DRAFT

MEMORANDUM

Date: July 11, 2000

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

From: C.H. Huckelberry
County Administrator

Re: **Sonoran Desert Conservation Plan Update**

I. Overview

This report provides a brief update on the Sonoran Desert Conservation Plan in the areas of research, education and community participation, and intergovernmental cooperation.

II. Research

There are six elements to the Sonoran Desert Conservation Plan: (1-2) Habitat and Corridors Protection, (3) Riparian Protection, (4) Cultural Resources, (5) Ranch Conservation, and (6) Mountain Parks protection. Land use and fiscal considerations have also been analyzed.

A. Habitat and Corridors Elements -- Biological Evaluation

Since April of 1999, sixteen reports in a series of nineteen have been drafted to assist in the development of the biological element of the Preliminary Sonoran Desert Conservation Plan, which will be issued later this summer. Studies issued so far include:

- *Determining Species of Concern* (April 30, 1999, Science Team and County staff)
- *Pygmy-Owl Update* (November 9, 1999, Consulting biologists and County staff)
- *Science and GIS Update* (November 23, 1999, Science Team, Drs. Stine, Gilpin, staff)
- *Heritage Data Management System* (December, 1999, Science Team and County staff)
- *Biological Evaluation Workplan* (January, 2000, Science Team and County staff)
- *Land Stewardship in Pima County* (February 9, 2000, County staff)
- *Desert Ironwood Primer* (February 22, 2000, Dr. Gary Paul Nabhan)
- *Middle San Pedro Concept Plan* (March 25, 2000, The Nature Conservancy)
- *Land Cover Data Assessment* (April 3, 2000, Recon Consulting)
- *Biological Stress Assessment* (April 17, 2000, Recon Consulting)
- *Review of Vulnerable Species List* (April 17, 2000, Recon Consulting)
- *Geological and Ecological Diversity* (April 29, 2000, Dr. Gary Nabhan, Dr. Mark Dimmitt)
- *Priority Vulnerable Species* (June 8, 2000, Recon Consulting)
- *Pygmy-Owl Investigations* 1997-1999 (July 5, 2000, Consulting biologists)
- *Habitat Selection by Pygmy-Owls* (July 6, 2000, Consulting biologists)
- *Issue of Non-Indigenous Species in Public Reserves* (July 7, 2000, County staff)

These studies have been forwarded to the Board and Science Team, and provided in summary form to the Steering Committee and interested members of the community. The reports are considered to be in draft form and under review by the Science Technical Advisory Team.

During the next few weeks, the following studies will be issued to continue to develop the biological element of the Preliminary Sonoran Desert Conservation Plan.

- *Priority Vulnerable Species Habitat Data Analysis* (Recon Consulting)
- *Non-native Species Analysis* (Recon Consulting)
- *Draft Reserve Design Guidelines, Goals, Opportunities and Constraints* (Recon Consulting)

Regional Biological Evaluation

The study series for the biological evaluation includes and goes beyond the workplan created by the Science Technical Advisory Team by incorporating short term investigations to fill data gaps as they become known. Background on the process includes this history:

- In March of 1999, the Board of Supervisors adopted the concept Sonoran Desert Conservation Plan and directed staff to pursue the scientific studies that establish the basis of a habitat conservation plan under the Endangered Species Act.

- A Science Technical Advisory Team was formed and since April of 1999, reports have been issued and geographic information system data layers have been gathered at a steady rate, increasing the data coverages in the Pima County system from 175 to over 1000 data layers that are now available for analysis as part of the Sonoran Desert Conservation Plan.

- The Science Team, over the course of a six month period, drafted a workplan for a biological consultant who would undertake studies that provide a sound basis for the conservation plan, evaluate and improve existing resource data and mapping, and provide advice about vulnerable species, reserve design and species management programs.

- The workplan is divided into fifteen categories of tasks and has been peer reviewed by scientists with experience in conservation biology and regional habitat conservation planning, including Dr. Reed Noss.

- In mid-November, 1999, Pima County requested proposals for consulting services when it was clear that funds in the amount of $996,000 would be appropriated for Pima County in the federal budget, and transferred to Pima County as a grant from the United States Fish and Wildlife Service in order to conduct the underlying scientific studies for the County's multi-species conservation plan this fiscal year.

- Despite the scale and complexity of the Sonoran Desert Conservation Plan, five consulting firms teamed to submit two proposals. On January 18, 2000, the Board awarded contracts to conduct the biological evaluation for the Sonoran Desert Conservation Plan to RECON (Regional Environmental Consulting) for Tasks I-VI and VIII - XIV in an amount not to exceed $534,564, and Harris Environmental Group for Riparian Vegetation Mapping (Task VII) in an amount not to exceed $232,950.

- The RECON team is led by Paul Fromer, who has directed the habitat conservation planning efforts in Clark County, Nevada; San Antonio, Texas; and Riverside County and numerous other county and city efforts throughout California, dating back to 1989. Mr. Fromer is considered to be one of the most experienced biologists leading the field of regional habitat conservation planning. RECON teamed with local biologists and will manage the project from its local office, thereby gaining economies and local expertise that allowed them to streamline their proposal.

- The Harris Group has superior experience in mapping, with Dr. Lisa Harris having served as the project manager in the multi-phase Wildlife Habitat Inventory Project (WHIPS).

- The Request for Proposals specified that seven major deliverables be available to Pima County by the summer of 2000 so that a Preliminary Sonoran Desert Conservation Plan can be presented to the Board of Supervisors at this time.

- The consulting team has met all deadlines and submitted and number of products, including:

    1) Threats assessment (Task II.A)
    2) Recommendations on adjustments to vulnerable species list (Task III)
    3) Draft vulnerable species data summaries, including distribution maps (Task IV)
    4) Draft data analysis (Task VI.B)
    5) Pilot vegetation mapping exercise (Task VII. C1 and C2)
    6) Draft land cover community map (Task VIII.A)
    7) Draft reserve design guidelines (Task IX.A)

- **Threats Assessment based on Existing Plans**

    In March of 2000, a report entitled *Biological Stress Assessment* identified key biological threats based on review of existing and proposed land or water uses described by the technical reports prepared by Pima County, existing land use plans prepared by federal, local, state and tribal jurisdictions, incidental take permits, and approved development plans and subdivision plats. Emphasis was on identifying the specific components of existing and proposed land or water uses, by sub-area, that pose the greatest biological threats over the next 30 years to focal species and special habitats, plant associations, and communities identified by the STAT.

- **Review of Vulnerable Species List**

    In April of 2000, a report entitled *Review of Vulnerable Species* was issued. The report reviewed the Science Team's and identified those species that are not recommended for further evaluation because:

    1. Species conservation can be accomplished as a result of other species, habitat or plant community protection afforded by the SDCP.

2. Insignificant or non-viable numbers of the species occur in the planning area and conservation is best accomplished elsewhere (accidentals, range peripherals, etc.).

3. The species does not occur in the study area, nor is it likely to occur in the study area within the planning horizon, or

4. The species is too broadly distributed to help differentiate among a range of plan alternatives.

- **Data Compilation and Synthesis for Vulnerable Species**

A draft report was issued in June entitled *Priority Vulnerable Species*. For vulnerable species (categories 1 and 2) affirmed in the review of vulnerable species, the Consulting team compiled existing biological and management information. All sources of data were documented. The report reviewed at least: Arizona Game and Fish Department (AGFD) records, State and Federal government reports and data compilations, AGFD species Abstracts and BISON-M compilations, as well as the relevant scientific literature. For each vulnerable species the Consultant prepared a written summary of information, including

1. Federal status.
2. State and federal recovery goals.
3. Other status (global rankings, state lists, other lists).
4. Taxonomy, especially of Pima County populations.
5. Past and present distribution.
6. Habitat requirements, including home range requirements and ability to utilize major human land use categories.
7. Life history.
8. All available demographic (population density, status, trend, survival rates, reproductive rates, sex and age ratios, etc.) and distributional information within Pima County and range-wide. Define population or (sub-population) basis in the planning area, and identify any areas of special significance to the Pima County populations.
9. Habitat trends within the planning area, if known.
10. Current and potential threats to species or populations in Pima County, considering the location, amount, and quality of habitat already protected, as well as existing and potential pest species. Identify the mechanism of threats.
11. Management needs, including sensitivity to human activity and densities, corridor needs, key relationships, migratory requirements, etc.
12. Results of past mitigation activities.
13. Existing monitoring and research programs.

The Science Team is now in the process of securing review of each compilation by species experts.

- **Land Cover Community Inventory**

  In March of 2000, Recon produced as part of a report on *Land Cover Community Inventory*, a consolidated land cover map that represents the best available information for the study area. Data sources were documented along with an assessment of the accuracy of data sources and the decision-making process for producing the land cover map.

- **Vulnerable Species Habitat Data Analysis**

  In the near future, Recon will issue the draft *Priority Vulnerable Species Habitat Data Analysis.* It meets the terms of this task from the biological workplan: Once data is gathered, the Consultant shall evaluate the feasibility of using existing and developed GIS covers to model species habitat, distributions, or habitat potential for focal species and pest species. Evaluation of GIS modeling capabilities in this context will be conducted in close cooperation with the Project Manager and County GIS staff. The Consultant will clearly indicate the GIS covers, or combinations of covers, that may serve to represent particular habitats or communities used by a species. As part of this evaluation, a matrix will be constructed, showing presence or absence of vulnerable species (rows) as they relate to environmental characteristics depicted in various GIS layers (columns). These characteristics would primarily be related to land cover. The matrix will be based on the species data summaries as well as expert opinion. Then representation of each species' habitat within the existing reserve network will be quantified, and summarized, showing species richness by land-cover type.

- **Riparian Vegetation Mapping**

  Harris Environmental is producing the following map and has submitted interim items

  1. Vegetation maps and a map showing field verification locations as Arc/Info vector coverages or in a format pre-approved by the Pima County Department of Transportation Technical Services GIS Section.

  2. A complete reproducible set of mylars registered to 7.5 minute USGS quadrangle maps. Each mylar shall contain a legend, scale, index map, and title block.

  Each map shall portray the locations of boundaries and the geographic extent of vegetative communities. Each polygon shall be labeled numerically with the vegetation classification. In addition, one mylar index map shall be provided.

  3. A report shall be prepared describing the methods, the scale and source of base information used, assumptions made, the nature of any interim products, and a non-statistical assessment of reliability in the mapping in terms of 1) positional accuracy and 2) classification accuracy as it varies by geographic area and by classification category.

- **Pest Species Data Summary**

  The biological consulting team is ahead of schedule in carrying out this task and has expanded it to include community level analysis: In close consultation with the STAT, evaluate pest species (plant and animal) which have the potential to expand into the planning area. The evaluation shall consider the vulnerable species literature review, consultation with experts, and an evaluation of the potential variable in climatic and ecological conditions likely to occur in the planning area within the next 30 to 50 years. The list of potential pest species shall be ranked according to likelihood of occurrence within the planning window and by potential threat to elements of the conservation plan. For up to ten pest species approved by STAT, summarize existing data and identify data gaps for:

  1. Taxonomy.
  2. Habitat, affected native species, communities or habitats.
  3. Effects on host or vulnerable species, including specific mechanisms, if known.
  4. Rate of invasion, spread, or date of introduction.
  5. Population trend.
  6. Factors affecting spread and distribution, hosts, etc.
  7. Legal status.
  8. Management methods, efficacy and sensitivity.
  9. Research ongoing and planned.
  10. Potential future status in the planning area.

