanation of how conservation of the protected natural resource is accomplished by the plan of development.

8. ***Appeals on Environmentally Sensitive and Historic Areas***

The boundaries of most environmentally sensitive and historic areas as depicted on attached Exhibit A are general and will not be established with certainty until the conclusion of the Sonoran Desert Conservation Plan's review period.

An applicant may appeal the decision of the Planning Official regarding the applicability of an environmentally sensitive area to a subject property by providing alternative site plans that provide plans of development with and without consideration of the disputed environmentally sensitive resource.

9. ***Decision of the Board of Supervisors***

Demonstration that the plan of development provides for actual conservation of the environmentally sensitive or historic areas of the subject site is no guarantee of approval by the Board of Supervisors for the request.

10. ***Sunset Provision***

This policy shall be reviewed by December 31, 2002.

3. Adopt Concept Document

On March 2, 1999, the Board adopted the Sonoran Desert Conservation Plan in concept to establish a framework for more detailed planning and directed staff to:

a) Incorporate changes to maps based on comments from the public in instances where there are no conflicting public comments submitted in relation to a specific land area;

b) Adopt, in concept form, maps as originally proposed on October 27, 1998 in instances where there is no public comment;

c) Work with the landowner and those who favor conservation during the planning process to achieve mutual goals where there are conflicting recommendations;

d) Change the name of the proposed Sierrita Mountain Park to the Sierrita Ranch Conservation Area and remove the proposal of "mountain park" as applied to Southern Lago Del Oro, but work with the Southern Lago Del Oro community to achieve conservation goals; and

e) Add Silverbell Mountain Park which includes Ragged Top and Silverbell Mountains.

The figures on the following pages reflect the changes to the concept plan and include:

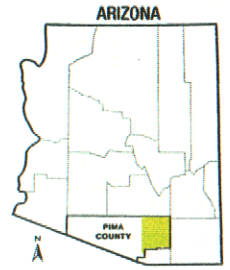
- The Sonoran Desert Conservation Concept Plan map for Eastern Pima County;
- Colossal Cave Mountain Park expansion, as proposed in comments responding to the draft concept plan;
- Empire Mountain Park as proposed in comments responding to the draft concept plan;
- Amphi School Site as proposed in comments responding to the draft concept plan;
- Tortolita Mountain Park as proposed in comments responding to the draft concept plan;
- Revised Sierrita Ranch Conservation Area, as proposed in comments responding to the draft concept plan;
- Revised Catalina State Park expansion, as proposed in comments responding to the draft concept plan;
- Silverbell Mountain Park, as proposed in comments responding to the draft concept plan.

4. Interim Acquisition Proposal

To ensure protection of the western slopes of the Tortolita Mountains and it alluvial fan, and the Ironwood forest, an Arizona Preserve Initiative (API) application was submitted for 16,185 acres of State Trust Land. This creates the starting point of a potential pygmy-owl preserve under the Sonoran Desert Conservation Plan. Another application was filed to preserve the Tortolita east biological corridor.

Sonoran Desert Conservation Plan

Concept Plan Adopted March 2nd, 1999 by the Pima County Board of Supervisors



Elements

- Ranch Conservation
- Historic and Cultural Preservation
- Riparian Protection and Restoration Projects
- Anza National Historic Trail
- Anza Campsites
- Arizona Trail
- Riparian Corridors
- Proposed Mountain Park Expansion Boundaries
- Biological Corridors
- Proposed Empire-Cienega NCA

Critical and Sensitive Habitat

- Palo Verde / Saguaro
- Ironwood
- Riparian Habitat

- Major Roads
- County Line
- Major Washes
- Indian Nations
- National Forests, National Parks and Preserves
- Bureau of Reclamation Wildlife Corridor
- Private, other

0 5 10

Approximate Scale in Miles

Carpenter

Pinal County

Pima County

Cochise County

Santa Cruz County

SILVERBELL RAGGED TOP MOUNTAIN PARK

TORTOLITA MTN. PARK

Catalina

CORONADO NATIONAL FOREST

Summerhaven

San Pedro River Protection

Bingham Riparian Restoration

Buehman-Bingham Natural Preserve

CATALINA STATE PARK EXPANSION

CATALINA STATE PARK

Tortolita

Oro Valley

Marana

SANTA CATALINA MOUNTAINS

Bellota

SAGUARO NATIONAL PARK WEST

TUCSON MOUNTAINS

WATERMAN-ROSKRUGE MOUNTAIN PARK

TUCSON MOUNTAIN PARK

TOHONO O'ODHAM NATION

Tortuga

South Tucson

Tucson

SAGUARO NATIONAL PARK EAST

RINCON MOUNTAINS

PASCUA YAQUI TRIBE

TOHONO O'ODHAM NATION (SAN XAVIER DISTRICT)

Robles Junction

COLOSSAL CAVE MOUNTAIN PARK

CIENEGA CREEK NATURAL PRESERVE

MESCAL ARROYO

SANTA RITA MOUNTAIN PARK

Sahuarita

Green Valley

SIERRITA MOUNTAINS

SANTA RITA EXPERIMENTAL RANGE

SANTA RITA MOUNTAINS

BABOQUIVARI MOUNTAINS

BUENOS AIRES NATIONAL WILDLIFE REFUGE

CERRO COLORADO MOUNTAIN PARK

CORONADO NATIONAL FOREST

EMPIRE / CIENEGA RESOURCE CONSERVATION AREA (BLM)

Anvil

Elkhorn

Sopori

Seco

Marley

Amado

Canoa

Empire

Cienega

Empirita

Six

Esmond Station

Kentucky Camp

Brawley Wash

Black Wash

Altar Wash

Champmado Wash

Penitas Wash

Esperanza Wash

Santa Cruz River

Rillito River

Cañada del Oro

Pantano Wash

Tanque Verde Creek

Rincon Creek

Sabino Creek

Davidson Canyon

Cienega Creek

Honey Bee Canyon Protection

Sutherland Rock Art District

Sutherland Wash

Lemmon Rock

Lowell Ranger Station

Romero Ruin

Cañada del Oro Recharge

Los Morteros Cortaro Mesquite Bosque

Llano del Adobe

Casas Adobes

Three Rivers Project

Rillito Racetrack

Rillito Habitat Restoration

Sabino Canyon Ruin

Sabino/Bear Canyon Protection

Agua Caliente Protection

Agua Caliente Ranch

Fort Lowell

University Indian Ruin

Tanque Verde Protection

Manning Camp

Rincon Mountain District

Rincon Creek Restoration

Tucson Presidio

Brachman School

Park Avenue Detention Basin

Tucson/Ajo Detention Basin

Tumamoc Hill

Tohono O'odham Mission San Agustin

Pasco de las Iglesias

Valencia Site

San Xavier Mission

Martinez Hill

Robles Ranch

Gunsight Mountain District

Coyote Mountain District

Titan Missile Silo

Sierrita Mountain Ranch

Canoa Ranch

Canoa Overbank Storage

Upper Davidson Canyon District

Santa Rita Ranch

Empire Ranch

Cienega Creek Streamflow Restoration

Cienega Bridge

Agua Verde Protection

Posta Quemada

Cienega Creek Pantano Jungle Restoration

Pantano Townsite

Empirita Ranch

Cocoraque Butte

Los Robles District

Marana Mound

Santa Cruz Effluent Riparian

Cocoraque Butte

Liano Grande

Major Washes

Indian Nations

National Forests, National Parks and Preserves

Bureau of Reclamation Wildlife Corridor

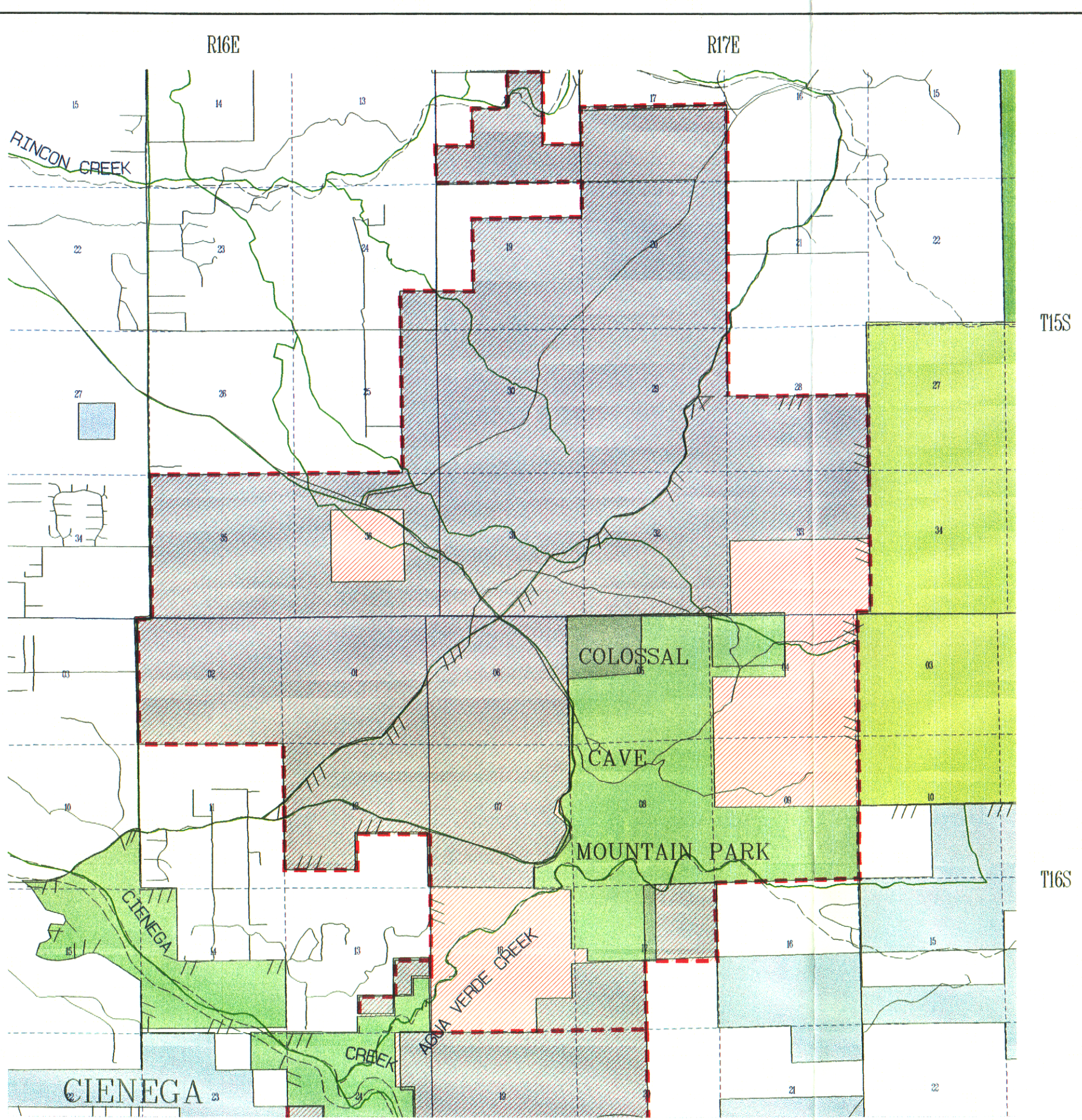
Private, other

0 5 10

Approximate Scale in Miles

Eastern Pima County

SDCP/MP-MAP/5/14/99



Colossal Cave Mountain Park

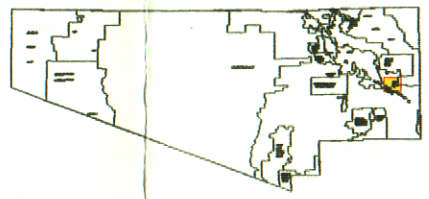
- Empire National Conservation Area (NCA)
- Proposed Park Boundaries
- Parcel Base And Streets
- Township And Range Lines
- Section Lines
- Washes
- Administrative Boundaries
- Trails

- Proposed Mountain Parks
- Existing Pima County
- National Forest Land
- Private Lands
- State Trust Lands

DRAFT

FIGURE 15b

Pima County Index Map



Index Map Scale 1:1,500,000

N

Scale 1: 14,000

PIMA COUNTY DEPARTMENT OF TRANSPORTATION
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(520) 740-6670 - FAX: (520) 798-3429
http://www.dot.co.pima.az.us

/daffy/markp/sdcp/mtpark/colossal2.aml

Plotted: 04/19/99

R17E

R18E

T17S

T18S

Empire Mountain Park

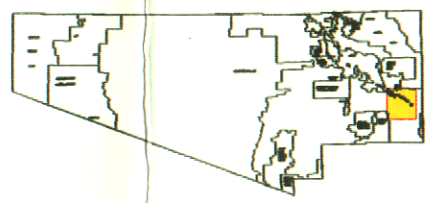
- Empire National Conservation Area (NCA)
- Proposed Park Boundaries
- Parcel Base And Streets
- Township And Range Lines
- Section Lines
- Washes
- Administrative Boundaries
- Trails