  Map the range of up to ten selected pest species within the planning area, to produce GIS maps to aid with the reserve design. The selection of pest species to be mapped shall be made in consultation with the STAT. Verify pest species mapping by ground-truthing using a sampling method and analysis.

- **Preserve Design and Management Recommendations:**

  In the next weeks, a draft report that sets out *Draft Reserve Design Guidelines, Goals, Opportunities and Constraints* will be issued in partial completion of this task from the biological workplan: Following the data synthesis phase, make reserve design recommendations based on the best available scientific information for all remaining focal species, special habitats, species associations and plant communities. The reserve (plan) shall be designed to obtain the goals and objectives of the plan, integrating conservation of focal species, special habitats, plant associations and plant communities according to a priority ranking developed above. The reserve design shall clearly indicate priority areas that identify the most vulnerable components. The reserve design and management recommendations from the biological consultant shall be based upon conservation biology principles, including long-term population viability (for species which might be listed or considered for listing), focal species' ecology and behavior, community ecology, and relevant biological considerations.

Future deliverables from the consulting team include completion of these tasks:

- **Vulnerable Species Goals**

  For all vulnerable species (categories 1 and 2), the Consultant shall develop recommendations for County-level conservation goals and objectives to the STAT. County-level goals must be consistent with SDCP goals (Table 1) and recovery plan (USFWS) goals. Conservation goals and objectives may be expressed in terms of demographic or population units (numbers of populations, density, age-class, etc.) or in terms of habitat units, depending on information available. The scientific basis for choosing a demographic or habitat-based objective should be described.

- **Habitat Suitability Modeling**

  Working collaboratively with County GIS and the decision support model team, refine the habitat suitability models by identifying and consulting appropriate experts, identifying literature sources, identifying limitations of data sources, and providing technical opinions related to these products. The habitat suitability models produced by the decision support model team will be iterative products.

- **Adaptive Management Plan Recommendations and Manual**

  The Consultant shall prepare a management plan that includes:

  Species and community-specific management recommendations and practices.

  Clear statements of desired future conditions for each management subject.

  A plan for assessing progress toward desired project goals including assessment and adjustment of management actions. The process should detect surprises, and generate improved decision-making over time.

  Management recommendations and long-term monitoring plans for assessing continuing and developing threats, including pest species. Monitoring must be able to detect population trends and habitat quality changes.

  A process for reviewing, analyzing, and disseminating data gathered.

  Recommendations of acceptable levels of deviation of species populations and communities that account for natural environmental variability, including disease and catastrophic events; determine action levels for increased monitoring or intervention.

  Consideration for incidental take that is phased with achievement of specified population levels as determined through monitoring.

Procedures for changed circumstances, defined as listing of new species, modifications in activities described by the original HCP, or modifications in the monitoring program.

Procedures for dealing with unforeseen circumstances (which shall not include natural variation, such as catastrophic flooding, disease).

Review by species and community experts and the STAT, with incorporation of changes as recommended.

Prioritized research recommendations consistent with the plan goals, and classed as short-term, mid-term, and long-term.

Mitigation requirements that consider species' habitat requirements and conservation of core habitats and linkages, as well as the efficacy of the mitigation method used. Avoiding and minimizing impacts should be the first option considered to limit impacts to vulnerable species.

Provisions for independent scientific review of research and monitoring results.

- **Evaluate Plan Impact on Federally Listed and Candidate Species**

Issuance of a Section 10 (a)(1)(B) Endangered Species Act Permit is a federal action and must be evaluated under the Endangered Species Act for effects on listed species and species proposed for listing. The Consultant will prepare an assessment of the impacts on federally listed threatened and endangered species, species proposed for listing, and designated and proposed critical habitat within the planning area for four plan alternatives. Three alternatives must meet the SDCP biological and species goals. The fourth alternative shall be the no-action alternative. It shall estimate the amount of take for each listed species for each alternative, the effects on the species population, and the impacts on the recovery of each species. Biological assessments shall include all threatened, endangered, and candidate species, species proposed for listing, and proposed and designated critical habitat in the planning area, regardless of inclusion in the SDCP. Each Alternative Assessment shall estimate local population effects and effects of the action (plan) on the entire species, as required under the Endangered Species Act. The assessment shall follow USFWS guidelines regarding Section 10 (a)(1)(B) permits and Biological Assessments. Each assessment will include:

1. A description of the planned action.
2. Description of the project area biological resources and conditions.
3. A list of federally listed species and critical habitat in the project area.
4. Descriptions of the kinds of effects expected from the plan alternatives.
5. A summary of population levels and trends for each listed, or proposed, species in the project area and range-wide.
6. Assessment of direct, indirect, and cumulative impacts based on the proposed action (the SDCP).

- **Assistance with Preparation of NEPA Documents**

  The Consultant shall assist Pima County in preparing National Environmental Policy Act (NEPA) documents, as consistent with the SDCP, and prepare technical studies and analyses in support of the SDCP's NEPA process and documents. This will be limited to include descriptions of the project areas' biological resources, impacts of the plan on these resources (see V. A. above) including Threatened and Endangered Species, and evaluation of impacts on common biological components and plant communities. The Consultant shall provide technical information and assistance in a cooperative working relationship that emphasizes meeting project goals, objectives and quality standards. NEPA documentation assistance is secondary to the primary goal of developing the Reserve Design and Management Plan.

B. Riparian Protection Element

Since April of 1999, fifteen reports in a series of sixteen have been drafted to assist in the development of the Riparian Protection Element of the Sonoran Desert Conservation Plan. This Element is closely related to the biological aspects of the plan, and will be issued later this summer. Studies issued so far include:

- *Paseo de las Iglesias* (April 1999, County staff)
- *Water Resources and the Sonoran Desert Conservation Plan* (July 20, 1999, staff)
- *Focus on Riparian Areas, SDCP Update* (July 21, 1999, County staff)
- *Environmental Restoration* (December 15, 1999, County staff)
- *Evaluation of Riparian Mapping* (December, 1999, County staff)
- *Perennial Streams, Intermittent Streams, Shallow Groundwater* (January 26, 2000, PAG)
- *Resources of Arivaca* (March, 2000, AWET)
- *Prioritization of Streams for Conservation* (April 5, 2000, Science Team, County staff)
- *Pima County's Watersheds and Watercourses* (April 18, 2000, Barbara Tellman et al)
- *Cocio Wash and the Gila Topminnow* (April 27, 2000, Biologists, County staff)
- *Riparian Vegetation Mapping Pilot Study* (May 8, 2000, Harris Environmental)
- *Riparian Habitat and Riparian Vegetation Mapping* (May 8, 2000, County staff)
- *Springs in Pima County* (May 23, 2000, County staff, Science Team)
- *Water Usage Along Selected Streams in Pima County* (July 10, 2000, PAG)
- *Aquatic Vertebrate Conservation in Pima County* (July 10, 2000, Dr. Philip Rosen)

These studies have been forwarded to the Board and Science Team, and provided in summary form to the Steering Committee and interested members of the community. They are all considered to be in draft form and under review by the Science Technical Advisory Team.

During the next few weeks, the following study will be issued to continue to develop the Riparian Element of the Preliminary Sonoran Desert Conservation Plan.

- *Preliminary Riparian Element -- Riparian Protection, Restoration and Management*

C. Mountain Parks Element

Since August of 1999, one major report and eight subarea studies have been drafted to assist in the development of the Mountain Parks Element of the Sonoran Desert Conservation Plan:

- *Mountain Parks and the Sonoran Desert Conservation Plan* (August 1999, County staff)

This study has been forwarded to the Board and provided in summary form to the Steering Committee and interested members of the community. During the next few weeks, the following report, including a full analysis of eight subareas, will be issued to continue to develop the Mountain Parks Element of the Preliminary Sonoran Desert Conservation Plan.

- *Preliminary Mountain Parks Element -- Reserves & Biologically Significant Resource Lands*

D. Ranch Conservation Element

Since November of 1999, nine reports about ranching in a series of fourteen have been issued to assist in the development of the Ranch Conservation Element of the Sonoran Desert Conservation Plan. Report issued so far include:

- *Ranching in Pima County* (November 1999, County staff)
- *Ranching in the Middle San Pedro* (March 2000, County staff)
- *Ranching in the Altar Valley* (March 2000, County staff)
- *Ranching in the Avra Valley* (April 2000, County staff)
- *Ranching in the Cienega-Rincon* (May 2000, County staff)
- *Ranching in the Upper Santa Cruz* (May 2000, County staff)
- *Ranching in Western Pima County* (May 2000, County staff)
- *Ranching in the Tortolita Fan* (June 2000, County staff)
- *Ranching in the Middle Santa Cruz* (June 2000, County staff)

These studies have been forwarded to the Board, the Ranch Technical Advisory Team, and provided in summary form to the Steering Committee and interested members of the community.

During the next few weeks, the following reports will be issued to continue to develop the Ranch Conservation Element of the Preliminary Sonoran Desert Conservation Plan.

- *Conservation Tools for Ranching*
- *Altar Valley: History, Resource Assessment, and Environmental Assessment* (3 reports)
- *Preliminary Ranch Conservation Element- Our Common Ground, A Conservation Objective*

E. Cultural Resources Element

Since May of 1999, sixteen reports in a series of nineteen have been drafted to assist in the development of the Cultural Resources Element of the Preliminary Sonoran Desert Conservation Plan, which will be issued later this summer. Studies issued so far include:

- *Preserving Cultural and Historic Resources* (May 18, 1999, County staff)
- *Cultural Resources in the Middle San Pedro* (March 25, 2000, County staff)
- *Cultural Resources in the Altar Valley* (March 25, 2000, County staff)
- *History of Archaeological, Historical and Ethnographic Research* (April 26,2000, SRI)
- *Cultural Resources in the Avra Valley* (April 29, 2000, County staff)
- *People of Southern Arizona, Past and Present* (May 10, 2000, SRI)
- *Cultural Resource Sites Depicted on Early Maps* (May 11, 2000, SRI)
- *Cultural Resources in the Cienega-Rincon* (May 20, 2000, County staff)
- *Cultural Resources in the Upper Santa Cruz* (May 20, 2000, County staff)
- *Cultural Resources in Western Pima County* (May 20, 2000, County staff)
- *Cultural Landscapes, Relationships Between Land and People* (May 23, 2000, SRI)
- *Overview of Traditional Cultural Places* (May 30, 2000, SRI)
- *Cultural Landscapes of History in Southern Arizona* (May 30, 2000, SRI)
- *Cultural Resources in the Tortolita Fan* (June 3, 2000, County staff)
- *Cultural Resources in the Middle Santa Cruz* (June 3, 2000, County staff)
- *Cultural Landscapes of Prehistory* (July 3, 2000, SRI)

These studies have been forwarded to the Board and Cultural Resources Team, and provided in summary form to the Steering Committee and interested members of the community. They are all considered to be in draft form and under review by the Cultural Resources Technical Advisory Team. During the next few weeks, the following studies will be issued to continue to develop the Cultural Resources Element of the Preliminary Sonoran Desert Conservation Plan.

- *Cultural Resources -- The Classic Period* (SRI Consulting)
- *Mapping and Modeling Cultural Resources* (Arizona State Museum, County staff)
- *Preliminary Cultural Resources Element -- Saving the Past for the Future*

F. Land Use Considerations

Since October of 1998, eighteen reports in a series of twenty-seven about land use, legal and fiscal issues have been drafted to assist in the development of the such data and information for the Sonoran Desert Conservation Plan. Reports issued so far include:

- *Sonoran Desert Conservation Concept Plan* (October 21, 1998)
- *Correspondence in Response to the Draft SDCP* (January 19, 1999)
- *Report, Comment, Recommendations -- Draft SDCP Concept* (March 2,1999)
- *Comparison of County Expenditures Per Capita, Other Govts* (June 29, 1999)
- *History of Land Use in Pima County* (January 31, 2000, County staff)

- *Impact of Unregulated Development, Service Demand* (February 22, 2000, County staff)
- *Impact of Unregulated Development, Community Level* (March 6, 2000, County staff)
- *Proposal in Support of the Ironwood Preserve* (March 21, 2000, County staff)
- *Land Use in the Middle San Pedro* (March 24, 2000, County staff)
- *Land Use in the Altar Valley* (March 24, 2000, County staff)
- *Committed Land* (April 25, 2000, County staff)
- *Land Use in the Avra Valley* (April 26, 2000, County staff)
- *Mining Interests in the Ironwood Preserve Area* (April 26, 2000, County staff)
- *Land Use in the Cienega-Rincon* (May 8, 2000, County staff)
- *Land Use in the Upper Santa Cruz* (May 11, 2000, County staff)
- *Land Use in Western Pima County* (May 18, 2000, County staff)
- *Land Use in the Tortolita Fan* (May 30, 2000, County staff)
- *Land Use in the Middle Santa Cruz* (June 1, 2000, County staff)

These studies have been forwarded to the Board and provided in summary form to the Steering Committee and interested members of the community. During the next few weeks, the following reports will be issued to continue to develop the land use, legal and fiscal information of the Preliminary Sonoran Desert Conservation Plan.

- *Recent Aquatic and Riparian Protection Rules*
- *Importance of the Cienega Watershed Area*
- *Multi-Species Conservation Plan Comparisons*
- *State Trust Land Issues*
- *Density and Service Intensity*
- *Implementation Options and Constraints*
- *Infrastructure Report*
- *Growth Management Study*
- *Draft Regional Analysis of Land Use for the Preliminary Sonoran Desert Conservation Plan*

G. Summary of Research

- 16 of 19 studies have been issued to develop the biological element
- 15 of 16 studies have been issued to develop the Riparian Element
- 10 reports, including subareas analysis, create the basis of the Mountain Parks Element
- 9 of 12 reports have been issued to develop the Ranch Conservation Element
- 16 of 19 studies have been issued to develop the Cultural Resources Element
- 18 of 27 reports have been issued to provide data on land use, legal and fiscal issues
- The summaries of fifty reports from this series are attached to this memorandum.
- A total of 103 studies creates the basis for information for the Preliminary Sonoran Desert Conservation Plan, which will be issued later this summer.

III. Education and Community Participation

Since May of 1999, thirteen education sessions have been held to bring data and information to the Steering Committee and interested members of the community as they prepare to make recommendations on reserve design to the Board based on the options available.

- The discussion of options will begin this fall at scoping meetings according the schedule provided below.
- The education and information sessions that Pima County has held for the Steering Committee to date have not been a part of prior conservation planning processes.
- The average attendance for each meeting of the thirteen sessions was 115 people. There are 84 people on the Steering Committee.
- The top five meetings for highest attendance were:

  1) May 22, 1999 -- Sonoran Desert Conservation Plan & Endangered Species Act (165)

  2) September 18, 1999 -- Conservation Biology (159)

  3) August 14, 1999 -- Ranch Conservation (130)

  4) June 26, 1999 -- Pygmy-Owl (128)

  5) April 29, 2000 -- Avra Valley / Ironwood Preserve (127)

- Other sessions were held on these topics:

  6) December 11, 1999 -- Tohono O'odham Nation (113)

  7) July 24, 1999 -- Land Use, Water, Social and Economic Considerations (112)

  8) October 16, 1999 -- Cultural Resources (108)

  9) November 6, 1999 -- How to Draft an MSCP (106)

  10) March 25, 2000 -- Resources of the Altar Valley and Middle San Pedro (95)

  11) June 3, 2000 -- Resources of the Tortolita Fan and Middle San Pedro (89)

  12) June 24, 2000 -- Regional Review of Elements (85)

  13) May 20, 2000 -- Resources of Cienega, Upper Santa Cruz, Western Pima County (80)

Future Meetings

The United States Fish and Wildlife Service and the biological consulting team have agreed to the following draft schedule for processing the Sonoran Desert Conservation Plan:

Aug 2000	Preliminary Report on Sonoran Desert Conservation Plan -- comment period begins, pre-scoping working meetings. Notice of scoping: FWS publishes Notice of Intent in Federal Register with schedule of scoping meetings (time, location, date)
Sept 2000	Notice of scoping: publish notice of scoping meetings in local newspapers
Sept 2000	Scoping: 3 scoping meetings/workshops in different locations
Sep-Dec 2000	Steering Committee formulates recommendations on alternatives
Jan-Mar 2001	County provides Technical Draft of HCP and EIS to FWS for review
Apr 2001	FWS provides comments on Technical Draft HCP and EIS
May 2001	County provides revised Tech Draft HCP and EIS for review (30 days)
June 2001	FWS provides comments on Revised Tech Draft HCP and EIS
July 2001	FWS, County, and other applicants develop IA
Aug 2001	County and other applicants submit application (with HCP and IA)
Sep 1, 2001	AZ FWS submits application package (application with HCP, Draft EIS, Draft IA) to Alb. Regional Office
Nov 1, 2001	FWS publishes Notice of Availability and request for comments for permit application, Draft EIS, and Draft IA in FR and local newspapers (90 days) Announces 3 hearing dates
Nov 2, 2001	AZ FWS begins preparation of Biological Opinion
Dec 2001	FWS holds 3 hearings on Draft EIS
Feb 1, 2002	Close of comment period
Feb 2, 2002	County, RECON, and FWS begin preparation of responses to comments and changes to documents
May 1, 2002	County submits technical Draft of Final HCP and EIS to FWS
June 1, 2002	FWS provides comments on Technical Draft HCP and EIS
July 1, 2002	County provides revised technical draft of HCP and EIS to FWS
Aug 1, 2002	FWS provides comments on Revised Technical Draft HCP and EIS

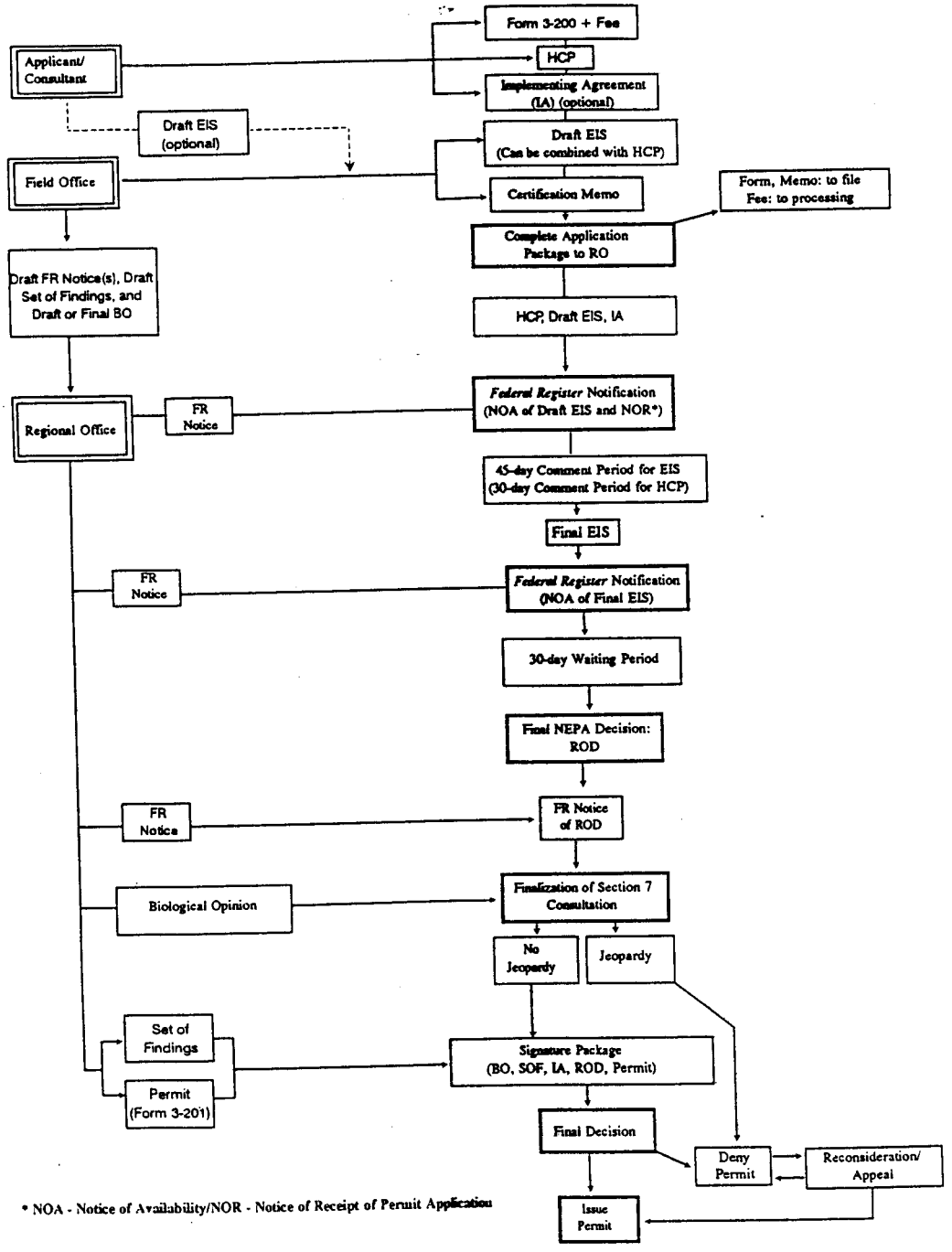
Sept 2002 AZ FWS finalizes Biological Opinion and drafts findings

Oct 1, 2002 Az FWS submits final package to Regional office (Final HCP, EIS, IA, Record of Decision, final Biological Opinion, findings)

Nov 2002 FWS Publishes Notice of Availability of Final EIS

Dec 2002 FWS makes final decision on permit (signature on ROD, IA, Permit, findings)

Typical Processing Steps for Section 10(a)(1)(B)
Incidental Take Permit Applications Requiring an EIS



* NOA - Notice of Availability/NOR - Notice of Receipt of Permit Application

IV. Intergovernmental Cooperation

Pima County continues to work with the Tohono O'odham Nation, staff from the Bureau of Land Management, National Parks Service, United States Geological Survey, United States Fish and Wildlife Service, United States Army Corps of Engineers (Planning and Regulatory), Air Force, and Arizona Game and Fish Department in developing the Sonoran Desert Conservation Plan. The County has started to work with the City of Tucson on the Tres Rio riparian project. This fall the Implementation Team of the Sonoran Desert Conservation Plan will begin to meet. Additional local government representatives will be invited to join.