- Proposed Mountain Parks
- Proposed Pima County Natural Preserves
- Riparian Habitat /Wildlife Corridor Link

- Bureau Of Land Management (BLM)
- Existing Pima County
- National Forest Land
- Private Lands
- State Trust Lands

DRAFT

Pima County Index Map



Index Map Scale 1:1,500,000

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Scale 1: 14, 000

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/daffy/markp/sdcp/mtpark/empire.aml

Plotted: 05/17/99

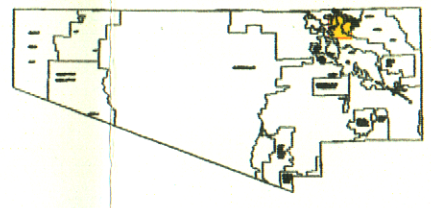
R13E

Critical and Sensitive Habitat
Proposed Amphi School Site

- Major Roads And Streets
- Section Lines
- Washes
- Administrative Boundaries
- Proposed Parcels
- Major Segments Of Riparian Habitat Not Linked With Protected Areas
- Palo Verde-Saguaro Sonoran Desert Community
- Ironwood Plant Community

DRAFT

Pima County Index Map



Index Map Scale 1:1,500,000

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Scale 1: 4,000

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http://www.dot.co.pima.az.us

/daffy/markp/sdcp/critsena/sensitive2.aml

Plotted 05/17/99

Tortolita Mountain Park

DRAFT

R11E R12E R13E R14E

T11S

T12S

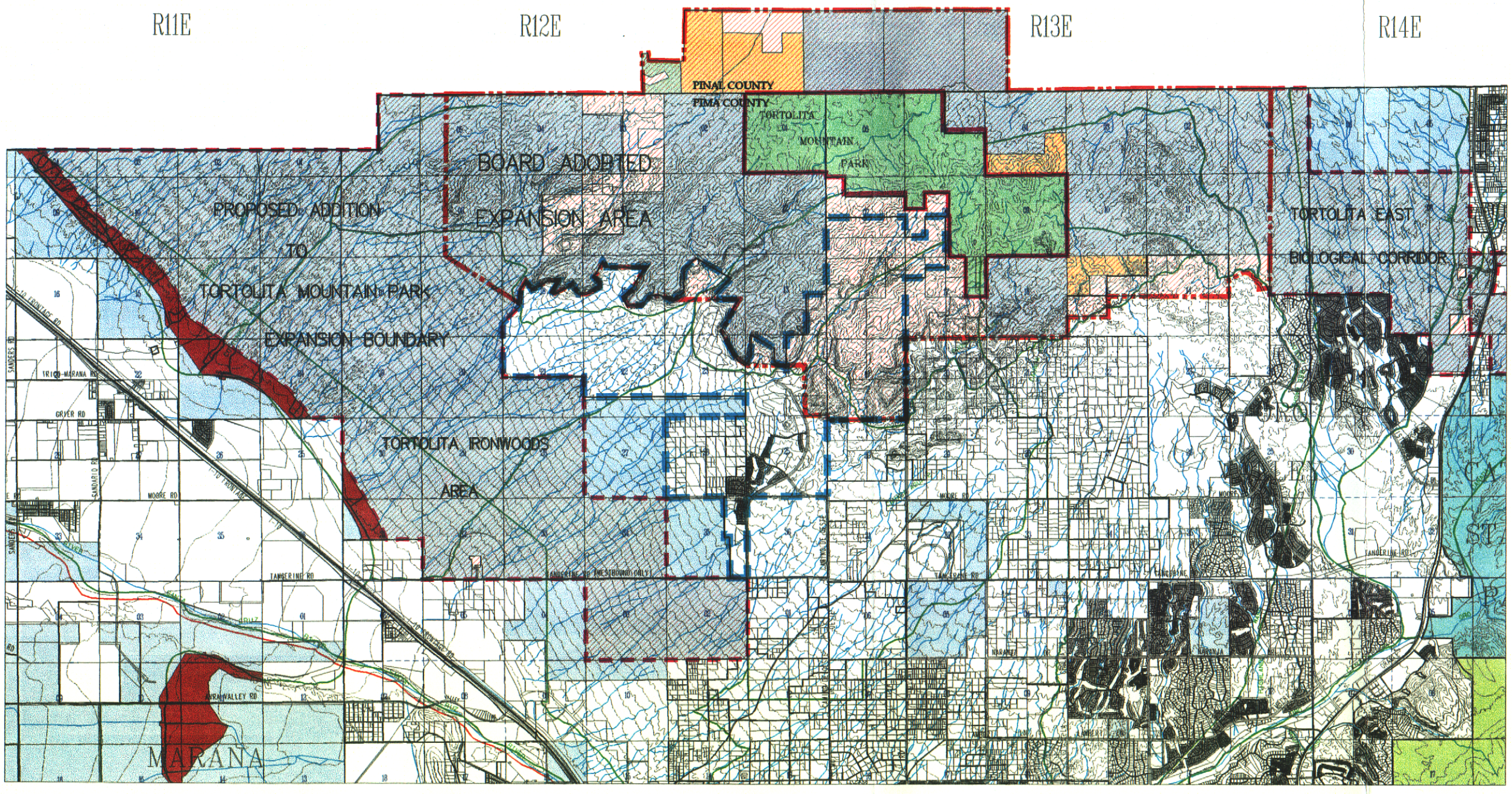

FIGURE 13B

PIMA COUNTY DEPARTMENT OF TRANSPORTATION

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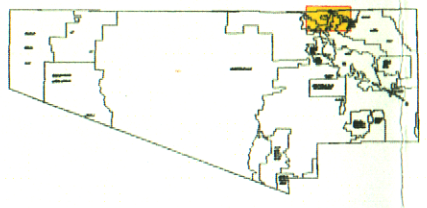
http://www.dot.co.pima.az.us

/mach33/special/parks/proposed/amls/tortolita2.aml

- Dove Mountain Property
- Contour Lines
- Parcel Base And Streets
- Township And Range Lines
- Section Lines
- Washes
- Trails
- Administrative Boundaries
- Existing Park Boundaries
- Proposed Park Boundaries
- Present Master Plan Boundary
- Proposed Mountain Parks
- Bureau Of Land Management (BLM)
- Bureau Of Reclamation
- Catalina State Park
- Existing Pima County
- National Forest Land
- Private Lands
- State Trust Lands

TORTOLITA MOUNTAIN PARK:
State: 27,827 Acres
Federal: 2,204 Acres
Private: 4,615 Acres



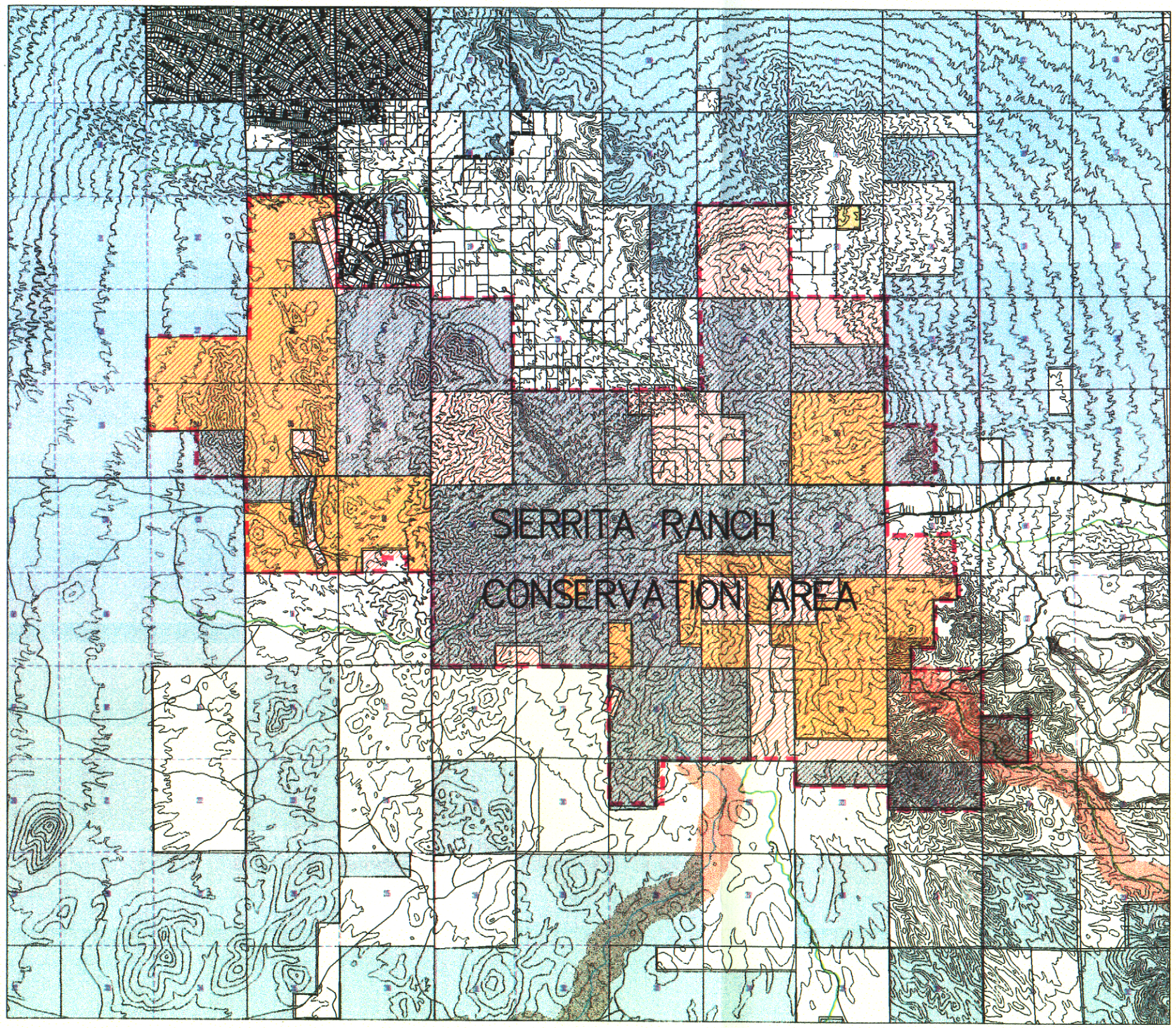
Pima County Index Map

N

Scale 1: 27,000

THE SEAL OF PIMA COUNTY ARIZONA

Plotted: 4/20/99



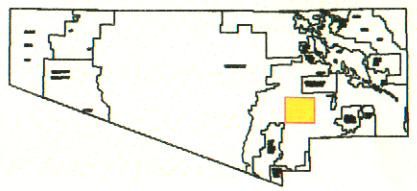
Sierrita Ranch Conservation Area

- Contour Lines
- Parcel Base And Streets
- Township And Range Lines
- Section Lines
- Washes
- Administrative Boundaries
- Proposed Park Boundaries
- Trails
- Wildlife Corridor Links
- Proposed Mountain Parks
- Bureau Of Land Management (BLM)
- Private Lands
- State Trust Lands

SIERRITA MOUNTAIN PARK:
State: 10,904 Acres
Federal: 5,870 Acres
Private: 4,348 Acres

FIGURE 20

Pima County Index Map



Locator Map Scale 1:1,500,000

N

Scale 1: 24, 000

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/mach33/special/parks/proposed/amls/sierrita.aml

Plotted: 4/29/99

R13E R14E R15E

T11S

T12S

TORTOLITA EAST

BIOLOGICAL CORRIDOR

Catalina State Park Expansion (Biological Corridor)

CATALINA STATE PARK

TANGERINE RD

ORACLE

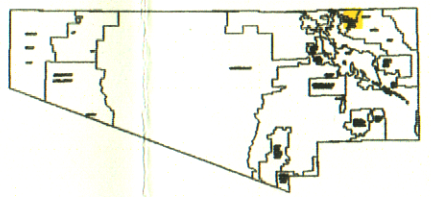
Catalina State Park Expansion

- Contour Lines
- Parcel Base And Streets
- Township And Range Lines
- Section Lines
- Washes
- Administrative Boundaries
- Existing Park Boundaries
- Proposed Park Boundaries
- Trails
- Proposed Mountain Parks
- Bureau Of Land Management (BLM)
- Catalina State Park
- National Forest Land
- Private Lands
- State Trust Lands