V. Conclusion

- In March of 1999, the Concept Sonoran Desert Conservation Plan was adopted by the Board of Supervisors to frame planning efforts.
- Funding for the biological evaluation was not available until the year 2000.
- Pima County undertook an education series and gathered data in anticipation of carrying out an aggressive time line for creating the information needed for the conservation plan, once funding became available.
- During the first 120 days of the funded study period, 60 reports were generated.
- Over 100 reports will constitute the basis for the Preliminary Sonoran Desert Conservation Plan issued later this summer.
- This fall the Steering Committee for the Conservation Plan will participate in scoping meetings. These meetings are widely noticed, including publication in the Federal Register.
- An independent facilitator will conduct the scoping meetings involving the Steering Committee and interested members of the community.
- The United States Fish and Wildlife Service has agreed to prioritize the Sonoran Desert Conservation Plan so that it can move through the next stages of federal process quickly.
- Preliminary reports on each of the Elements of the Conservation Plan, and the Draft Preliminary Sonoran Desert Conservation Plan itself will be issued in the next few weeks.
- The chart on the next page summarizes the study series leading up to the Preliminary Sonoran Desert Conservation Plan. Summaries of 50 of the 103 reports are attached to this report.

Concept
SONORAN DESERT CONSERVATION PLAN
(March 1999)

DRAFT

Habitat and Corridors

- Determining Species of Concern 04-99
- Pygmy-Owl Update 11-99
- Science & GIS Update 12-99
- Heritage Data Management System
- Biological Evaluation Workplan 01-00
- Land Stewardship 02-00
- Desert Ironwood Primer
- Land Cover Data Assessment 03-00
- Middle San Pedro Concept Plan
- Biological Stress Assessment
- Review of Vulnerable SpeciesList 04-00
- Geological & Ecological Diversity
- Priority Vulnerable Species 06-00
- Vulnerable Species Data Analysis 07-00
- CFPO Investigations
- CFPO Habitat Selection
- Issues of Non-Native Species
- Non-Native Species
- Draft Reserve Design 08-00

Preliminary Habitat and Corridors Element

Riparian Restoration

- Paseo De Las Iglesias 04-99
- Focus on Riparian Areas 06-99
- Water Resources & The SDCP 07-99
- Evaluation Riparian Mapping 12-99
- Environmental Restoration in Pima County
- Stream Reaches and Shallow Groundwater Zones 01-00
- Arivaca Resources 03-00
- Priority Streams In Pima County 04-00
- Watercourse Study
- Cocio Wash and the Gila Topminnow
- Pilot Riparian Mapping Report 05-00 A
- Draft Riparian Analysis B
- Springs Report in Pima County
- Groundwater Usage 08-00
- Aquatic Vertebrate Conservation

Preliminary Riparian Element 08-00

Mountain Parks

- Mountain Parks & The SDCP 08-99
- Mountain Parks Middle San Pedro 07-00 1
- Mountain Parks Cienega Rincon 2
- Mountain Parks Upper Santa Cruz 3
- Mountain Parks Middle Santa Cruz 4
- Mountain Parks Tortolita Fan 5
- Mountain Parks Altar Valley 6
- Mountain Parks Avra Valley 7
- Mountain Parks Western Pima County 8

Preliminary Mountain Park Element

Ranch Conservation

- Ranching in Pima County 11-99
- Ranching, Middle San Pedro 03-00 1
- Ranching, Altar Valley 2
- Ranching, Avra Valley 04-00 3
- Ranching, Cienega Rincon 05-00 4
- Ranching, Upper Santa Cruz 5
- Ranching, Western Pima County 6
- Ranching, Tortolita Fan 06-00 7
- Ranching, Middle Santa Cruz 8
- Conservation Tools for Ranching 07-00
- Altar Valley History
- Altar Valley Resource Assessment
- Altar Valley Environmental Assessment

Preliminary Ranch Conservation Element 08-00

Cultural and Historic Preservation

- Preserving Cultural/ Historic Restoration 05-99
- Cultural Resource Middle San Pedro 03-00 1
- Cultural Resource Altar Valley 2
- Cultural Resource Avra Valley 04-00 3
- History of Archaeological, Historical, and Ethnographic Research
- Cultural Resource Cienega Rincon 05-00 4
- Cultural Resource Upper Santa Cruz 5
- Cultural Resource Western Pima County 6
- People of Southern AZ, Past and Present
- Cultural Resource Sites as Depicted on Early Maps of Pima County
- Cultural Landscapes of History in Southern AZ
- Overview of Cultural Landscapes, History
- Relationships Between Land & People
- Overview of Traditional Cultural Places in Pima County 06-00
- Cultural Resources Tortolita Fan 7
- Cultural Resources Middle Santa Cruz 8
- Overview of Cultural Landscapes, Prehistory 07-00
- Classic Period
- Mapping & Modeling Cultural Resources

Preliminary Cultural/Historic Preservation Element 08-00

Land Use, Legal and Fiscal Considerations

- Expenditure Comparison 06-99
- History of Land Use 01-00
- Impact of Unregulated Development 02-00
- Unregulated Development at Community & Watershed Level 03-00
- Ironwood Preserve
- Land Uses of San Pedro 1
- Land Uses Altar Valley Subarea 2
- Committed Land 04-00
- Land Use Avra Valley 3
- Mining Interests in the Ironwood Preserve
- Land Use Cienega-Rincon Subarea 05-00 4
- Land Use Upper Santa Cruz Subarea 5
- Land Use Western Pima County Subarea 6
- Land Use Tortolita Subarea 7
- Land Use Middle Santa Cruz 06-00 8
- Recent Regs, Aquatic 07-00
- Focus on the Cienega Watershed
- MSCP Comparison
- State Trust Land
- Density & Service Intensity
- Implementation Options & Constraints
- Infrastructure Report
- Growth Management Study

Preliminary Analysis of Land Use 08-00

Public Process/ Education

- Session #1 SDCP and ESA May 22, 1999
- Session #2 CFPO June 26, 1999
- Session #3 Social Economics July 24, 1999
- Session #4 Ranch Conservation August 14, 1999
- Session #5 Conservation Biology September 18, 1999
- Session #6 Cultural and Historic Preservation October 16, 1999
- Session #7 How to, MSCP November 6, 1999
- Session #8 Tohono O'odham Nation December 11, 1999
- Session #9 Altar Valley Subarea San Pedro Subarea March 25, 2000
- Session #10 Avra Valley Subarea April 29, 2000
- Session #11 Cienega Rincon Subarea Western Pima County Upper Santa Cruz Subarea May 20,2000
- Session #12 Tortolita Fan Subarea Middle Santa Cruz Subarea June 3, 2000
- Session #13 Cultural Hist Element Ranch Element Mountain Park Element Riparian Element Habitat/Corridor Elements June 24, 2000
- Sessions 14-20 Scoping, Steering Committee's consideration of alternatives.

Preliminary
SONORAN DESERT CONSERVATION PLAN
(August 2000)

S. Pesqueira - 07/10/00

ATTACHMENTS -- SUMMARIES OF FIFTY MAJOR STUDIES SINCE MARCH 1998

HABITAT AND CORRIDORS BIOLOGICAL ELEMENT

MEMORANDUM

Date: April 30, 1999

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

From: C.H. Huckelberry
County Administrator

Re: **Attached Discussion Paper Entitled *Determining Species of Concern in Pima County***

Background:

The attached 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. During the past 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.

Report:

This 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. (Table 1, pages 1-2 to 1-5)

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. (Table 3, page 3-2)

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. (Table 4 pages 4-2 to 4-8)

A) 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);

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

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

D) 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. (Table 5, pages 5-1 to 5-2)

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. (Page 6-1, Appendix B, pages B-1 to B-6) Fifty non-native species are described to highlight the need for proper management of native species and natural resources. (Page 7-1, Appendix C, pages C-1 to C-6)

Summary:

On May 11, 1999, the Science Technical Advisory Team to the Sonoran Desert Conservation Plan will meet for the first time to begin discussions about the biological underpinnings for our regional multi-species conservation plan. The attached report provides an initial frame of reference for the Science Team. It will likely undergo numerous changes before recommendations are made to the Steering Committee about what species should be covered by the Sonoran Desert Conservation Plan. I will forward all reports to the Board as they are produced by staff.

Attachment

MEMORANDUM

Date: November 9, 1999

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

From: C.H. Huckelberry
County Administrator

Re: **Pygmy-Owl Update**

I. Summary

The pygmy-owl was listed as endangered in 1997, but notice of the potential listing dates back to 1989, when the United States Fish and Wildlife Service included the pygmy-owl as a candidate for listing throughout its range. Despite the long period of advance warning, the study effort by wildlife agencies and other interested parties prior to the listing was minimal. The attached discussion paper entitled *Pygmy-Owl Update* provides a report on pygmy-owl research and rulings, evaluates whether the efforts of the community are leading to the recovery, downlisting and delisting of the pygmy-owl, and concludes that with the exception of valuable in-kind services of the Arizona Game and Fish Department pygmy-owl biologist, meaningful financial support for research and conservation planning efforts has been limited to federal and County contributions.

The basis for listing the pygmy-owl as endangered is essentially three-fold: a) habitat loss; b) potential vulnerability to extinction due to environmental, demographic and genetic threats; and c) the absence of effective conservation measures. Since the time of listing, it has become evident that development pressures on the northwest side exceed what the Service described in the 1997 Final Rule, the information necessary to understand the needs of the pygmy-owl was not pursued in advance of the listing, and has not received substantial funding beyond the Pima County study effort, and effective long-term conservation measures will be defined through the Sonoran Desert Conservation Plan. However, until this goal is achieved for the pygmy-owl and each of the 85 imperiled plants and animals that the Plan will protect, federal guidance, federal consultations, and federal rulings will shape many interim land use decisions.

The Sonoran Desert Conservation Plan, and Pima County's funding of a comprehensive pygmy-owl study series, which has included giving money to the State to conduct studies, have been the most broad based responses by government entities to deal with pygmy-owl and multi-species protection. At least five of the six elements of the Sonoran Desert Conservation Plan will, when implemented, provide the proactive approach that can head off conflicts between land use plans and species protection. The following summary and the attached report describe past, present and on-going pygmy-owl research efforts and rulings.

Significant progress has been made through survey and telemetry work conducted in the past months. A lasting solution to endangered species listings will occur only when these research efforts are completed and the resulting plans are implemented. This solution will be reached much faster if efforts are focused and there is broad cooperation among all levels of government.

II. Basis for the Listing

The United States Fish and Wildlife Service can determine endangered status under Section 4 of the Endangered Species Act if one of five factors is met. The pygmy-owl was listed as endangered on March 10, 1997 based on three major factors including:

1. Habitat Modification - the present or threatened destruction, modification, or curtailment of its habitat or range;

2. Lack of Effective Conservation Programs - the inadequacy of existing conservation and regulatory mechanisms; and

3. Other Factors - including the environmental, demographic and genetic vulnerability of the pygmy-owl to random extinction.

III. Habitat Modification and Lack of Conservation Programs as a Basis for Listing

1. Impact to Corridors and Critical Habitat - In discussing the degree of habitat loss the Service described the growth pressures on the northwest side and stated that it was "aware of five specific housing and development projects operating or in the planning stages that would affect habitat where the majority of the birds in Arizona currently exist." Aerial photos within the report show the urbanization pattern of pygmy-owl habitat around Arthur Pack Park from 1983 to 1999, and maps show the committed and vacant land within the same area. Growth pressures on the northwest side exceed levels cited by the Service at the time of listing.

2. Impact to Riparian Habitat - In addition to the impacts of urbanization in the area of a known owl population, the Final Rule describing the reasons for the listing identifies riparian losses as a major factor leading to the listing of the pygmy-owl and states that "the Federal Clean Water Act contains provisions for regulating impacts to river systems and their tributaries. These mechanisms have been insufficient to prevent major losses of riparian habitat, including habitats occupied by the pygmy-owl." Within the last two weeks, a federal district court enjoined aspects of the Army Corps Nationwide Permit program until a regionally based programmatic impact analysis is performed, and the Army Corps consults with the Service regarding the effect of the Nationwide Permit program. As these steps are taken, individual permits that require the Corps to take a closer look at the impact of proposed projects will be the course available.

3. Addressing the Habitat Modification Issues Under the Sonoran Desert Conservation Plan - Five of the six elements of the Sonoran Desert Conservation Plan have the potential to address the habitat modification issues that led to the listing of the pygmy-owl.

    - Habitat and Corridors - These elements call for protection of Critical and Sensitive Habitat and Corridors, once such biologically sensitive lands are identified through resource evaluation and actually protected under a conservation program.

    - Riparian Restoration - The Sonoran Desert Conservation Plan also includes a Riparian Restoration element that will provide a comprehensive assessment of the decline in water, riparian habitat and riparian dependent wildlife. Within the text of the report, preliminary benchmarks are established to gain a sense of the magnitude of riparian losses. In general, science planning for the Sonoran Desert Conservation Plan has been underway since the Board ordered the Plan to be developed. Some of the early findings and understandings of the planning process to date indicate that the current resource base is not sufficient to maintain suites of species much less reverse the direction of continued listings under the Endangered Species Act. The pygmy-owl is just one of approximately 85 plants and animals in need of protection in Pima County. It is estimated that 60 to 85 percent of Sonoran Desert wildlife depend on riparian habitat for some part of their life cycle. Riparian habitat itself has been targeted by the Science Team for protection under the Plan.

    - Ranch Conservation plays a role in protecting the habitat of the pygmy-owl. This survey season it was discovered that the Altar Valley ranch community is home to the largest known population of pygmy-owls -- 31 individuals. The Valley provides a potential corridor and a connection to owls that might be protected and recovered on the Buenos Aires National Wildlife Refuge.

    - Mountain Park expansion under the Sonoran Desert Conservation Plan also promotes pygmy-owl protection. Pima County would like to see the Tortolita Mountains and the Tortolita Alluvial Fan Ironwood Forest protected, and has filed an Arizona Preserve Initiative application to try to acquire some of this land. This area is currently the home to the second largest known pygmy-owl population.

4. Addressing Federal Habitat Issues as Part of the Sonoran Desert Conservation Plan - As mentioned, the District Court has recently ordered that the Corps must consult with the Service about the effect of the Section 404 Nationwide Permit program on the pygmy-owl and its habitat. What this means for Pima County is that the information gathered during the cumulative impact analysis should correspond with some of the information that is being gathered by the Science Technical Advisory Team for the Sonoran Desert Conservation Plan as the biological evaluation for Pima County is undertaken. Likewise, the Section 7 consultation ordered by the Court for the federal agency should be parallel to the Section 10 negotiation that Pima County undertakes with the Service to establish the terms of the conservation plan, since both these processes address the effects of

urban development on native species and their habitats. As Pima County moves forward with the Sonoran Desert Conservation Plan, and the federal entities move forward with their assessment of permitting programs on wetlands, a number of deficiencies within and between the programs can be addressed. The varying standards that exist between local and federal entities could be aligned so that the resource is effectively protected and the permit seeker gains assurances. Permitting programs for water and land protection could be streamlined and work in a coordinated fashion. And, the application of standards could be more accurately tailored to conditions within the Pima County environment.

The District Court's scrutiny of federal permitting practices should result in a shared local, state and federal study effort and a more effective and coordinated permit program at the federal and local level when impacts are better understood, and advance planning allows permit seekers to know where biologically sensitive areas are so they can be avoided.

IV. Vulnerability to Environmental, Demographic and Genetic Threats as a Basis for Listing

1. Research initiatives - One of the three major factors underlying the listing is vulnerability to environmental, demographic and genetic threats. Threats include at least the following: low population numbers, isolated and fragmented populations, inbreeding, unknown habitat requirements (water, cover), unknown status of prey availability, unknown status in relation to predators and competitors, and unknown ability to resist pathogens. On March 2, 1999, the Board of Supervisors adopted the Sonoran Desert Conservation Plan in concept and funded a series of studies to advance the state of knowledge about the pygmy-owl and begin to address each of these questions through: 1) a broad survey effort; 2) a genetics investigation; and 3) telemetry and habitat assessments. The timeline for these 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.
   - October 1999: Survey results reported to Pima County (results within this text).
   - February 15, 2000: Report on telemetry and habitat assessment due to Pima County.
   - March 2000: Final report, genetics study due to Pima County.

2. The Need for Federal, State and Local Funding - To date, Pima County has made the largest financial commitment among all government entities in an attempt to close the information gap which led to the listing, and it is the only local entity actively funding the comprehensive pygmy-owl study series. An intergovernmental effort would move the comprehensive study series forward at a much faster pace. This has been demonstrated through advances realized in a combined survey effort during 1999. Pima County, the United States Fish and Wildlife Service, the Forest Service, the Bureau of Land Management, and Arizona Game and Fish coordinated survey efforts and in so doing, covered several times the land base of the previous year's effort, and discovered new populations of owls in the process. In summary, as information is gathered about the number of owls, their location and habitat needs, their tolerance for various land uses, their health, and their prospects for long-term viability and ultimately for recovery, one of the three major factors that led to the listing will be better addressed.

3. 1999 Study Effort - In 1999, a total of five governments funded survey work: United States Fish and Wildlife Service, the Forest Service, the Bureau of Land Management, Arizona Game and Fish, and Pima County. Pima County alone, contracting through the Harris and Duncan team, covered 226,068 acres, or 353.2 square miles, which is almost 3 times the call area covered under the 1998 U.S. Fish and Wildlife Service contract, and it is 5 to 15 times the area covered by the State survey efforts conducted between 1993 and 1996.

   The combined intergovernmental effort resulted in the observation of 74 to 78 pygmy-owls in 1999: 41 adults and 33 to 37 offspring:

   - 31 owls were found in Altar Valley
   - 27 owls were found in Northwest Tucson
   - 12 owls were found in Pinal County
   - 8 owls were found in Organ Pipe National Monument.

   In 1999, Pima County also funded some of the telemetry work performed by Arizona Game and Fish through a $60,000 contract. Based on preliminary information:

   - 11 nest sites were located and monitored and owls at each site were banded
   - Nest sizes varied from 2 to 5 babies and at least 16 of 35 fledglings dispersed
   - At least 13 owls had transmitters placed on them (including 3 adult males)
   - At least 8 juvenile owls were tracked through dispersal
   - At least 5 owl mortalities occurred during the survey season

4. Harris/Duncan 1999 Survey Report - During the 1999 survey season (from January to July), Pima County undertook the most comprehensive study effort of the decade through a contract awarded to Harris Environmental Group through a competitive proposal process. Covering over one quarter of a million acres, this search for owls exceeded the scope of all combined efforts during the first five years of surveys conducted by the State

before the listing of the pygmy-owl. Pima County also obtained site specific results from the survey effort conducted on numerous future bond projects. After determining where surveys were already being conducted by U.S. Fish and Wildlife, Arizona Game and Fish, the Forest Service, and the Bureau of Land Management, the remaining study area was divided into 9 survey districts and 2,632 call stations were established, under the Pima County contract. To put this in perspective, in 1998, the same team staked out 768 call points. In 1996, Arizona Game and Fish worked from a total of 356 call points. The 1999 effort allowed research to take place in areas that have not been surveyed in the past.

Agency	Call Stations	Acres
1996 Arizona Game and Fish surveys	356	14,144
1998 U.S. Fish and Wildlife surveys	768	86,000
1999 Pima County Government surveys	2,632	226,000

At 348 of the 2,632 call stations, there was a "mobbing" response from other birds to the surveyor's tape recorded pygmy-owl calling. Mobbing is a "defensive aggressive response to the broadcast call, such as scolding vocally and/or attacking physically" (i.e. swooping in on the caller). While mobbing can mean many things, it may indicate that "local birds are familiar with pygmy-owls." The report states that: mobbing "behaviors may be evidence that the birds have had experiences with pygmy-owls, either in the area surveyed, or other places (Mexico and Central America) if the birds are migratory." The report recommends that "areas where mobbing occurred be resurveyed in future efforts." Other specific sites are identified for future survey efforts.

5. Ongoing and Future Research

A. Genetics Study - In March of 1999, 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? Work is ongoing and a final report is due to Pima County by March of 2000.

B. Telemetry and Habitat Analysis - The workplan accepted by the Board includes telemetry studies. 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 with Pima County, will issue a final report to the County by February 15, 2000.

C. Studies in Mexico and Pima County in Fiscal Year 2000 - The Regional Office of the U.S. Fish and Wildlife Service has funded $120,000 for pygmy-owl studies during the year 2000 survey season. Estimates are that $28,000 of this amount will fund telemetry and habitat work within Pima County and Arizona, while $92,000 will fund studies in Mexico, including surveys, habitat assessment, and assessments of dispersal potential as well as threats and constraints to cooperative management across the border. These studies will continue to build the knowledge base established during the past two survey seasons when owls were located near the international border.

D. Recovery Plan - 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. Publication of the Recovery Plan by the United States Fish and Wildlife Recovery Team is anticipated in the upcoming months. Recovery Plans typically have a research agenda with a specific budget. Success in funding the research needs identified within the Recovery Plan will lead to a quicker resolution of the dilemmas surrounding this listing.

E. Artificial Nest Box Study - Given the low number of known pygmy-owls, protective management strategies should be invoked to conserve the existing population. Artificial nest structures have been used in Texas with success. Nest box availability for Arizona owls might reduce predation and increase the ability to gather life history data. A proposal will be submitted to the National Fish and Wildlife Foundation and other potential funding sources to begin nest box management strategies in Arizona.

V. Recommendations for Future Action

With the listing of the pygmy-owl as an endangered species in March of 1997 due to: a) habitat loss, b) vulnerability to extinction, and c) absence of conservation, a great deal of scientific study, analysis, and research has been performed, funded primarily by the federal government and Pima County, with the Arizona Game and Fish Department providing significant, in-kind personnel contributions. This increased information as it continues to be completed will form the basis of a rational, organized, and structured response to the listing and hopefully, in future years, lead to de-listing. The greatest promise for this action comes from the eventual development and adoption, by all jurisdictions, of the Sonoran Desert Conservation Plan. The work of the Steering Committee Educational series, also known as "Scientific Boot Camp," will be completed on December 11, 1999, and Plan development can begin in earnest with much of the required background analysis and information gathering completed. I will be providing to the Board, within the next three weeks, a comprehensive update on the progress of formulating the Sonoran Desert Conservation Plan and each of its six elements.

In the meantime, this update report on the pygmy-owl can be used to organize and structure future actions both of Pima County and other local jurisdictions, as well as federal and state agencies. Of importance will be:

1. Recovery Plan - With release of the draft recovery plan, Pima County, as well as all other local jurisdictions, should carefully review their existing land use codes to determine what interim measures may be necessary to reduce the rate of critical habitat loss now being incurred. The analysis in this report regarding committed and zoned lands in the northwest demonstrates the continuing threat to habitat loss and fragmentation.

2. Riparian Protection - The United States District Court action on cumulative riparian losses underscores the importance of reexamining land use codes and floodplain management regulations that allow incremental impacts and losses to vital and significant riparian habitats. We must review existing codes to determine that the desired level of riparian habitat protection is occurring, and what mitigation strategies should be employed and acted upon if riparian habitat losses are unavoidable based on exercising private property or vested zoning rights of individual land owners.