DRAFT

FIGURE 16b

Pima County Index Map



Index Map Scale 1:1,500,000

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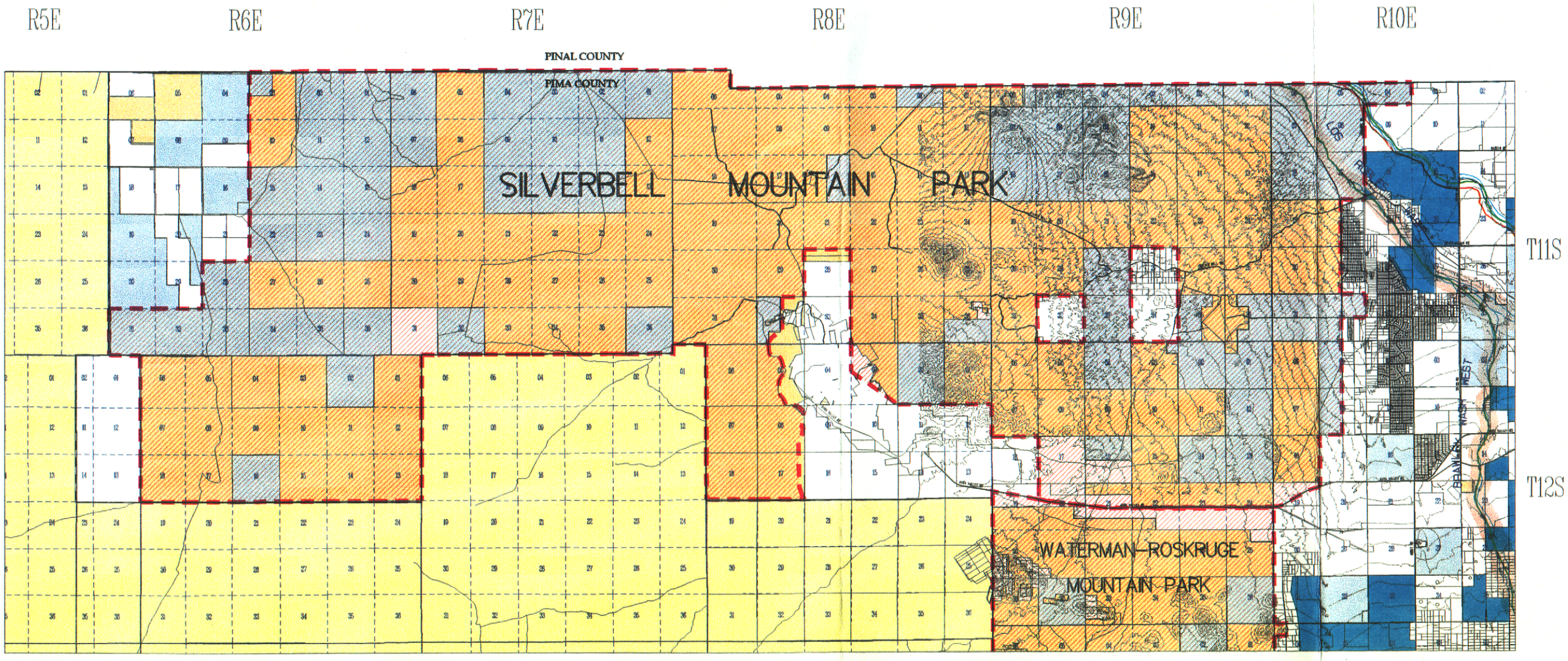
http://www.dot.co.pima.az.us

/daffy/markp/sdcp/mtpark/catalin2.aml

Plotted: 04/14/99

Silverbell Mountain Park



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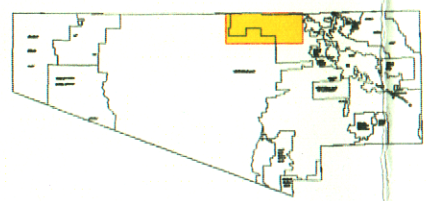
- Contour Lines
- Parcel Base And Streets
- Township And Range Lines
- Section Lines
- Washes
- Trails
- Administrative Boundaries
- Proposed Park Boundaries
- Proposed Mountain Parks
- Bureau Of Land Management (BLM)
- Private Lands
- State Trust Lands
- Tucson Water Land
- Tohono O'Odham Nation
- Wildlife Corridor Links

N

Scale 1: 45, 000



Pima County Index Map

THE SEAL OF PIMA COUNTY ARIZONA

/mach33/special/parks/proposed/amls/silverbell.aml

Plotted: 4/6/99

IV. Steering Committee Update

On March 2, 1999, the Board directed staff to (1) invite each of the organizations and individuals who submitted letters to become members of the Steering Committee contingent upon their willingness to attend a series of educational seminars and workshops, and (2) forward recommendations to the Board about whether the Steering Committee should create an Executive Committee and defined Sub-Committees within the larger Steering Committee and/or invite additional members in the fall of 1999.

A. Members -- From October 1998 through January of 1999 comments and letters of interest were received from the public. On March 2, 1999, the Board invited 89 individuals to participate in a Steering Committee process. To date, 85 of these individuals have continued to show interest by completing paperwork and submitting a loyalty oath to the Clerk of the Board. The high retention rate of Steering Committee members also maintains the initial balance that was achieved between neighborhood, environmental, business, ranch and private property interests. The original appointees to the Steering Committee are:

1. Ken Abrahams
2. Stan Abrams
3. Neale Allen
4. Bill Arnold
5. Peter Aronoff
6. Charles Award
7. Ellen Barnes
8. Dan Beckel
9. George Bender
10/11 R/L Benson
12. Laurence Marc Berlin
13. Tim Blowers
14. John Bordenave
15. Carolyn Campbell
16. Joe Cesare
17. Sue Chilton
18. Hector Conde
19. Vicki Cox Golder
20. William Crosby
21. Richard Daley
22/23 C Davis/Kirkpatrick
24. Mary Darling
25/26 C Duffner /JMurray
27. Jonathan DuHamel
28. Andra Ewton
29. Richard Genser
30. Gay Lynn Goetzke
31. David Goldstein
32. Mike Grassinger
33. Bruce Gungle
34. William Hallihan
35. Richard Harris
36/37 L Harris / H Fox
38/39 G Hartmann/N Wright
40. Duff Hearon
41. Deborah Hecht
42. David Hogan
43/44 D/C Honnas
45. Barbara Huffstetler
46. Jan Johnson
47. Gerald Juliani
48/49 P/M King
50. Rob Kulakofsky
51. Teresa Leal
52. Alan Lurie
53. Lance MacVittie
54. Teresita Majewski
55. John Martin
56. Mitch McClaran
57. Andrew McGibbon
58 Christina McVie
59 Doug McVie
60 John Menke
61 Mary Miller
62/63 MMilroy/D Naugle
64 Chris Monson
65 Joe Parsons
66 Luther Propst
67 Jud Richardson
68 Patricia Richardson
69 Barbara Rose
70/71 Sikora / E.Cohen
72. Chris Sheafe
73. Jim Shiner
74. Quinn Simpson
75. Lisa Stage
76. Tim Terrill
77. Dale Turner
78. Lucy Vitale
79. Dick Walbert
80. Sally Wegner
81. Frances Werner
82. Michael Winn
83. CarlWinters
84. Michael Zimet
85. Nancy Zurenberg

B. Education Series -- The Steering Committee will ultimately make a recommendation on a preferred preserve alternative based on its conservation value and in light of the community's fiscal capacity. In order to do this members will have to acquire knowledge in a number of complex subject areas. From May through December of 1999, the Steering Committee is scheduled to attend a series of education sessions to prepare for this responsibility.

Session 1: Conservation Plans, the ESA, & the Constitution (May 22, 1999, 9:00-11:30 a.m.)
- The Origins of the Sonoran Desert Conservation Plan (Chuck Huckelberry)
- The Origins of Habitat Conservation Plans (Gail Kobetich)
- Trends in Regional Conservation Plans (Marc Ebbin)
- The Endangered Species Act and the Constitution (Fred Bosselman)

Session 2: The Cactus Ferruginous Pygmy-owl (June 26, 1999, 6:00-8:30 p.m.)
- The Pygmy-owl Issue in Perspective (Lisa Harris)
- The Pygmy-owl in Historical Context (Russell Duncan)
- The Pygmy-owl in Texas (Glenn Proudfoot)
- The Pygmy-owl in Arizona (Scott Richardson)

Session 3: Pima County's People, Economy and Land (July 24, 1999, 9:00-11:30 a.m.)
- Pima County's Social Demographics (David Taylor)
- Pima County's Economy (Marshall Vest)
- Pima County's Water (Michael McNulty)
- Pima County's Land (Frank Behlau)

Session 4: Ranching within Pima County (August 14, 1999, 9:00-11:30 a.m)
- An Overview of Ranch Conservation (Thomas Sheridan)
- Ranch Tradition and Conservation in the Altar Valley Area (Sue Chilton)
- Ranch Tradition and Conservation in the Empire-Cienega Valley (Mac Donaldson)
- Ranch Tradition and Conservation - Santa Rita Experimental Range (Andrew McGibbon)
- A National Perspective on Ranch Conservation and Conservation Ranching (John Cook)

Session 5: Conservation Biology (September 18, 1999, 9-11:30 a.m.)
- The Science of Conservation Planning (Reed Noss)
- Pima County's Plant and Animal Communities (Bill Shaw)

Session 6: Pima County's Cultural and Historic Resources (October 16, 1999, 9-11:30 a.m.)

Session 7: How to Create a Multi-Species Conservation Plan (November 8-9,1999, all day)
- The National Conservation Training Center will conduct a two day workshop on how to create a conservation plan.

Session 8: Tohono O'odham Nation Presentation (December 1999 -- to be scheduled)

The first two education sessions have been well attended by Steering Committee members, members of the public, and employees of from a number of governmental entities. The sessions are recorded (video and audio). Transcripts are available on the internet and through the Clerk's office. A summary and analysis of all sessions will be published at the end of the series. Attachments 1 and 2 contain the transcripts from the first two educations sessions.

Session 7, on creating a plan, will probably be collapsed into a one day event in November, depending on speaker availability.

C. Future Subcommittees for Subarea Planning -- When the Comprehensive Plan was drafted in 1992, there were six land panels representing sub-regions. Boundaries were not defined by natural features. The Sonoran Desert Conservation Plan will be divided into subareas based on watershed and riparian features. Initial proposals for subareas in Eastern Pima County include these units, which are also described earlier in the text:

(1) The San Pedro planning unit, which includes Buehman Canyon and the San Pedro River in the vicinity of Redington.

(2) The Cienega-Rincon watershed planning unit, which includes the Empire-Cienega Ranch and proposed National Conservation Area, as well as the Vail and Rocking K communities.

(3) The Upper Santa Cruz planning unit, which extends north from the Santa Cruz county line to Martinez Hill. It includes Green Valley, Sahuarita, Amado and the Santa Rita Experimental Ranch.

(4) The Middle Santa Cruz planning unit, which encompasses the Santa Cruz River from Martinez Hill north to the confluence of the Canada del Oro Wash. The unit includes the foothills of the Tucson and Catalina Mountains, and the Tanque Verde Creek.

(5) The Tortolita Fan planning unit, which includes all the watersheds that drain the Tortolitas, as well as the communities of Tortolita, Catalina, Oro Valley and portions of Marana along the Santa Cruz River.

(6) The Avra-Altar planning unit, which includes all of the Avra or Brawley Wash, as well as portions of north-ward flowing watersheds near the Silverbell Mountains, and southward-flowing watersheds near Sasabe. This planning unit will be broken into two subunits, recognizing that the Altar Valley ranches have organized their own watershed association.

(7) The Tohono O'odham planning unit, which includes the Aguirre and Santa Rosa Valleys, and the San Simon watershed.

(8) Western Pima County's planning unit, which includes four separate watersheds: the Midway, Childs Valley, San Cristobal and Rio Sonoyta.

The watershed / riparian link to subareas enhances the ecosystem basis of the conservation plan. To give greater definition to the different resources existing in subareas, staff is preparing a series of reports which describe the Sonoran Desert Conservation Plan elements in the context of subareas linked to the important riparian reaches of Pima County.

A report chronicling the resources of each subarea will be drafted in concept form, and redrafted after the biological, cultural and economic assessments are completed and land panels from each subarea have formulated conservation and growth accommodation recommendations.

These subarea plans, when re-aggregated and viewed together from a regional perspective, will provide preserve alternatives that will constitute Pima County's conservation plan.

2. Partnership with the Tohono O'odham Nation

On April 28, 1999, the Chairman of the Tohono O'odham Nation accepted an invitation to partnership with Pima County in developing the Sonoran Desert Conservation Plan. Twelve individuals were designated to represent the Nation in the process. (Attachment 3) In subsequent meetings and conversations, the outlines of this partnership have been sketched out to include mutual interests in at least the elements of the Sonoran Desert Conservation Plan which involve Mountain Parks, Cultural and Historic Resources, and Riparian Protection. Representatives of the Tohono O'odham Nation are included at every level of the process, including expert committees and education sessions.

3. Relationships with Federal, State and Local Governments

A. Federal Partners -- In May of 1999, representatives from the following federal entities met with Pima County staff to discuss cooperative efforts in carrying out the conservation plan.