3. Continue Study Funding - Additional studies related to the pygmy-owl referenced in this report should be funded. These continuing studies will help determine actual vulnerability to extinction. A private/public partnership should be formulated to continue funding of these efforts. In addition, given the vast State Trust land holdings in Pima County and, in particular, within critical and sensitive habitat, the State of Arizona should participate in funding said studies.

4. Mitigation Bank - Clearly, critical habitat losses will be unavoidable due to continuing implementation of public improvements to highways, parks, schools, etc. as well as local government inability to curtail or eliminate some habitat losses because of individuals exercising private property rights or vested zoning in accordance with the laws of various local jurisdictions. In such instances habitat losses can be mitigated through the establishment of a land trust that has as its sole purpose acquisition and protection of critical habitat. A Pima County land trust for this purpose needs to be established.

5. Cooperative Agreements - Based on information now available, as well as interest expressed in development of effective conservation measures by other local jurisdictions and federal agencies, it is now appropriate to develop cooperative agreements that contain substantial commitments of known actions to advance the Sonoran Desert Conservation Plan.

I will be bringing specific reports on each of these elements to the Board in the next two months that will require Board direction.

Attachment

MEMORANDUM

Date: November 23, 1999

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

From: C.H. Huckelberry
County Administrator

Re: ***Sonoran Desert Conservation Plan Science and Geographic Information Systems Update***

I. Background

This memorandum summarizes four documents that reflect some of the work that Pima County and Department of Interior staff, along with the Science and Geographic Information Systems (GIS) Technical Teams, have created to develop the biological component of the Sonoran Desert Conservation Plan. The first document, entitled *Determining Vulnerable Species Within Pima County*, updates the April 30, 1999 discussion paper, and describes over 100 species, 12 habitat types, and 20 plant communities that are currently being considered for protection under the Sonoran Desert Conservation Plan.

The second document is the request for proposals for the biological consultant for the Sonoran Desert Conservation Plan. It contains a detailed work plan and describes the tasks that will be carried out by the consultant. Through the efforts of Congressman Kolbe and Secretary Babbitt, and with the support of Congressman Pastor and Senator Kyl, an appropriation for $1 million is included in the latest version of the federal budget. The workplan for the biological evaluation requires that seven major deliverables be received by Pima County on or before June 30, 2000. Described in more detail below, these work products will allow the County to issue a major status report about the Sonoran Desert Conservation Plan in the summer of 2000.

The third document is a habitat conservation plan decision support system workplan for which Pima County has applied for funding from the National Fish and Wildlife Foundation. 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 that will combine the best available biotic, cultural resource and socio-economic data to produce alternative potential preserves that attain a balance of fiscal and natural resources.

The fourth document is an interim report from Pima Association of Governments on a study being conducted to create geographic information system coverages for perennial and intermittent streams and shallow groundwater. In addition to these efforts, County staff along with staff from the Department of the Interior have gathered data from other jurisdictions and performed analysis of this information to accelerate the time line involved in developing the Sonoran Desert Conservation Plan. Whereas the County GIS system had about 175 coverages before planning began, we now have 1004 data layers, gathered by County staff.

II. Determining Vulnerable Species within Pima County

In April of 1999 a report entitled *Determining Species of Concern* was issued to launch the work of the Science Technical Advisory Team. The report described the status, location, distribution and habitat needs of species already recognized by the federal government as imperiled, extirpated species, and the surprisingly large number of species that are in decline and potentially on the way toward listing if conservation measures are not put in place. Since the release of this report, the Science Technical Advisory Team has met on a monthly basis and refined the original report.

The second draft, found at attachment 1, is renamed *Determining Vulnerable Species within Pima County, Arizona.* It includes a statement of the goals and objectives of the Science Technical Advisory Team and expands the list from 75 species of concern to over 100 vulnerable species. The report also presents two systems of categorizing species that are preliminarily recommended for protection under the conservation plan.

Under one method of categorization, the report describes 24 federally listed, proposed and candidate species for Pima County; 13 extirpated species are described (most of which were dependant on aquatic habitat that is now lost); and four subcategories of vulnerable species are described: (1) species at risk in Pima County and for whom habitat in Pima County is crucial for their existence; (2) species at risk in Pima County and /or are generally declining throughout their range; (3) species that are rare in Pima County, but the overall status is unknown; and (4) species that are at risk in Pima County, but are not at risk overall.

Under a second method of categorizing vulnerable species, the report describes (1) keystone species, i.e., those who enrich ecosystem function in a unique and significant manner, with effects beyond their numerical abundance; (2) flagship species, i.e., charismatic species that have wide appeal; and (3) umbrella species, who generally serve as mobile links at the landscape scale through predation, seed dispersal or pollination.

In addition to making preliminary recommendations about particular species to protect, the report recommends protection of particular habitats and plant communities. Foremost are aquatic environments, wetlands, and riparian woodlands, which the Science Team considers "to be a high priority for conservation.... A large number of species listed within the report either live in aquatic or riparian habitats, or utilize them in some way. Primary threats include groundwater pumping, which has reduced water tables needed to sustain these ecosystems."

The importance of the Riparian Restoration element of the Sonoran Desert Conservation Plan becomes more apparent as the Science Team continues its work. Accordingly, riparian vegetation mapping is included in the scope of work for the biological consultant, and data layers for shallow ground water and perennial and intermittent streams are now being developed.

III. Biological Consultant Services for the Sonoran Desert Conservation Plan

On November 12, 1999, the request for proposals found at attachment 2 was publicly noticed and sent to all known interested biological consultants. Proposals are due to Pima County on December 16, 1999. A recommendation by a subcommittee of the Science Technical Advisory Team will be forwarded to the County Administrator and the Board so that work may begin in January, pending funding availability. It was noted earlier that the latest version of the federal budget contains an appropriation of $1 million for the Sonoran Desert Conservation Plan. County staff is working with the Department of Interior to determine how quickly these funds can be transferred, if adopted in the final budget. The work plan was developed over a six month period by the Science Team and it was the subject of extensive peer review. In general, the biological consultant contract will create a program of work needed to achieve the biological goals of conserving Pima County's indigenous plants and animals. The contract will have several phases, with services including the following:

- Compile, document and synthesize existing information on vulnerable species, and high priority biotic communities as recommended by the Science Team. Produce or synthesize new GIS-based data layers on selected biotic communities. Identify data gaps and prioritize data needs. Produce a threats assessment.

- Recommend species/habitat goals. Review remaining focal species and special habitats or plant communities to devise conservation strategies. Investigate pest species important to the planning area and planning goals.

- Prepare and recommend preserve designs with specific management recommendations that meets the goals of the plan for selected species, habitats and plant communities as approved by the Science Team.

These phases are divided into fifteen categories within the scope of work, each containing a number of specific tasks. A number of draft, interim and final work products are called for under the work plan, with seven major deliverables due to Pima County by June 30 of 2000:

1) Threats assessment;
2) Recommendations on adjustments to vulnerable species list;
3) Draft vulnerable species data summaries, including distribution maps;
4) Draft data analysis;
5) Pilot riparian vegetation mapping;
6) Draft land cover community map; and
7) Draft reserve design guidelines.

These work products will allow County staff to draft a major status report about the scientific research and other elements of the Sonoran Desert Conservation Plan, by next summer. A detailed description of each component of the biological evaluation work plan is found on pages 2 through 14 of the sample contract in attachment 2.

IV. Habitat Conservation Plan GIS Decision Support System

The Pima County Geographic Information System has an extensive library of data layers. Prior to work being conducted to develop the Sonoran Desert Conservation Plan, the County held approximately 175 coverages within its system. Since April of 1999, County staff members have gathered additional data bases, bringing the total number of coverages to over 1000. 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 early 2000.

County staff members have also entered into a collaborative effort with conservation biologists who have experience with complex modeling to create a habitat conservation plan GIS decision support model. The principal investigators working with Pima County in this effort are: Dr. Michael Gilpin from the Department of Biology at the University of California at San Diego; Dr. Peter Stine of the United States Geological Survey at California State University; Dr. Richard Church of the University of California at Santa Barbara; and Dr. Ross Gerrard. A full description of the project is found at attachment 3. In general, the project attempts to address issues that have plagued prior habitat conservation planning efforts, such as whether sufficient desirable alternatives are being considered; whether there has been an objective analyses of a full range of alternative outcomes; and whether the proposed preserve alternatives maximize all desired features and minimize risks and costs.

The research effort to improve decision support in the area of habitat conservation planning focuses on combining the best available biotic, cultural and fiscal data within an optimization models with the intent that this approach will 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. The approach shows the trade-offs between various levels of conservation, obtained by reserving certain lands, and the economic and social costs of doing so. The components of the proposed decision support tool can be summarized within these four 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.

The primary product expected from this effort is a customized software package, combined with linkages to commercially available software that executes this entire model. Several scientific publications will result from the research and development activities of this project. Pima County has applied for an award from the National Fish and Wildlife Foundation to pursue this project. Both the California and Southwest Regions of the United States Fish and Wildlife Service also have committed funding to support this project.

V. GIS Coverage for Perennial Streams, Intermittent Streams, and Shallow Groundwater

Reports issued since April of 1999 consistently point out the need to protect and restore riparian habitat. To accelerate the development of information in this area, County staff along with the Pima Association of Governments have created three GIS coverages to show perennial streams, intermittent streams, and areas of shallow groundwater within eastern Pima County. An interim report on this project is found at attachment 4. Final maps and the GIS product will be delivered in December, in time for the Science Team to review the results, and the consultant to incorporate this information into the biological evaluation.

VI. Conclusion

Since the Board adopted the Sonoran Desert Conservation Plan in concept in March of 1999, technical teams have been meeting to review staff reports and existing data, and create workplans to carry out the components of the Sonoran Desert Conservation Plan. Reports on the progress of other technical teams will be sent to the Board in the coming weeks. This memorandum conveys information about some of the work that Pima County and Department of Interior staff, along with the Science and Geographic Information Systems (GIS) Technical Teams, have carried out so far to develop the biological component of the Sonoran Desert Conservation Plan. Recommendations for award of contract to a biological consultant will also be sent to the Board as soon as possible so that work can begin and deliverables can be produced to create the Sonoran Desert Conservation Plan.

Attachments

MEMORANDUM

Date: February 9, 2000

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

From: C.H. Huckelberry
County Administrator

Re: *Land Stewardship in Pima County*

I. Report

The attached draft entitled *Land Stewardship in Pima County* is the seventeenth in the technical series of reports being prepared for the Sonoran Desert Conservation Plan. It is one of several documents that describes biological status and management protection considerations under the conservation plan. The report provides (1) an overview of levels of management protection afforded to land within Pima County; (2) vegetation communities viewed within the context of varying levels of management protection; (3) an analysis of the amount of different types of vegetation that have been damaged or destroyed by urban, agricultural and mining uses; and (4) recommendations for gathering and assessing data that will improve the accuracy of future reports on this topic.

II. Levels of Reserved Land

The *Land Stewardship* report addresses an area of misunderstanding that arises in the public discussions of land use by describing how much land is protected within reserves, the level of protection, and the amount of unprotected land within Pima County. A national initiative called the Gap Analysis Program provides the framework and some of the information that staff relied on to assess the management status of land for biodiversity at six levels:

Status 1a: An area that has permanent protection from conversion of natural cover and a mandated management plan to maintain a natural state within which disturbance events are allowed or mimicked through management.

Status 1b: Same as 1a, but may have uses that detract from the quality of the land, with up to 5% of the land being managed in an unnatural state.

Status 2: Similar to 1b, but over 5% of the land is managed in an unnatural state.

Status 3a: An area managed for biodiversity, but not subject to permanent protection.

Status 3b: An area managed for other purposes but which confers some protection for federal status species, and has some extractive or intensive uses.

Status 4: An area allowing conversion of natural land, or an area with unknown status.

III. Method

The attached report provides a detailed explanation of the methods used to create this report, including an identification of the strengths and weaknesses of the data. To determine land stewardship, county staff members took steps including:

- Digitizing maps of the reserves in Pima County and reviewing and verifying boundaries with land managers. As a result, a more accurate mapping of the existing reserve system is now available.

- Researching, gathering, reading, and analyzing the management plans of existing reserves in order to assign a GAP management status. Table 2 within the report shows the over twenty reserves in the county, identifies the managing entity and notes the activities permitted, delineated into 23 categories from mining to gazing to hunting to hiking.

- Performing analysis of reserved land areas within each watershed subarea planning unit of the Sonoran Desert Conservation Plan.

- Estimating the amount of eight different vegetation types that have been damaged or destroyed as a relative measure by urban, mining and agricultural uses (although the impact of water diversions and pumping have not been described in this report).

IV. Results of the Analysis

Tables within the report summarize the acreage of land within each reserve in Pima County and the level of management, or GAP status of each. In general:

- 73.5 percent of all land in Pima County is within Status 4, i.e., there is no protection against conversion of natural cover to unnatural cover.

- 15 percent of all land in Pima County is within Status 1a, the highest protection, with 443,524 acres of that total managed by the U.S. Fish and Wildlife Service, 388,810 managed by the National Parks Service, 41,806 managed by the Forest Service, 7,182 acres managed by the Bureau of Land Management, and 1,243 acres managed by Pima County.

- 2.7% of all land in Pima County is within Status 1b, managed by four stewards: U.S. Fish and Wildlife (77,003 acres); Forest Service (57,120 acres); National Park Service (19,238); and The Nature Conservancy (2,793).

- 0.7% of all land in Pima County is within Status 2, with five stewards: Pima County (18,112 acres); National Park Service (13,994 acres); Arizona State Parks Board (5,453 acres); Bureau of Land Management (3,245 acres); and Bureau of Reclamation (2,717 acres).

- 0.05% of all land in Pima County is within Status 3a, with Pima County managing 2,643 acres, and The Nature Conservancy managing 180 acres at this level.

- 8% of all land in Pima County is within Status 3b, with five stewards: Forest Service (238,328 acres); Bureau of Land Management (132,275 acres); University of Arizona (51,984 acres); Department of Defense (44,278 acres); and Pima County (5,261 acres).

- Results of calculating the amount of vegetation damaged or destroyed show that as of 1992, urbanization had caused losses of over one quarter of a million acres, or more than twice the acreage of agriculture and mining combined.

- In terms of total acreage, the creosote-bursage series and the palo verde-mixed cacti series have suffered equally high losses as a result of these three land uses.

- As a percentage of total "baseline" vegetation, the riparian and saltbush communities have suffered greater losses (relative to their total acreage in Pima County) than have creosote-bursage or palo verde-mixed cacti vegetation, with losses on the order of 47% within the deciduous swampforest biome, 33% loss within the riparian and oasis forest (cottonwood-willow), and 50% loss within the Sonoran Desertscrub (saltbush) biome.

Type of Vegetation Displaced by Land Uses in Pima County		
GAP Vegetation Biome (Series)	**Acreage**	**% Loss of Baseline**
Chihuahuan Desertscrub (Creosote-Tarbush)	427	3%
Sonoran Desertscrub (Creosote-Bursage)	148,505	11%
Scrub Grassland (Mixed Grass-Scrub)	30,000	2%
Madrean Evergreen Forest (Encinal)	30	<<1%
Mogollon Deciduous Swampforest (Mixed Broadleaf)	7,569	47%
Sonoran Desertscrub (Palo verde-Cacti)	144,640	5%
Sonoran Riparian and Oasis Forest (Cottonwood-Willow)	939	33%
Sonoran Desertscrub (Saltbush)	22,351	50%
Sonoran Desertscrub (Unclassified)	1018	N/A
Unclassified	97	N/A
Water	24	N/A

The report notes that the data does not reflect landscape level conversions of grasslands to what is now creosote bush habitat, which may include tens of thousands of acres in Eastern Pima County. Loss of sacaton and other grassland cover in riparian areas is also not a part of the analysis of the attached report, since this baseline was altered prior to the mapping which forms the basis of the current analysis.

V. Conclusion:

The *Land Stewardship* report discusses management plans and the potential to achieve greater protection within the existing preserves by improving plans or tailoring them to what might ultimately be prescribed through the Sonoran Desert Conservation planning process.

Reserve managers are invited to review this report for purposes of accuracy and future planning. The Pima County Parks and Recreation Department has undertaken a more extensive review of management plans in anticipation of defining the Mountain Parks Element of the Sonoran Desert Conservation Plan.

This week, an invitation was issued to all federal land managing entities to enter into a cooperative relationship with Pima County to conduct a similar review of plans to assess the regional potential to meet endangered species compliance obligations through the improvement of reserve management practices and plans.

The report also points out important documentation needs for the final conservation plan, including the need to more precisely quantify mineral withdrawals within reserves, as well as the existing and potential affect of surface water diversions and groundwater pumping to otherwise protected land.

Attachment

MEMORANDUM

Date: February 22, 2000

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

From: C.H. Huckelberry
County Administrator

Re: *Desert Ironwood Primer*

I. Report

It is a privilege to forward the attached report entitled *Desert Ironwood Primer* from the Arizona-Sonora Desert Museum in coordination with the Sonoran Desert Conservation Plan effort. Written by Dr. Gary Nabhan and other scientists, the *Desert Ironwood Primer* is the first study that takes a comprehensive view of ironwood habitats in both the United States and Mexico, evaluating the ecological and cultural resources supported by the ancient ironwood tree. Divided into two parts, the study provides an overview of the history and ecology of desert ironwood, and a discussion of the binational research effort undertaken to produce the report. A number of recommendations are offered by the authors, which I support as part of the Sonoran Desert Conservation Plan and as interim measures to offer protection to areas identified by the authors as having extraordinary ecological significance.

II. Ecological Significance

The *Desert Ironwood Primer* establishes the importance of ironwood as a habitat modifying keystone species and nurse plant that has a role in supporting the biodiversity of over 500 Sonoran Desert species, including the endangered cactus ferruginous pygmy-owl. At the site specific level, biodiversity associated with ironwood can be even higher. The ironwood-bursage habitat in the Silverbell Mountains of Pima County is associated with 674 species, including 64 mammals and 57 bird species. Some of the highlights from the report include these points:

- Ironwood "ranks among the most ecologically and economically important plant species in the region. ... It's influence stands out in two biotic communities: 1) ancient cactus and legume forests of desertscrub on rocky bajadas and alluvium in adjacent valleys; and 2) xeroriparian habitats, which occur as narrow curving corridors along ephemeral and intermittent watercourses in the driest portions of the Sonoran Desert." (P. 4)

- "Ironwood generates a chain of influences on associated understory plants, affecting their dispersal, germination, establishment, and rates of growth. ... Ironwood is the dominant nurse plant in some subregions of the Sonoran Desert." (P. ii)

  "The mere presence of ironwood and other legume trees can increase the number of bird species in desertscrub habitat by 63%." (P. ii)

- "Recent studies show that without the protective cover of the desert legumes, the distributional ranges of saguaro, organ pipe, and senita cactus would retreat many miles, to more southern, frost-free areas." (P. iii)

- "Protecting ironwood habitat in Pima County, Arizona, will benefit a different mix of native species than would be conserved in ironwood habitats currently being protected on the islands or coasts of the Gulf of California." (P. v)

- "North of the U.S. - Mexico border, the highest ironwood densities we recorded per hectare came from Arizona Uplands sites in Pima County (Ragged Top, 35 trees/ha; Cocoraque and Saguaro National Park West 22 trees/ha)." (P. 14)

Ironwood Densities in Pima County	
Location	**Ironwood/Hectare**
Organ Pipe National Monument (Northern Areas)	37-90 ironwoods / hectare
Ragged Top (Silverbells)	35 ironwoods / hectare
Cocoraque (Brawley Wash)	21.25 ironwoods / hectare
Saguaro National Park West	21.25 ironwoods / hectare
Tortolitas	11.25 ironwoods / hectare
Mason Audubon Center, NW Tucson	11.25 ironwoods / hectare
Cabaza Prieta National Wildlife Refuge	11.25 ironwoods / hectare
Organ Pipe National Monument (cut areas)	2.5 ironwoods / hectare

- In general, densities in Mexico range from 1.25 to 30 trees per hectare. The report points out that "it appears ironwood densities ... are greater near the species' northernmost limits in the Arizona Uplands and Lower Colorado River Valley." (P. 14)

- "Lush riparian habitats, such as closed-canopy mesquite bosques, are often assumed to be the most threatened habitat type in this region. However, mounting evidence indicates that the biodiversity associated with xeroriparian habitats has become just as imperiled. At least 31 breeding bird species declined locally in riparian mesquite bosques within the last half-century. Thirty of these birds also spend part of the year in ironwood habitats." (P. 21-22)

- "The Ragged Top site ... contributed the highest levels of species richness [of the study], with six of the ten plots having the highest levels within the entire region." (P. 56-57)

III. Need for Greater Protection

The report points that the United States offers limited protection for ironwood, compared to Mexico, despite the importance of the ironwood stands to the species itself, and to the larger Sonoran Desert system.

The Ragged Top and Cocoraque Rock areas are identified in the report as priorities for new protection and for strengthened conservation management, since "within the region as a whole, the [Ragged Top, Ironwood Picnic Area, and Cocoraque sites] contribute the highest values of significance to biodiversity conservation." (P. 59).

IV. Recommendations

Pages 61 through 64 contain recommendations from the authors based on a decade of study by the science community.

The conservation related recommendations will be forwarded to the Science Technical Advisory Team for consideration as part of the Sonoran Desert Conservation Plan.

I have directed staff to formulate a proposal for the Board's consideration which incorporates to the extent possible the recommendations found on pages 62-64. These include:

- Requiring assessments to determine the extent of ironwood destruction during the permitting process;
- Salvaging and relocating ironwood;
- Protecting the areas of highest density ironwood;
- Protecting and devising a corridor of stepping stone reserves within ironwood habitats for the benefit of species, including the pygmy-owl; and
- Planning and implementing protection strategies for ironwood as needed in wash, rocky slope and valley/plains ironwood habitats.

The *Desert Ironwood Primer* is the most comprehensive biological review that has emerged during the planning process for the Sonoran Desert Conservation Plan, and it points out the importance of understanding the value of our resource base within the larger context of natural systems. We look forward to more collaborations with the Arizona-Sonora Desert Museum and to basing policy proposals on the comprehensive science based analysis that we are privileged to see now, in the example of the attached *Desert Ironwood Primer*.

Attachment

MEMORANDUM

Date: April 3, 2000

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

From: C.H. Huckelberry
County Administrator

Re: *Land Cover Data Assessment in Pima County*

I. Background

This memorandum summarizes the attached report by Recon entitled *Land Cover Data Assessment in Pima County*. In the workplan established by the Science Technical Advisory Team for the Sonoran Desert Conservation Plan, one of the fifteen tasks identified for the biological evaluation requires the consultant to:

1) Produce a consolidated land cover map that represents the best available information for the study area;

2) Document data sources, accuracy of data sources, and the decision-making process for producing the land cover map; and

3) Identify and prioritize additional mapping needs.