(1) U.S. Department of Agriculture, Forest Service
(2) U.S. Department of Defense, U.S. Air Force
(3) U.S. Department of Defense, U.S. Army Corps of Engineers
(4) U.S. Department of the Interior, Bureau of Land Management
(5) U.S. Department of the Interior, Bureau of Reclamation
(6) U.S. Department of the Interior, Fish and Wildlife Service
(7) U.S. Department of the Interior, National Park Service
(8) U.S. Department of the Interior, Office of the Secretary
(9) U.S. Department of the Interior, U.S. Geological Survey
(10) U.S. Environmental Protection Agency

There was consensus to pursue a cooperative agreement, and a goal was established to have a draft for circulation by September of 1999. A summary of four conservation planning agreements is included at Attachment 4.

B. State Relationships -- State entities that have expressed interest in participating in the Sonoran Desert Conservation include: Arizona Department of Environmental Quality; Arizona Department of Water Resources; and the Arizona Game and Fish Department. Pima County works with employees of the Game and Fish Department on a day-to-day basis either in dealing with interim issues, or in developing the long term conservation plan. An invitation has been accepted by the Arizona Department of Water Resources Director of the Tucson Active Management Area to sit on an expert committee. The County will continue to try to facilitate technical and inter-governmental relationships through the conservation planning process.

C. Local Government Relationships -- All local government entities have expressed interest in participating in the Sonoran Desert Conservation Planning process. The Service, through Mr. Harlow, is working with Pima County to support the regional approach. He states in his June 9, 1999 letter: *"Pima County is currently involved in developing a regional Habitat Conservation Plan (HCP) that can serve as 'umbrella' ESA compliance for all activities covered by the plan. We are urging all municipalities within Pima County to strongly consider becoming involved in this regional effort, to preclude the need to address ESA issues separately, one project at a time. Obtaining individual ESA permits would be more time-consuming, cumbersome and costly for both the Service and the municipalities involved, compared to using the regional approach. A regional approach would also provide greater opportunities for resolving species conservation and economic development conflicts."*

V. Technical Advisory Team and Technical Report Series Update

Technical Advisory Teams are an integral part of the structure of the planning process, adopted by the Board of Supervisors in December of 1998, which includes the Steering Committee, Technical Advisory Teams, and a Project Management Team. The Project Management Team (comprised of staff from Pima County and the Department of Interior entities) will maintain the administrative record and coordinate the flow of work between the Technical Advisory Teams and the Steering Committee.

The Technical Advisory Teams (comprised of experts in areas of science, law and economics, historic preservation and ranch/range issues) will gather data and work products, produce white papers, and, in general, provide expert information to the Steering Committee. The Steering Committee will narrow the options created by this information into recommendations that will ultimately go to the elected officials of various governments for final deliberations.

The following Technical Advisory Teams have been seated and County staff members assigned to these Teams are drafting a series of technical reports to introduce to the committees on the state of the subject matter. More members will be added as time goes on, particularly from the Tohono O'odham Nation.

- Science Technical Advisory Team
- Cultural/Historic Resources Technical Advisory Team
- Ranch Conservation Technical Advisory Team
- Geographic Information Systems (GIS) Technical Advisory Team
- Implementation (Law & Economics) Technical Advisory Team

1. Technical Report Series

County staff members have been drafting a series of reports which facilitate discussion within the Technical Teams. Reports range from broad examinations of a subject matter, to updates, to narrow studies of specific issues within the field of expertise.

A. Broad Studies and Status Reports -- Since March of 1999, ten broad status reports have been drafted, or are scheduled for release in the coming months.

(1) **Report on Public Comment, Update** (March 1999) This 63 page report provided information about issues related to public process and comments on the draft concept plan, liability issues, incentive based programs, funding issues and the proposed pygmy-owl research series.

(2) **Determining Species of Concern** (April 1999) The paper entitled *Determining Species of Concern in Pima County* was drafted by County staff along with Dr. Bill Shaw from the University of Arizona in order to facilitate discussion about which species might be considered for protection under the Sonoran Desert Conservation Plan. Over a period of months, a series of in-depth interviews were conducted with members of the local science community who have expertise in the areas of birds, fish, invertebrates, mammals, plants and plant communities, and reptiles and amphibians. The results of the interviews are compiled within the report.

The report describes the status, location, distribution and habitat needs of species already recognized by the federal government as imperiled, extirpated species, and a

much larger number of species that are in decline, and potentially on the way toward listing if conservation measures are not put in place.

Federally recognized: There are 25 animals and plants within Pima County that are federally recognized as listed, proposed, candidates, or petitioned for threatened or endangered status.

Extirpated: A dozen species that are not federally listed have been extirpated in Pima County. A disproportionate number of these missing natives to the area were dependent on aquatic habitat which is now lost.

Species of concern: An additional 49 species have been identified by local scientists as species of concern. These are divided into categories based on the criteria below.

- 12 species are considered to be in jeopardy in Pima County, and are species for whom habitat in Pima County is critical for their overall existence (Status 1);

- 18 species are considered to be in jeopardy in Pima County, and are generally declining throughout their range (Status 2);

- 13 species are believed to be in jeopardy in Pima County, but are not considered to be at risk overall (Status 3);

- 6 species are not believed to be at risk in Pima County, but should be considered for conservation by the County plan because of their ecological or social importance (Status 4).

Habitats of Concern: In addition to the identification of specific species, the report describes habitats of concern, and target habitats for conservation.

Other Species: Over 100 other species are described in the report. More than half are believed to be commonly found in Pima County, or are commonly found elsewhere, and were never common in Pima County. The report finds that most of these species would benefit from a conservation plan that protected listed species and species of concern. Fifty non-native species are described to highlight the need for proper management of native species and natural resources.

(3) **Preserving Cultural and Historic Resources** (May 1999) The text forwarded to the Board on May 18, 1999 entitled *Preserving Cultural and Historic Resources,* was drafted by County staff to facilitate discussion of the Cultural Historic Technical Advisory Team about protection of cultural resources under the Sonoran Desert Conservation Plan.

Divided into two major sections, the first part of the report provides an overview of historic preservation in Pima County, while the second part provides analysis and recommendations for improving Pima County's historic preservation policy. Sixteen major points of the report are summarized within the report, including the following:

- Citizen pressure to preserve cultural resources can be traced back to the 1880s. In 1889, Congress designated the Casa Grande ruin as the first "archaeological reservation" placed under the protection of the Department of the Interior. In Pima

County, current support for protection of such resources is reflected in the nearly 70 percent approval rating in the 1997 bond election for conservation of open space and historic preservation.

- During the past 100 years, a series of laws and national policies have been created to protect cultural sites. The National Register of Historic Places provides a listing for nationally recognized sites.

- At the local level, protection policies maintain the community's identity, continuity and sense of place. Pima County's heritage is longstanding, complex, and multi-cultural. Our legacy of at least 12,000 years has left us rich in archaeological, historical and cultural properties which give us the opportunity to memorialize and retain aspects of our Native American, Mexican, Spanish Colonial and Territorial heritage that vitalize our lives today.

- Population growth and the lack of effective protections has posed a serious threat to non-renewable cultural resources. Only 16 percent of eastern Pima County, and 7 percent of the entire County has been inventoried. Inventories typically occur in advance of development. An estimated 60 percent of known resources are now destroyed.

(4) **Comparison of Pima County Expenditures** (June 1999) Because the Sonoran Desert Conservation Plan is keyed to Section 10 of the Endangered Species Act, Pima County will be in a position to address and resolve issues related to our economic and fiscal strength over time. The opportunity to address fiscal issues arises because Section 10 of the Endangered Species Act requires a defined revenue source for the conservation plan, which invites us to: quantify the revenue source for both conservation and development land use over the life of the Section 10 permit (perhaps 30 to 50 years), and prescribe in our comprehensive plan the type of growth that will pay for itself today, and return revenue through the tax base over the long term.

A cost of growth study series will be conducted by the Implementation Technical Advisory Team. This study is the first in the series. It examines the decline in trends in county expenditures, confirmed by several cuts at historical and comparative expenditure data. Pima County's expenditures are in decline, when viewed in constant dollars on a per capita basis. Pima County also tends to spend less per capita than other county governments (35% less), and often spends much less than governments serving the same size population base (Pima County, for instance, spends less than half the per capita expenditure of same size Florida counties).

(5) **Water Resources** (July 1999). A discussion paper entitled *Water Resources and the Sonoran Desert Conservation Plan* describes a comprehensive regional policy proposal to achieve meaningful riparian restoration necessary for endangered species compliance.

Five Premises: The basic relation of water policy to conservation planning is that: (1) continued groundwater mining has caused substantial damage to riparian environments, with an estimated loss of 85 to 95% of quality riparian habitat during the last century; (2) an estimated 85% of wildlife depends on this riparian habitat for some part of its life cycle, including a long list of endangered, extirpated and imperiled species; (3) the ongoing implementation of water programs which undermine the purpose of the

Endangered Species Act and significantly impact habitat, might preclude implementation of meaningful conservation under the Sonoran Desert Conservation Plan; (4) given that two decades of plans administered under the State's Groundwater Code have failed to bring the Tucson Active Management Area on track with the goal of balancing groundwater withdrawal with recharge (safe yield), perhaps the Conservation Plan can assist where other actions have fallen short; (5) given the status of the riparian ecosystem, the jurisdictions throughout the region face the realistic prospect that a level of restoration will be a condition of the Section 10 permit issued under the Endangered Species Act. Such restoration will require improvement and some changes in the direction of current regional water policy with regard to groundwater mining and underutilization of sources such as effluent.

Five Problems: This report describes five water resource problems that have particular significance to the viability of the conservation plan. These include the problems of: (1) the administration of a system of rights for surface water and groundwater that does not reflect their hydrologic interconnection, or account for the environmental impact of streamflow and groundwater depletion; (2) the continuation of groundwater mining in the face of a seriously overdrafted aquifer; (3) the substantial damage that past practices have done to the riparian ecosystem; (4) the impact of this damage to the species; and (5) the continued strategies within the community to defer reconciliation of water use with water availability.

Five Proposed Solutions: After discussion of these problems, five proposals are described in the context of the Sonoran Desert Conservation Plan. These include acceptance of a regional water policy that: (1) anticipates various types of water uses (including conservation uses) that will make calls on future resources, respects Indian water rights and other federal purposes, and recognizes hydrologic and environmental realities; (2) achieves safe yield within the Tucson Active Management Area; (3) implements recovery strategies for riparian systems; (4) adapts multi-species conservation and recovery programs to riparian restoration plans; and (5) integrates effluent, recharge and reclaimed water programs into the regional conservation program so that the best use of renewable resources is made for the community.

As the lead local entity overseeing the development of the Plan, Pima County will support and promote regional water policy which moves toward an ecosystem baseline that requires our basin to be in balance, and eventually results in some level of recovery of natural functions within riverine systems.

(6) **Sonoran Desert Conservation Concept Plan Update** (July 1999). This report describes events and activities which have contributed to the development of the Sonoran Desert Conservation Plan from April 1999 through July of 1999.

(7) **Mountain Parks** This report will be issued in August of 1999.

(8) **Land Use Planning** This report will be issued in September of 1999.

(9) **Compilation of Ranch Conservation Studies** This report is due by October of 1999.

(10) **Fiscal Impact of Growth** This report will be issued during or before November of 1999.

B. Single Issue or Narrowly Focused Studies -- Since March of 1999, five issue-specific or more focused reports have been drafted. These are prepared on an as-needed basis, and it is probable that an increasing number of such studies will be released in the coming months as Technical Teams pursue lines of inquiry to develop data layers and other information needed for the Sonoran Desert Conservation Plan.

(1) **Paseo de las Iglesias** (April 1999). Paseo de las Iglesias (Walk of the Churches) is the name of the plan to restore the Santa Cruz River between San Xavier and the Convento site at the base of Sentinel Peak. The plan provides potential recharge opportunities for Central Arizona Project Water and other water sources, native farming restoration opportunities on the Tohono O'odham Nation, preservation of the numerous prehistoric, historic, and cultural sites along the riverbank, and completion of missing trail links along the Santa Cruz River Park.

The Paseo project is uniquely located among our conservation initiatives in the heart of the community. It links the San Agustin Convento site, sometimes called the birthplace of Tucson, to the San Xavier District of the Tohono O'odham Nation, preserves historic and prehistoric sites along the way, and holds the promise of replacing water in the Santa Cruz -- a move toward the restoration of natural function which would in turn heal the plant and animal communities that have suffered increasingly serious losses during this past century.

Pima County is going forward with the Paseo de las Iglesias project. Future steps include formalizing discussions with the Tohono O'odham Nation about leasing water to return to the Santa Cruz River, supporting the creation of a Cultural Center for the Native American community, and pursuing partnerships and funding with all levels of government. While many of the future projects within the Sonoran Desert Conservation Plan call for preservation of resources around the outer periphery of the community, the Paseo de las Iglesias project literally flows through the heart of the community, providing us with the opportunity to link the past to today, and revitalize the cultural and natural resources which have been exhausted over time. Paseo de las Iglesias is the best and most immediate opportunity we have to begin to restore our original resources and in doing so ensure our continuation as a community.

(2) **State of the Pima County Geographic Information System** (April 1999). In order to evaluate the capacity of Pima County's existing Geographic Information System for the Sonoran Desert Conservation Plan, this report examined the network and hardware, software, personnel, existing data layers, and internet availability. A few enhancements were recommended in order to prepare Pima County to perform more GIS analysis on a regional scale.

(3) **Evaluation of Previous Vegetation Mapping Efforts** (June 1999). This study examined the strengths and weaknesses of previous mapping efforts and provided recommendations for improving the accuracy of vegetation delineation.

(4) **Focal Species** (July 1999). Building off the typeology found in the Species of Concern report, this study delineates species by categories of flagship species; keystone species; pest species; and vulnerable species. In a related study, the Heritage Data Management System species were portrayed to show the global rank, state rank and Sonoran Desert Conservation Plan status for species that occur in Pima County.

(5) **Simple Representational Analysis of GAP Mapping** (July 1999). This report performs representation analysis of GAP vegetation. It asks the question -- what percentage of each vegetation community exists in current public preserves. The answer brings riparian habitat to the forefront: "In general, riparian series have the lowest percentage of representation, varying from 67% to 100% unprotected. The Paloverde-Mixed Cacti series is 87% unprotected. A high percentage of the two Chihuahuan desertscrub series are not included (96 to 97% unprotected). Montane plant communities generally have high percentages of representation in public reserves, due to the National Park and National Forest lands considered in the analysis. Saltbush is also well represented: 100% of the series occurring within Organ Pipe Cactus National Monument."

Conclusions of the study are that: "On the basis of this study, the riparian plant communities are of limited distribution and are poorly protected. However, our knowledge of the distribution of these important plant communities is incomplete. Improved mapping is needed. Table 3 lists the plant communities identified as target habitats within the April 1999 draft "Species of Concern" report. Of the target plant communities proposed by the STAT or experts consulted for the "Species of Concern" report, this investigation suggests emphasizing the scrub grassland and paloverde-mixed cacti series, and de-emphasizing the saltbush community. However, it is noted that the saltbush community has suffered historic declines which are not reflected by this representational analysis. Given the deficient knowledge of their present-day occurrence and a record of historic losses, all riparian vegetation communities should be considered underrepresented, with the possible exception of cattail marshland."

2. Science Advisory Team

A. Science Technical Advisory Team - The following individuals serve on the Science Technical Advisory Team.

(1) William W. Shaw, Ph.D., Committee Chair -- William W. Shaw is Professor and Chair, Wildlife and Fisheries Science, in the School of Renewable Natural Resources, University of Arizona where he has worked since 1974. He has degrees from UC Berkeley (Ecological Science), Utah State (Wildlife Management) and the University of Michigan (Natural Resources). His research interests encompass topics that combine biology and the socio-political dimensions of wildlife conservation. He has published widely on topics that deal with the effects of urbanization on wildlife resources. He has also worked on studies involving relationships between protected areas and local people in many countries throughout the world. In 1988, he received the Daniel Leedy award for Urban Wildlife Conservation. This award is given to one person each year in recognition of efforts to integrate conservation with urban planning and design.

(2) Gary Paul Nabhan, Ph.D. -- Gary Nabhan is director of Conservation and Science with the Arizona-Sonora Desert Museum. He received his Ph.D. and M.S. from the University of Arizona and his B.A. from Prescott College. Mr. Nabhan received a MacArthur Fellowship (1990-1995) and a Pew Scholarship in Conservation and Environment (1993-1995) to support his work in conservation and interpretation of the natural world. Dr. Nabhan has authored more than 60 technical journal articles in botany, geography, nutritional ecology, conservation biology, linguistics, anthropology, education, regional studies and literature. His essays have been anthologized in more than two dozen edited volumes in four languages. Additionally, he is a board member and co-founder of Native Seeds/SEARCH, a non-profit organization for conserving indigenous crops of semi-arid North America

(3) Cecil R. Schwalbe, Ph.D. -- Cecil Schwalbe is employed as a research ecologist with the U.S. Geological Survey, Biological Resources Division. He received a B.A. in mechanical engineering from Rice University (1969), an M.S. in Environmental Science from Washington State University (1973), and a Ph.D. in Zoology from The University of Arizona (1981). Dr. Schwalbe has been actively involved in research on and management and conservation of amphibians and reptiles in the southwestern U.S. and northwestern Mexico for more than 25 years. He was the first State Herpetologist for Arizona Game and Fish Department. He has served or is serving on numerous advisory teams, including two recovery teams for the U.S. Fish and Wildlife Service (Desert Tortoise -- Mojave Population, and Houston Toad). Recent research has focused on conservation of native amphibians, methods for monitoring populations of terrestrial vertebrates, human impacts on Southwestern herpetofaunas, and effects of introduced grasses and fire on Sonoran Desert biomes.

(4) Stephen DeStefano, Ph.D. -- Stephen DeStefano is Assistant Unit Leader for wildlife research with the Arizona Cooperative Fish and Wildlife Research Unit, and Associate Professor in the School of Renewable Natural Resources at the University of Arizona. He received B.S., M.S., and Ph.D. degrees in wildlife science and ecology from the Universities of Massachusetts, Wisconsin, and Idaho, respectively. Major interests include animal population dynamics, wildlife-habitat relationships, and conservation biology. Recent research projects have addressed issues related to management of desert and arid grassland wildlife, urban wildlife, survival and other population processes, and recovery of endangered species.

(5) Douglas Duncan, M.S. -- Douglas Duncan works for the U.S. Fish and Wildlife Service in Arizona on endangered species and fisheries biology. He received a B.S. in Wildlife Management (1983) and an M.S. in Wildlife Management (1989) from the University of Arizona. Mr. Duncan's thesis work was performed at the Saguaro National Monument. Mr. Duncan worked with Dr. Krausman at the University of Arizona on CAP environmental studies (e.g., mule deer and bighorn sheep) from 1982 to 1983. He worked on his M.S. and other projects at Chiricahua and Organ Pipe Cactus National Monuments, focusing mostly on rodents and vegetation. Mr. Duncan worked with the Bureau of Land Management in San Pedro, Arizona (1987-1989) on mammal inventories, and in Safford, Arizona, on desert tortoise inventories. By 1990, Mr. Duncan was working on a status review on the desert tortoise at the Arizona Game and Fish Department. He later worked with the Bureau of Land Management in Las Vegas, Nevada, on desert tortoise and riparian ecology and management. In 1994, he began working for the U.S. Fish and Wildlife Service.

(6) Mima Falk, M.S. -- Mima Falk is the plant ecologist on the Coronado National Forest. She received her B.S. and M.S. degree from Cal-Poly, Pomona in Botany. Her master's degree concerned pollination of desert annuals in Joshua Tree National Monument. She has worked 17 years in land management; nine years with the Army Corps of Engineers as a riparian ecologist, two years on the Angeles National Forest as their fire ecologist and botanist, and six years as plant ecologist in the Coronado National Forest. During her tenure in government service, she has worked extensively with U.S. Fish and Wildlife Service on Section 7 consultations, habitat conservation plans and recovery plans for plant and animal species. Ms. Falk is currently the Co-President for the Arizona Native Plant Society.

(7) Natasha C. Kline, M.S. -- Ms. Kline is currently a wildlife biologist for Saguaro National Park, where she is responsible for natural and cultural resource management operations in the Rincon Mountain District, and for wildlife issues throughout the Park. She has received an MS degree in Biology, and for the last twelve years has worked throughout the U.S. as a biologist

for the U.S. Fish & Wildlife Service, the Air Force, and the National Park Service. Her research interests/expertise include vertebrate (particularly avian) ecology, and conservation biology, with an emphasis on the impacts of roads on ecosystems.

(8) Steven James Prchal -- Mr. Prchal founded the Sonoran Arthropod Studies Institute in 1986 and is currently the Executive Director. Previously, Steven Prchal worked with the Arizona-Sonora Desert Museum from 1970 to 1986 as their assistant curator of the Small Animal Department. In 1979, he initiated the Desert Pupfish Research and Breeding Program for the museum; and, in 1980, he initiated, designed, and supervised construction for their montane snakes breeding program. In addition, he possesses skills in museum entomology techniques, museum and zoo exhibit design and construction, and lower vertebrate and invertebrate husbandry, to name a few. Mr. Prchal maintains interests in popularization of entomology, insect life histories and ecology, ants, saturniidae and sphingdae of Sonora, Mexico; and insect and plant relationships.

(9) Sherry Ruther, M.S. --- Ms. Ruther has had a longstanding interest in the conservation and management of urban wildlife resources from the perspective of a state wildlife management agency. In 1987, Ms. Ruther received her Master's Degree in Urban Wildlife Conservation from the University of Arizona and following a stint in biological consulting, in 1992, began her tenure as a Habitat Specialist with the Arizona Game & Fish Department (AGFD). During the course of the last seven years, her job responsibilities have focused on encouraging and assisting urban communities to incorporate wildlife conservation into their land use planning. Ms. Ruther has contributed to numerous county- and city-wide comprehensive plans, provided technical expertise in the development of local resource-based ordinances, and performed biological reviews for countless proposed development projects.

B. Peer Review -- Two independent peer reviewers have been selected by the Science Advisory Team, and both Dr. Reed Noss and Ms. Laura Hood have accepted invitations to serve in this role. Dr. Noss is one of the most well respected and well published scholars in the field of conservation biology, with over 150 books, articles, chapters, reports and proceedings to his name. Ms. Laura Hood, currently with the Washington D.C. office of Defenders of Wildlife, is the author of the influential text about conservation plans entitled *Frayed Safety Nets*. Other reviewers will be selected as the planning process continues.

C. Meetings -- On May 11, 1999, the Science Technical Advisory Team to the Sonoran Desert Conservation Plan met for the first time to begin discussions about the biological underpinnings for our regional multi-species conservation plan. The Team has met on a monthly basis since that time and has covered topics such as:

> what species should be included in the conservation plan; the charter of the Team; evaluation of existing vegetation mapping; biological goals; the Request for Proposals for a biological consultant; selection of independent peer reviewers; watershed based subarea planning; GIS decision making models; environmental history; focal species; the representation of vegetation communities within protected areas; and the status of data collected by Pima County staff. (See Attachment 5)

D. Workplan -- The Team has worked on a Request for Proposals and will be prepared to let the RFP when funding is available to contract with a biological consultant.

3. Cultural / Historic Resources Technical Advisory Team

A. Members - The following individuals have agreed to serve on the Cultural and Historic Resources Technical Advisory Team, and started to meet in June, 1999 to discuss planning issues including the creation of a data layer for cultural and historic resources, and the report entitled *Preserving Cultural and Historic Resources.*

(1) Paul Fish, Ph.D. -- Paul Fish received his Ph.D. in anthropology from Arizona State University. He is currently the Curator of Archaeology and head of the Archaeology Division at the Arizona State Museum and Professor of Anthropology at the University of Arizona. His duties at the Arizona State Museum include coordination of the Museum's research review and permitting responsibilities under the Arizona Antiquities Act. His current research focuses on the political and social organization and land use patterns of the Hohokam in Tucson Basin. His academic interests in the Tucson area and his experience in cultural resources management have made Dr. Fish a renown expert in the archaeology of southern Arizona. Recent publications include articles and monographs on archaeological methodology as well as research in the Southwest, Mexico, and Brazil.

(2) Beth Grindell, Ph.D. -- Beth Grindell received her Ph.D. in anthropology at the University of Arizona and is currently is a senior research specialist at the Arizona State Museum, Archaeology Site Files Office. For the past four years she has been coordinator of the AZSITE Project, a collaborative effort of multiple state and private agencies to develop a geographically referenced cultural resource database for the State of Arizona. A 12-year resident of Tucson, Dr. Grindell has taught archaeology at Pima Community College and the University of Arizona. She has also participated in archaeological excavations in France and extensively throughout the Near East, as well as New England and Arizona.

(3) Mary M. Farrell, M.A. has a B.A. in anthropology from the University of Virginia (Charlottesville) and an M.A. in anthropology from the University of Arizona (Tucson). She is currently Acting Forest Archaeologist with the Coronado National Forest, where she's worked since 1986. She has also worked as an archaeologist with the USFS in California, the National Park Service, and University of Virginia. Ms. Farrell is responsible for compliance with federal historic preservation mandates for the Coronado National Forest and also coordinates volunteer and avocational groups in historic site stabilization and restoration, prehistoric site protection and monitoring, and interpretation.

(4) Christine A. Ramirez was born and raised in Tucson Arizona. She is a Member of the Pascua Yaqui Tribe, and lives on the New Pascua Reservation in Tucson. Ms. Ramirez is currently Administrative Assistant in the tribal Administration Department and is responsible for researching, collecting, and preserving all Historic documents and records for the Pascua Yaqui Tribe Historical Preservation Project. She has served with the Intertribal Council of Arizona as the liaison for the Tribe and been involved in consultations under the Native American Graves Protection and Repatriation Act in New Mexico and Arizona. Ms. Ramirez has received training in cultural and historic preservation, historic sites management, and the administration of photographic collections. Ms. Ramirez is a member of the Tucson Pima County Historic Commission and represents District 3.

(5) Susan J. Wells, M.A. earned her B.A. in anthropology from Duke University and her M.A. in anthropology form the University of Arizona in Tucson. She has been employed as an archeologist at the Western Archeological and Conservation Center, National Park Service, since 1983. The Center assists more than 50 national parks and monuments in 10 western

states with archeological inventory and compliance as well as with collections conservation and curation. She is currently a supervisory archeologist with responsibilities for assisting parks with cultural resource management and compliance by managing archeological projects conducted by Center staff in five western states. She has archaeological field experience in Arizona, Nevada, Virginia, and Israel.

(6) Max Witkind, M.A. received both his B.A. and M.A. in anthropology from Colorado State University in Fort Collins. He is currently the staff archaeologist for the Bureau of Land Management, Tucson Field Area, where he is responsible for preservation planning and agency compliance with federal cultural resources mandates. Over the past twenty years, Mr. Witkind has worked as a federal agency archaeologist for the BLM in Colorado and Arizona, and for the Army Corps of Engineers in Arkansas. Prior to this, Mr. Witkind taught anthropology at the San Antonio Community College in San Antonio, Texas, and worked as a research consultant for the Center for Archaeological Research at the University of Texas, San Antonio, campus.

(7-8) Joe Joaquin and **Peter Steere** of the Tohono O'odham Nation, Office of Cultural Preservation, are also members of the Team.

B. Meetings -- On June 28, 1999, the Team held its first meeting and discussed its role, mission, objectives and activities. (See Attachment 6).

C. Workplan -- On June 1, 1999, the Arizona State Museum began to work on a project under contract with Pima County that will complete the cultural resource geographic data for Eastern Pima County. This project involves 1420 hours to complete site and survey data entry, with an anticipated date of completion of October, 1999. (Attachment 7).

4. Ranch Conservation Technical Advisory Team

A. Members - The following individuals have agreed to serve on the Ranch Conservation Technical Advisory Team, which will begin to meet during the summer of 1999 to discuss planning issues including the creation of a data layer for ranch lands, and the first report in the technical series issued by staff. Additional membership will be invited.

(1) Thomas Sheridan, Ph.D., Committee Chair -- Thomas E. Sheridan is Curator of Ethnohistory, Director of Documentary Relations of the Southwest, and Head of the Ethnology Division at the Arizona State Museum and Professor of Anthropology at the University of Arizona. He has conducted ethnographic fieldwork and historical research in the southwestern United States and northern Mexico since 1971, and received his Ph.D. in Anthropology from the University of Arizona in 1983. From 1982-84, he directed the Mexican Heritage Project of the Arizona Historical Society under a grant from the National Endowment of the Humanities. Currently, he is directing a series of grants funded by the Udall Foundation and the National Oceanic and Atmospheric Administration on contemporary ranching and the transition from ranching to real estate development in Arizona.

Dr. Sheridan is a founding member of the Arizona Common Ground Roundtable, and has written or co-edited ten books and monographs including: *Los Tucsonenses: The Mexican Community of Tucson; Where the Dove Calls: The Political Ecology of a Peasant Corporate Community in Northwestern Mexico; Arizona: A History; and Paths of Life: American Indians of the Southwest and Northern Mexico* (with Nancy Parezo). Most recent publications include: *The Presidio and Militia on the Northern Frontier of New Spain: A Documentary History, Volume Two, Part I: The Californias and Sinaloa-Sonora, 1700-1765* (co-edited with

Charles Polzer); *Contested Ground: Comparative Frontiers on the Northern and Southern Edges of the Spanish Empire in the Americas* (co-edited with Donna Guy); and *The Land and the People: A History of the Southwest.*

(2) George Ruyle, Ph.D. -- Dr. Ruyle is a Range Management Specialist and Chair of the Rangeland and Forest Resources Program in the School of Renewable Natural Resources at the University of Arizona. He has a B.S. from Arizona State University, an M.S. from the University of California, Berkeley, and a Ph.D. in Rangeland Science from Utah State University. He has worked on issues related to public land grazing in Arizona for over 15 years. His research interests include plant-animal relationships, invasive species, and animal behavior. Dr. Ruyle served on the National Academy of Science Committee on Rangeland Classifications and co-authored a book, *Rangeland Health: New Methods to Classify, Inventory, and Monitor Rangelands.* More recently, he co-edited *Arizona Range Grasses,* and currently he is working to develop a comprehensive web site related to rangeland science and management.

(3) Tom Chilton -- Tom Chilton is a native to Arizona and represents his family as a fifth generation cattle rancher in Arizona. He is married and has two adult children and lives in southern Pima County. Mr. Chilton attended Mingus Union High School in the Verde Valley and in 1971 received a B.S. degree from Arizona State University in Livestock Production Management. After college, he was employed by the Farm Credit System and was active in loaning money to Arizona farmers and ranchers for over 20 years. Mr. Chilton is currently the President of the Southern Arizona Cattlemens Protective Association, which covers Pinal, Pima, and Santa Cruz counties. As a partner is the Chilton Ranch & Cattle Company, he is actively involved in the family cattle ranching operation in Pima and Santa Cruz counties.

(4) Mac Donaldson -- Mac Donaldson was born in Tucson in 1948, where he graduated from Catalina High School. He attended the University of Arizona, and later received a B.A. degree in Fine Arts from the Eastern Sidney Technical College in Sidney Australia. He comes from a second generation ranching family, and lived in the Altar Valley from 1952, until he moved in 1975 to the Sonoita Valley where he and his wife and three children currently live. Mr. Donaldson has worked for a Colorado cattle company representing the Southwest region, and he currently ranches on lands that comprise the Empire-Cienega Valley. He is a member of People for the USA in Cochise County, and a member of the Sonoita Valley Planning Partnership. He is active in 4-H activities and Little League and he served on the Santa Cruz County Fair and Rodeo Association.

(5) Dan Robinett -- Mr. Robinett is a Rangeland Management Specialist for the USDA Natural Resources Conservation Service (formerly the Soil Conservation Service) in Tucson where he has worked since 1974, and he is currently assigned to the southern Arizona region of the NRCS. Mr. Robinett is a native of Tucson where he attended both elementary and high school, and he also attended the University of Arizona and graduated in 1972. He holds a B.S. degree in Range Management. Mr. Robinett served in the US Army from 1972-1974 before joining the Soil Conservation Service, now the Natural Resources Conservation Service.

(6) Mette Brogden -- Udall Center

5. Geographic Information Services (GIS) Technical Advisory Team

A. Members - The following individuals have agreed to serve on the Geographical Information Services (GIS) Technical Advisory Team, which works through the Chair, John Regan, on all aspects of the Sonoran Desert Conservation Plan which involve the creation of data layers. Additional members will be invited to join the GIS Team.

(1) John Regan, Committee Chair -- John Regan, Pima County's leading GIS strategist for the Sonoran Desert Conservation Plan, received his M.S. in Regional Development Planning with an emphasis on computer applications, and his B.S. from the University of Arizona.

(2) Jack Avis -- Jack Avis received his B.A. from the University of Arizona and is responsible for management and integration of GIS technologies within Development Services.

(3) Sabra Schwartz -- Sabra Schwartz is the Heritage Data Management System Coordinator of the Arizona Game and Fish Department.

(4) Eugene Trobia -- Gene Trobia, State Cartographer with the Arizona State Land Department, received his M.S. and B.S. from the University of Arizona in Landscape Architecture.

(5) Jim Veomett -- Jim Veomett works with GIS in Pima County's Development Services Department. He has an M.A. in Geography from the University of Arizona and a B.A. in Geography from Humboldt State University.

(6) Steven Whitney -- Steve Whitney from Pima County's Technical Services Division received his B.S. in Applied Geography with an emphasis on remote sensing and cartography from the University of Arizona.

(7) Craig Wissler -- Craig Wissler of the School of Renewable Natural Resources, University of Arizona, received his B.S. in Environmental Resources from Arizona State University, and his M.S. in Landscape Architecture from the University of Arizona.

B. Workplan -- The Pima County GIS Library is extensive, covering over 175 data layers (Attachment 8). During the past months, County staff members have been accumulating additional data layers in anticipation of mapping and information needs for the Sonoran Desert Conservation Plan. The list below reflects an abbreviated compilation of new data layers gathered by staff in recent months, which puts the available layers of information at over 200.

- CAP
- Dams
- Depth to Water
- Exotic Species
- GAP Vegetation
- Geology
- Grazing Allotments
- Heritage Data Man Systems
- Natural Vegetation Info Systems
- Perennial Streams
- Precipitation
- Riparian Habitat
- Species Abstracts
- Springs
- Soils
- Stock Tanks
- Vegetation -- Arizona Game and Fish
- Vegetation -- Pima Assoc of Governments
- Vegetation -- Saguaro National Parks
- Vegetation, soils, geology, topography, roads, washes -- Organ Pipe Nat. Monument
- Watersheds and Sub-basins
- Wilderness Boundaries

Currently, county staff is dividing and analyzing all relevant data layers into subarea units. This data will become the basis of the initial subarea draft concept plans which will be issued to land panels in January of 2000.

Creation of a GIS Decision Support Model -- Pima County has entered into a collaborative relationship through the United States Geological Survey with four prominent California conservation biologists and geographic information scientists to create a decision support model for conservation planning as the Sonoran Desert Conservation Plan is developed.

County staff submitted a pre-proposal to the National Fish and Wildlife Foundation to seek funding assistance, and now has been asked to submit a full proposal based on the strength of the pre-proposal. The principal investigators working with Pima County in this effort are:

Dr. Michael Gilpin
Department of Biology
University of California at San Diego

Dr. Richard Church
Department of Geography
University of California at Santa Barbara

Dr. Ross Gerrard
ISERA Group

Dr. Peter Stine
United States Geological Survey
Western Ecological Research Center
California State University

Both Region 1 and Region 2 of the United States Fish and Wildlife Service support this effort, which the principals describe in the terms of their proposal, as reproduced below.

BACKGROUND: Conservation planning, which has often centered on the protection of individual species, has more recently begun to focus more on the protection of suites of species, their habitats, and even the ecological processes that characterize and help form and sustain the system. This trend reflects both an ecological and an economic rationale. The species-by-species approach produces biological inefficiencies by giving priority to the needs of the species that are earliest identified in the planning process. The serial nature of protecting one species after another fosters great economic uncertainty. Continuing pressures for land development and the realization that case by case conservation actions are ineffective has provided the incentives to be more proactive in both land use planning and conserving animals and plants before they are pushed to the brink of extinction.

The growth of conservation planning on the regional level has been enhanced by the rapid expansion in the gathering and dissemination of large amounts of computer-based data. These data include fieldwork results, time series from monitoring programs, and geographic data such as remotely sensed images and vegetation maps. Along with data proliferation has been huge growth in the power of desktop computer hardware and windows-based on-screen graphics. In particular, the growth in the power and use of desktop geographic information systems (GIS) has been tied to these trends. As a result, substantial progress has been made in the ability to apply data and software to regional scale conservation planning.

While computer technologies are enabling more and better habitat-based analyses, regulatory and policy mechanisms are moving in the same direction. The federal Endangered Species Act (ESA) as renewed in 1982 allowed for Habitat Conservation Plans or HCPs. The intent was to put more flexibility into the ESA by providing for allowed "incidental take" of a listed species as long as habitat conservation or similar mitigation was undertaken.

HCPs have mushroomed in the 1990's, from about 10 in 1993 to 250 in 1999 (covering over 6 million acres in 16 states). While an HCP may cover a small area and focus on only a single species, there is an increase in plans involving large areas, multiple species, and long time periods. For example, the Plum Creek HCP in Washington state covers 1.6 million acres of timber land in the Cascade Range that is habitat for several sensitive and threatened species. The Balcones Canyonlands Conservation Plan (30,000 acres) in Travis County, Texas allows for substantial development while directing mitigation funds toward the protection of areas deemed important for listed Texas songbirds. A similar effort in the Sonoran Desert near Tucson, Arizona, the largest plan ever considered covering over 9,000 square miles, is now moving forward. Large-area regional HCPs inherently involve diverse interest groups - developers, agriculture, recreationists, and environmentalists. For any consensus to be achieved, an open process with explicit goals, targets, assumptions, and data is essential.

While regional planning for conservation has gathered great momentum and many plans have been implemented, serious questions linger. Are all desirable alternatives being considered in HCPs or other conservation plans? Are there general approaches that could be applied that would aid the planning process? Can we provide for objective analyses of a full range of alternative outcomes? What can research do to improve the process of developing conservation plans and the quality of the final product? The resources being devoted to data gathering, consensus building, and implementation have grown greatly. For all of these funds and resources, little effort has been made to specifically establish or define what is a "good" plan, one that will maximize all desired features and minimize risks and costs, and what kind of process can lead to this desired result.

We propose a two-year research effort to improve decision support in the area of habitat conservation planning, focused on combining the best available biotic data, GIS and database software, and optimization models. We believe that this approach can produce potential solutions that appropriately evaluate conservation goals as well as socio-economic goals and identify high-quality alternatives that attain the best balance of both.

Our effort would be administrated through the National Center for Geographic Information and Analysis (NCGIA). The NCGIA, headquartered on the campus of the University of California at Santa Barbara, has implemented the major U.S. effort in GIS research for over ten years. Our proposed effort requires $500,000 over the two-year period.

The overall goal of our effort is the development of a computer-based framework for incorporating biological data, socio-economic data, and optimization modeling to support the development of good conservation plans. Our approach is to show the explicit trade-offs between various levels of conservation, obtained by reserving certain lands, and the economic and social costs of doing so. Our methods would seek to operate within an open decision process, utilizing the best science possible and attempting to address interests of all stakeholders. Furthermore, our intention is to provide a tool that gives the user (planners, local biologists, decision-makers) control over setting the salient ecological and economic parameters and in defining the appropriate values of each parameter.

OVERVIEW OF OUR BASIC APPROACH: The work described here commenced with a grant from the National Center for Ecological Analysis and Synthesis (NCEAS) in 1996. Our research team was assembled and began to explore the possibilities of a decision support tool that would address the salient ecological and reserve selection components of a conservation planning program. We describe here the concepts that we have developed which we plan to use as launching point for this proposed work.

The components of our proposed decision support tool can be condensed into four main categories:

(1) incorporation of expert biological data and opinion;

(2) computer-based processing to determine relative habitat suitability and socio-economic suitability in the region of interest;

(3) modeling viable territories for basic demographic units of the target species; and

(4) optimizing the selection of species territories to balance the conflicting goals of environmental and human needs.

1) Incorporation of expert biological data and opinion.

As a practical necessity, regional planning will be centered around a small number of target or umbrella species. The assumption is that if conservation and management efforts are sufficient to protect the umbrella species, they will be sufficient to protect many other species that require fewer resources and less habitat than the target species. Thus, for example, the San Joaquin Kit Fox of California is considered an umbrella species that, if protected, creates a relatively large-area reserve that collaterally protects smaller-ranging species such as kangaroo rats. Accordingly, it is essential to begin with the best possible data on the regional biota, both the umbrella species and those thought to receive ancillary protection under the umbrella. Where hard data are lacking, best expert opinion will have to provide a substitute. Information needed will include data on the complete species life cycle (if known and available), what habitats and resources are necessary for breeding and nurturing of young,,, , eating habits, migration patterns if any, foraging patterns, tolerance for landscape barriers and human activities, etc. Although any modeling approach is only as good as are the underlying data, the quality and quantity of the up-front biological input will determine as much as anything the ultimate quality and utility of the decision tool.

Our initial prototype has demonstrated the utility of this approach. We have used vegetation and other data to model landscape habitat values for the San Joaquin Kit Fox, a key indicator species, that is the subject of conservation attention in our study area. We realize, however, that many other data sources could be used to more realistically and accurately characterize habitat suitability for this species. In the further development of this work we plan to refine this initial step with additional data and to accomplish this for a suite of species, as needed for the planning area.

2) Computer-based processing to determine relative habitat suitability and socio-economic suitability of the lands in the region of interest.

Once habitat needs and preferences are known, they can be translated into a digital suitability map within a GIS. For example, a species like the kit fox, known to prefer open grassland and scrubland, would have high suitability for grasslands on a vegetation map. Oak woodlands and swampy areas on the vegetation map would translate to low kit fox suitability. In accordance with biological input, several GIS data layers, such as soils maps, climate maps, etc. could become relevant to establishing habitat suitability on a landscape. It is reasonable to assume that at least basic digital data (vegetation, topography) would be available for most areas in the U.S. In addition, a large scale planning effort would likely include substantial efforts to generate new data layers that could be used. For many areas, there should be a substantial

amount of both data and methods for translating data into habitat suitability, based on previous research and published work. There might even be ready-made habitat suitability maps for parts of some areas. We would take advantage of such opportunities wherever possible, as the most innovative and important components of our work involve (3) and (4) below.

So far we have discussed establishing the needs of the regional biota. Equally important is to evaluate the human landscape -- where is conservation action the most compatible with current land use? Where is it the least compatible? Again, the quality and amount of data available will vary. One approach would be to mask out areas that are currently urbanized or zoned for imminent development -- these areas are likely of little or no habitat value or would be very costly or impossible to conserve. The opposite extreme would be areas that have little development potential and yet have high-value habitat. These would be "ideal" lands for conservation action.

There is fundamentally a competition between the needs of wildlife and people for the landscape. When conservation action goes forward, there is a "cost" of reserving the lands in question. Parcels of high development or recreational value will be more expensive/difficult (more "costly") to reserve than remote parcels. There are different specific ways of calculating how the "cost of conservation" varies on a landscape. In many cases, simple zoning might provide acceptable estimates or be the only available basis for an estimate. In other cases, more sophisticated regional growth models could be used to predict where future development is likely to occur. The product of interest to us is the same in either case -- a GIS representation of the relative difficulty or cost of conserving certain areas in the landscape over a reasonable future time horizon.

We have used GIS data (e.g. land ownership, city boundaries, land use designations, etc.) to define the relative "costs" of conserving habitat in our prototype study area. This process created a companion set of data that defines, in the aggregate, a "cost surface" that scales the relative difficulty of protecting habitat for the target species. Once again, the initial prototype that has been developed will be enhanced with additional data and more detailed input from an Advisory Team.

These first and second steps are intended to be defined and controlled by the user of this tool; e.g. a land use planner, a regulatory agency, etc. The incorporation of the biological and socio-economic parameters at the beginning of the process will provide control and realistic considerations from which to perform subsequent optimization routines. The ability to adequately characterize both the habitat suitability layer as well as the cost layer is limited only by the availability of data and the innovation of the planning team.

3) Modeling viable territories for basic demographic units of the target species.

The habitat suitability map, resident in the GIS, does not answer the question of how much habitat of what types can support a basic demographic unit, or how much would be necessary for a sizable and sustainable population. For example, if biological data informs us that a breeding pair of kit fox requires four square miles of open grassland, where in a mixed landscape can we find a viable patch? It is necessary to identify all areas in the region of interest that are reasonably capable of sustaining the relevant demographic unit. These areas will of course depend on the habitat suitability data layer and expert opinion. For example, is a larger patch of less suitable habitat still reasonable to support a kit fox pair? What about the presence of unsuitable elements like wetlands or freeways?

To define all areas that reasonably provide options for conserving the target species on the landscape, we can conduct an exercise the might be termed "patch building." Given the basic demographic unit (breeding pair, social group, colony, etc.), we can create a method that generates viable patches on the derived habitat suitability layer. Reverting again to the kit fox example, one type of patch (ideal type) would be four square miles of top-quality open grassland habitat. Another case would be six square miles of mixed habitat that included unsuitable oak woodland and wetlands as well as grassland.

There are different ways in which patches can be created. Depending on various parameters that one might set, the quality of habitat included and the shape of the patch can differ. These parameters and assumptions would ultimately be under the control of the user of the decision tool. It is also important to realize that a "patch" or territory will not always represent the same population unit but can be modified for individuals, pairs, social groups, etc., in accordance with biological input and opinion. Finally, it is important to construct patches throughout the region of interest (where habitat type allows). In this way a complete set of options for conservation on the landscape is created. In accordance with a basic objective of ours, the decision tool user must have the ability to determine how many patches they intend to protect and, furthermore, have the ability to vary this as they envision alternative planning outcomes.

As far as how many patches are necessary to have a sustainable population, that will in many cases have to come from expert opinion, or possibly from a metapopulation model. Our methods will be able to accommodate any desired number of patches for breeding pairs or other demographic units. The next step is to locate the desired number of patches on the landscape such that a high-quality reserve system can be established while accounting for human activities. Balancing these needs in reserve construction is accomplished by means of an approach based on optimization modeling.

4) Optimizing the selection of species territories to balance the conflicting goals of environmental and human needs.

The final component of our proposed decision support tool is built around optimizing patch selection. This can be accomplished within different formulations of integer programming models. The approach is to select some desired number of pre-defined patch units (from step 3) according to a set of criteria. One major criterion can be characterized as minimum "cost." More specifically, we would like to minimize the total cost of all the patches/territories that we select. "Cost" would be calculated from the socio-economic analysis of step 2. The habitat suitability map and socio-economic suitability (or "cost") map exist in the GIS as perfectly rectified data layers. For any territory demarcated on the habitat map, its cost can be calculated from the cost map. Based on a min-cost criterion alone, an optimization model would select patches on the easiest-to-conserve lands (publicly owned or remote from development pressures). The drawback to using this criterion alone is that the highest value lands for conservation might go unselected. This gives rise to a second criterion with which to select patches -- habitat value.

Although the territory generation process is done to try to make all patches roughly equivalent in habitat suitability, there will likely be significant differences. Territories containing too much marginal habitat might exert an excessive burden on an animal's ability to forage for food or hunt for prey. It is possible to give each patch that is a candidate for selection a ranking of its overall quality. Optimizing on quality alone, the programming model would select a set of the highest quality territories around which to build a regional reserve. Ideally, such a reserve

would correspond to the lowest-cost lands as well. Unfortunately, this is unlikely to be the case. Regional conservation efforts such as HCPs often become most controversial when there is the presence of endangered species (e.g., California gnatcatcher, marbled murrelet) on valuable lands.

The real power of optimizing patch selection is not in using any single one of the criteria discussed above by itself, but in applying them simultaneously with differential preferences for each. For example, it might be possible to attain a group of selected patches with high overall habitat value for a much lower "cost" than the group that has the absolute highest overall habitat value. That is, a small reduction in overall quality might be identified that has much less cost. Generating and displaying this kind of trade-off is at the heart of the decision support tool that we are proposing here. In a broad sense, this approach is a way of balancing conservation priorities and human priorities on the landscape. By displaying explicit solutions, which can be evaluated according to both modeled and non-modeled criteria, it will be easier for consensus to form among various interests. We believe that an approach based on defined (yet changeable) assumptions and parameters, with the aid of patch building and optimization models, can yield valuable alternatives.

OBJECTIVES: Through the initial phases of the project we attempted to define exactly what our methods would be and refine the approach that we believed would successfully combine biological criteria, defined within a GIS framework, with an optimal or ultimately a heuristic method of selecting among a large set of alternatives. Our earliest progress was slow, due to some challenging problems in three phases; habitat suitability estimation, patch construction, and discrete linear optimization - now all solved problems. We had limited funds for the exploratory nature of the initial work, but we have now established the basic concept that we think can be developed into a useful tool.

Our primary objectives for this proposed development phase of the project include the following main issues:

1) Develop the model as a multi-species/habitat based problem.

As we have mentioned above, it seems clear that multi-species and multi-habitat conservation strategies will become the primary strategy for regional conservation efforts. There will likely be significant incentive for this approach in new legislation at all levels of government, encouraging this kind of comprehensive solution.

It presents certain challenges to our model that we have anticipated. Optimum or heuristic solutions, where suitable habitat is being selected for more than one taxon, will require new and more complicated formulations in model. However, it also presents an opportunity for creating a component of this tool that has never been done before.

2) Address the requirement for adjacency of patches to preserve contiguity of protected areas.

In the course of our initial efforts of selecting patches for an optimal solution we have discovered solutions that result in units of habitat that are disjunct from one another. Contiguity is one of the fundamental principles of reserve design that is crucial to the success of a planning effort. An additional constraint needs to be built into this model that will encourage or even require that a given selected patch have some acceptable level of adjacency with at least one other selected patch.

3) Formulate a heuristic solution to replace a optimal solution, once an optimal solution is demonstrated as a benchmark.

The intention is to create a formulation that can be executed without specialized software and for large problems that require unusually (and generally unavailable) powerful hardware. Ultimately a user of this tool should be capable of executing this work using commonly available GIS systems. We are not yet sure whether or not this could be executed using simple platforms that would require little training or whether it is more realistic to expect this to be executed by highly trained personnel with a fairly sophisticated software/hardware platform. However, the process is expected to be performed in a manner that will allow repeated runs of the model to examine alternative outcomes. Thus a relatively quick path to a solution is desirable, thus the desire to develop a heuristic alternative to an optimal solution.

4) Account for overlap of multiple patches (both intraspecific and interspecific) when identifying/formulating cost-efficient hueristic solutions.

This issue is a technical problem, probably transparent to a user. However, it is important that the solution formulation be able to account for the "savings" that results from the overlap of protected patches, both intraspecific and interspecific overlap. This is particularly important in the latter situation, when a multi-species solution is generated. We are not sure yet how this accounting process will be executed. Given the analysis will depend fundamentally on a raster GIS data source, cell by cell analysis will likely be required. This presents some significant challenges from a programming and problem formulation standpoint. However, addressing this problem successfully will be a significant advancement.

5) Develop the front-end software to run the model in a user-friendly manner. Explore use of Arc/Info or Arc/view as the platform for executing this model.

This entire process is ultimately intended to run on an Arcview or Arcinfo GIS platform, with data ported back and forth with any custom software. The user will be in control of setting all the biological and socio-economic parameters, a feature we believe is crucial for the acceptance of this approach and the ultimate success of the method. If the user is in control, he/she can run sensitivity analyses, varying only certain parameters deemed most crucial to decision-makers. Our progress to date has taken us through steps (1)-(3) above, and we have formulated the models that are the basis of steps (4) and (5). By the conclusion of the proposed project we will have developed a multi-species prototype of the entire process running within the Arc/Info GIS, including the software customization that will enable an average user to execute this method.

EXPECTED PRODUCT: The primary product expected from this effort is a customized software package, combined with linkages to commercially available software that executes this entire model. This software will be accompanied by an instruction manual and technical assistance from the team.

Several scientific publications will result from the research and development activities of this project. We also plan to hold workshops on this project, culminated in a final workshop where we will provide potential users of this tool with a full review of the potential applications of the tool. The Advisory Team will be intimately linked with the development of the tool and will therefore be provided with significant transfer of information on the technology development and the science underlying the potential applications.

6. Implementation (Law & Economics) Technical Advisory Team

A. Members - The following individuals have agreed to serve on the Implementation Technical Advisory Team, which will begin to meet in September, 1999 to discuss planning issues including the creation of data layers for fiscal impact analysis, and the first report in the technical series issued by staff. Additional team members will be recruited.

(1) Larry Hecker, J.D. Committee Chair -- Larry Hecker is a local attorney who has experience in environmental and land use issues and served as Bruce Babbitt's Chief of Staff when Mr. Babbitt was Governor of the State of Arizona.

(2) Katharine Jacobs -- Kathy Jacobs is the Area Director of the Tucson Active Management Area for the Arizona Department of Water Resources.

(3) Nancy Laney, J.D. -- Nancy Laney is the Associate Director of the Arizona-Sonora Desert Museum, a position she has held since 1993. Prior to that, Ms. Laney was an attorney for the University of Arizona, specializing in environmental, real estate and intellectual property matters. For more than 20 years she has been involved in the field of water and natural resources policy as a researcher and attorney. She is also an award winning author of texts and articles. She received her B.S. degree from Arizona State University and her M.P.A and J.D. degrees from the University of Arizona.

(4) Michael McNulty, J.D. -- Michael McNulty is the Managing Partner of Brown & Bain's Tucson office. He began his legal career in natural resources handling water law issues for Rep. Morris Udall, Chairman of the Interior Committee in the US House of Representatives. Thereafter, he served as the first Director of the Tucson Active Management Area, the unit of Arizona's Department of Water Resources responsible for promulgating water conservation regulations in the Santa Cruz and Avra valley watersheds. Since 1984, he has practiced in the water and water utility arenas. He has served as General Counsel to the Metropolitan Domestic Water District since its formation in 1992, and has advised a wide variety of clients in connection with the assured water supply requirements of Arizona's Groundwater Code.

(5) Sharon Megdal, Ph.D. -- Sharon Megdal received her Ph.D. and M.A. in Economics from Princeton, and her A.B. from Rutgers. Currently she is president of MegEcon Consulting, an economic and public policy consulting firm specializing in water resources policy and planning, transportation policy and finance. She is the author of numerous publications.

(6) Bill Roe -- Bill Roe has been involved in land preservation issues for over 20 years and has extensive experience in environmental consulting. For 12 years, Mr. Roe was a member of the Arizona Parks Board. He served on the Arizona Outdoor Recreation Commission for 6 years before that.

B. Meetings/ Workplan - The Implementation Team will begin meeting in the Fall to discuss the fiscal, legal, and water resource ramifications of land use planning under Section 10 of the Endangered Species Act. The Team will work with County staff and a consultant to assess and understand issues related to the cost of conservation and the cost of growth accommodation. In addition to identifying constraints, the Team will recommend mechanisms for implementing conservation and growth accommodation programs.

VI. Funding

On February 24, 1999, Congressman Jim Kolbe and Secretary of the Interior Bruce Babbitt discussed the Sonoran Desert Conservation Plan at an Interior Appropriation Subcommittee Hearing. Congressman Kolbe has supported funding for the Conservation Plan by marking $1 million in funds in the next federal budget. This effort has succeeded through the Subcommittee and full Committee processes. Recently the full House approved the Department of Interior Appropriations bill in a 377-47 vote.

On June 24, 1999, the Senate Appropriations Committee approved an Interior funding bill which specifically marked the Cooperative Endangered Species Fund with this language: "The Senate encourages the Fish and Wildlife Service to consider carefully the efforts in .... Pima County, Arizona for the Sonoran Desert Conservation Plan." Only two other efforts were called out by name in the Senate mark: the Washington County Utah effort to protect the desert tortoise and the Travis County Texas multi-species plan.

If the funding remains available to Pima County after the budget emerges from the Conference process, Pima County will enter into a transfer agreement with the United States Fish and Wildlife Service so the study process can begin immediately when federal funds are available.

In a related effort, Congressman Kolbe is supporting $100,000 in funding for the Sonoran Desert Conservation Plan through the Army Corps of Engineers. This bill goes to full Committee on July 20, 1999.

VII. Timeline

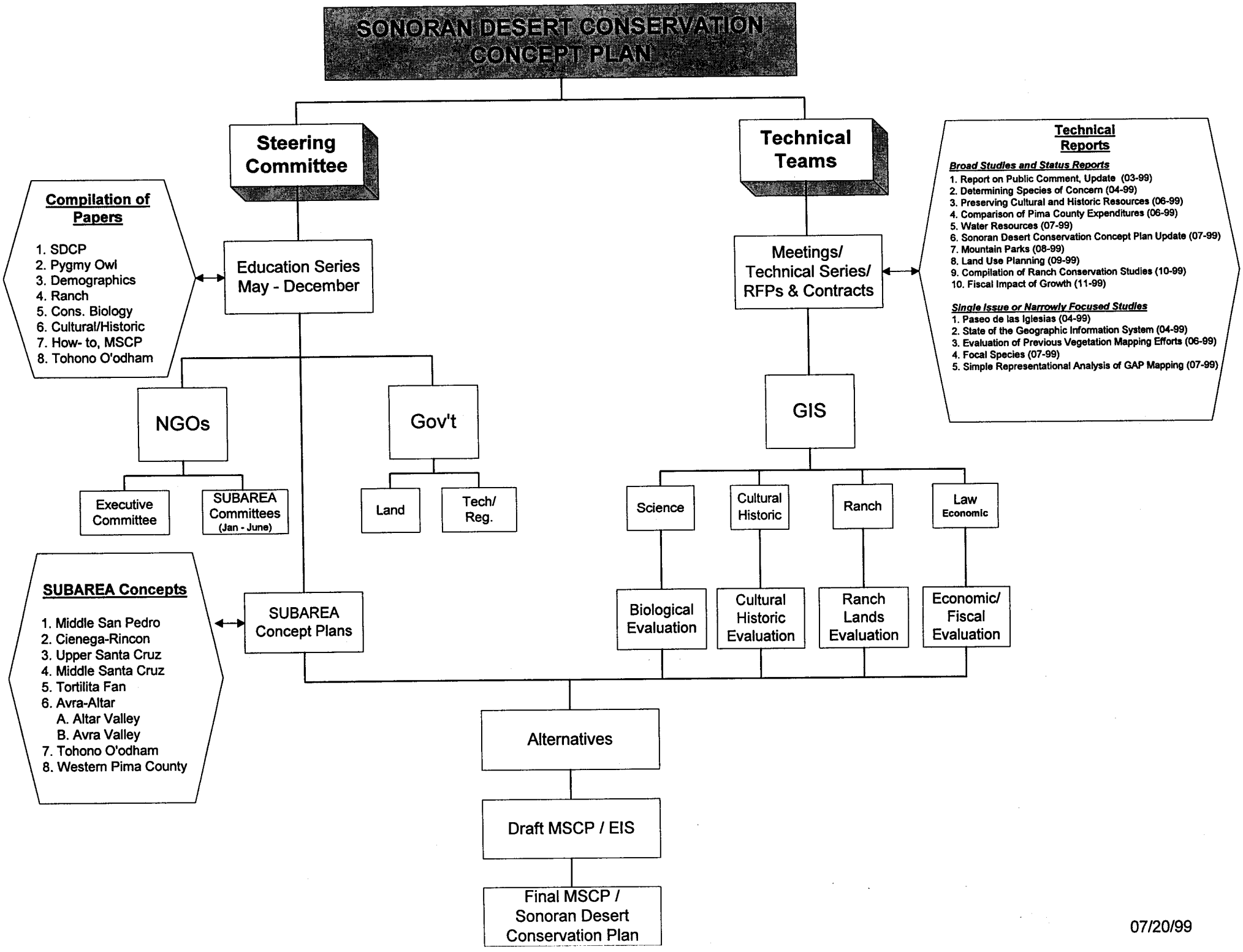
The completion of the Sonoran Desert Conservation Plan depends on funding availability. The following time table shows prior and estimated future dates for completion of various aspects of the conservation planning process, assuming funding availability as described above. The chart on the next page shows the entire process at a glance, with the Steering Committee, public and intergovernmental process running in parallel form to the Technical, information gathering and assessment process.

- October 1998 - March 1999: The project began with the publication of the draft Sonoran Desert Conservation Concept Plan in October of 1998. After a 3 month public comment period, the Board adopted the Plan in concept form in March of 1999.

- April 1999 - December 1999: The Steering Committee was seated and members are attending a series of education sessions. Five Technical Teams were formed, and a series of reports introduce and develop the major subject matter areas of the plan.

- January 2000-July 2000: The Steering Committee will break into subarea land panels and discuss the resources and constraints available in each watershed based subarea. This effort will be informed by members of the Technical Teams, who will be working with staff and consultants to complete GIS mapping and alternative production.

- July 2000 - until completion: The draft Sonoran Desert Conservation Plan, Environmental Impact Statement production, permit application, negotiations, and completion of the Plan will follow.


SONORAN DESERT CONSERVATION CONCEPT PLAN
Steering Committee
Technical Teams
Compilation of Papers
1. SDCP
2. Pygmy Owl
3. Demographics
4. Ranch
5. Cons. Biology
6. Cultural/Historic
7. How- to, MSCP
8. Tohono O'odham
Education Series May - December
Meetings/ Technical Series/ RFPs & Contracts
Technical Reports
Broad Studies and Status Reports
1. Report on Public Comment, Update (03-99)
2. Determining Species of Concern (04-99)
3. Preserving Cultural and Historic Resources (06-99)
4. Comparison of Pima County Expenditures (06-99)
5. Water Resources (07-99)
6. Sonoran Desert Conservation Concept Plan Update (07-99)
7. Mountain Parks (08-99)
8. Land Use Planning (09-99)
9. Compilation of Ranch Conservation Studies (10-99)
10. Fiscal Impact of Growth (11-99)
Single Issue or Narrowly Focused Studies
1. Paseo de las Iglesias (04-99)
2. State of the Geographic Information System (04-99)
3. Evaluation of Previous Vegetation Mapping Efforts (06-99)
4. Focal Species (07-99)
5. Simple Representational Analysis of GAP Mapping (07-99)
NGOs
Gov't
GIS
Executive Committee
SUBAREA Committees (Jan - June)
Land
Tech/ Reg.
Science
Cultural Historic
Ranch
Law Economic
SUBAREA Concepts
1. Middle San Pedro
2. Cienega-Rincon
3. Upper Santa Cruz
4. Middle Santa Cruz
5. Tortilita Fan
6. Avra-Altar
A. Altar Valley
B. Avra Valley
7. Tohono O'odham
8. Western Pima County
SUBAREA Concept Plans
Biological Evaluation
Cultural Historic Evaluation
Ranch Lands Evaluation
Economic/ Fiscal Evaluation
Alternatives
Draft MSCP / EIS
Final MSCP / Sonoran Desert Conservation Plan
07/20/99