The attached report successfully completes the task as it produces and describes the methods involved in creating the best possible land cover data layer from available sources.

It also adopts and applies a standard classification system, and perhaps most importantly, develops a system for improving the land cover map as new data becomes available.

II. Summary of the *Land Cover Data Assessment in Pima County*

A. Review of Past Mapping Efforts

In the data review and selection process, Recon analyzed fourteen mapping efforts that have taken place in the past decades, or that are ongoing. About half of these initiatives created data that is useful for the basemap of the Sonoran Desert Conservation Plan. In addition to producing a useful basemap for regional bio-planning purposes, the analysis by Recon provides advice about how future research and mapping initiatives within Pima County can gather data in a more effective manner so that the community can continue to build and improve the base map that has now been made available through this exercise.

The mapping efforts that were incorporated into the consolidated land cover for the Sonoran Desert Conservation Plan include:

1) the 1993 GAP Analysis Program map of Pima County that was created as part of the National GAP Program;

2) the 1993 and 1996 Wildlife Habitat Inventory Project (WHIP) map, which covers urban and suburban environments in the Tucson metropolitan area;

3) the 1977 and 1981 Organ Pipe Cactus National Monument map from the study conducted by Dr. Peter Warren (now at The Nature Conservancy), which is considered the most detailed vegetation study in the county;

4) the 1993 land cover inventory and mapping effort of the Cienega Creek Natural Preserve developed as part of the Pima County Preserve Management Plan; and

5) the improvements to GAP mapping in the Pima County Bingham-Cienega Natural Preserve area recently provided by The Nature Conservancy.

The mapping efforts that are currently underway and should be incorporated into the consolidated land cover for the Sonoran Desert Conservation Plan include:

1) the riparian study by the Harris Group that is being carried out as a separate task in the Sonoran Desert Conservation Plan biological evaluation workplan; and

2) the Bureau of Reclamation study of effluent dominated reaches of the Santa Cruz river that covers the 28 mile river floodplain from the Roger Road outfall to the Pima County line.

The mapping efforts that were reviewed but not incorporated into the consolidated land cover for the Sonoran Desert Conservation Plan include:

1) the 1993 USGS/EROS coverage based on high resolution satellite imagery;

2) the 1993 riparian habitat maps created for the Riparian Habitat Protection Ordinance (which are potentially useful in the current riparian study by the Harris Group);

3) the 1970s study by the Pima Association of Governments (PAG 208);

4) the 1975 study of riparian vegetation along four drainages;

5) the National Wetland Inventory mapping effort by the U.S. Fish and Wildlife Service;

6) the 1976 Arizona Game and Fish Department vegetation mapping; and

7) the 1980 Natural Vegetation data maps digitized from the Browne and Lowe publication.

B. Creation of a Composite Land Cover Data Layer

The unifying classification system among the maps that Recon combined to create the best available land cover data layer is a format known as the Brown, Lowe and Pase (BPL) system. Within this system there are eight levels of organization, from the broadest description to the most narrow and detailed, and they are: (1) biogeographic realm; (2) upland/wetland; (3) formation type; (4) climatic zone; (5) biome; (6) series; (7) association; and (8) sub-association. The maps that Recon included to create the land cover data layer have varying levels of detail.

- The GAP vegetation coverage has the advantage of covering all of Pima County and thus provides a uniform level of classification. However, its accuracy is higher at the course scale of biome level (82% accurate) but drops off at the series level (68% accurate).

- The Wildlife Habitat Inventory Project (WHIP) map covers almost one million acres at the association level. Given that the WHIP map has higher resolution than the GAP map, delineates riparian areas, and is assumed to be quite accurate at the series level, in areas where WHIP data is available, it takes precedence over GAP mapping in the consolidated land cover created by Recon.

- Similarly, the Cienega Creek Natural Preserve mapping has a more detailed delineation than the WHIP data, and so it takes precedence over the GAP and WHIP coverage, in the areas where this Cienega Creek data is available.

- The Organ Pipe and San Pedro vegetation mapping take precedence over GAP data. The Organ Pipe data covers 330,700 acres at the sub-association level.

In producing the consolidated land coverage, Recon retained all attributes from the multiple coverages, so that the user can always compare data at a uniform level of classification.

III. Recommendations and Follow Up Action

Recon makes seven recommendations to improve the usefulness of the land cover data, and these recommendations have been or are being followed by staff in the ways described below.

1) First, it is recommended that a recent mapping project of perennial and intermittent streams conducted by Pima County and the Pima Association of Governments be expanded to include springs, cienegas, ponds and lakes.

   These suggestions are being followed as staff works with PAG to separate springs from streams in data already collected, prepares point locations and seeks expert review, and derives urban pond and stock pond data from other existing covers.

2) Second, it is recommended that the ongoing riparian mapping effort by the Harris group focus on the distribution of cottonwood, willow and mesquite. This suggestion will be followed as part of the Harris study.

3) Third, the report recommends that grassland mapping is evaluated to ensure that delineations exist among native grasslands and non-native grasslands. This issue will be forwarded to the Science Technical Advisory Team for expert review of currently defined Sacaton / native grassland areas.

4) The fourth recommendation is to map the distribution of Saguaro, Palo Verde and Ironwood. Members of staff are working with federal entities to undertake such a study in the event expert review and analysis by wildlife managers is not sufficient.

5) The fifth recommendation is to map the distribution of limestone outcrops, soils, caves, mines potentially used by bats, and talus slopes. The limestone and soils data is available and being obtained by staff. Expert interviews will be conducted to supplement data on caves and mines.

6) The sixth recommendation is to obtain expert review in order to achieve series level mapping for the study area. This undertaking will be formally pursued by staff and the Science Technical Advisory Team.

7) Finally, the last recommendation is to prepare to map key habitat features as individual species requirements are further defined through the larger study process. County staff has and will continue to meet data gaps through short term studies as the need develops.

IV. Conclusion

The *Land Cover Data Assessment in Pima County* is the first in the series of deliverables that will be received from Recon as the biological evaluation is carried out over the next months. On one level, the study and composite map represent a technical achievement that organizes and provides a context for mapping initiatives of recent decades. On another level, the existence of a comprehensive land cover map will allow the scientific community to become more effective in building the community's store of conservation knowledge, as future bio-planning initiatives can avoid duplication of effort, adopt useful classification methods, and target data gaps with greater precision.

On still another level, the *Land Cover Data Assessment in Pima County* report has a significant place in the long history of local conservation scholarship. It has been said that from 1800 to 1900, explorers, trappers, and naturalists conducting surveys as part of military duty were responsible for accumulating and recording much of the resource information that is understood from that era. Collectors, conservationists and scientists took over and better organized attempts to inventory the resource base during the 20th century. Now we are turning isolated inventories into comprehensive regional maps, which will allow us to synthesize multiple layers of resource information at increasing refined levels of detail as part of the Sonoran Desert Conservation Plan. In this way, the *Land Cover Data Assessment in Pima County* report is a great deal more than a technical achievement. It sets the stage for meaningful conservation planning, and the implementation of broad preservation and restoration measures within Pima County.

MEMORANDUM

Date: April 17, 2000

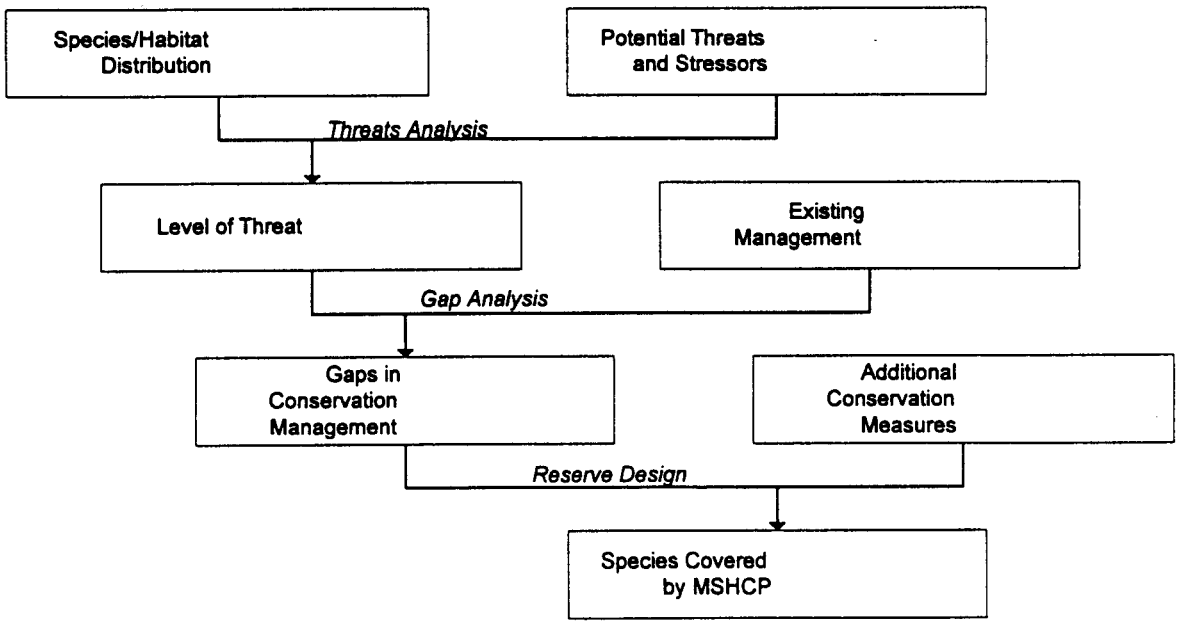
To: The Honorable Chair and Members
Pima County Board of Supervisors

From: C.H. Huckelberry
County Administrator

Re: **Biological Stress Assessment**

Overview

The attached report prepared by Recon as part of the biological evaluation for the Sonoran Desert Conservation Plan identifies some of the major potential threats and stressors to vulnerable species in the watershed planning areas of Pima County, and to the underlying biological and hydrological resources upon which these species depend. The *Biological Stress Assessment* examines past land and water uses, existing uses, and some major uses foreseeable over the next 30 years in an effort to determine the greatest potential threats to vulnerable species within each watershed planning unit. Under separate cover I am forwarding the *Review of Vulnerable Species*, which was developed in concert with the stress assessment. Read together, these documents start to sketch the outline of alternatives for reserve design since we can now begin the process of understanding and prioritizing areas where high natural resource value land is subject to stress because of past, current or planned use. As the work flow chart below indicates, studies and reports completed in the upcoming weeks and months will add information to the analysis of vulnerable species, their distribution and the threats across the landscape, and move us closer to the implementation of a science based reserve system.



Project Work Flow

Stress Sources -- Effects of Land and Water Use Activities on Biological Resources

Methodology: The first chapter of the *Biological Stress Assessment* describes the methodology used to (1) define biological stressors, (2) assign a conservation status to land as it relates to land ownership and management categories within the Pima County watershed planning units, and (3) describe the effects of land and water use activities on biological resources.

Water related activities: A number of water related activities are identified as having an effect on biological resources. The potential negative impact and potential benefit of each activity is described in Table 5 of the report. The list of water related activities includes:

- groundwater pumping;
- channelization and bank protection;
- recharge and release of CAP water;
- recharge and release of treated effluent water;
- stock tanks;
- impoundments;
- surface water diversions;
- canals; and
- water-based recreation.

Land Use- related activities: Table 5 also identifies and describes the potential negative impact and potential benefit of a number of land use related activities that effect biological resources. The list includes:

- urbanization;
- lot splitting;
- commercial development;
- residential subdivisions;
- mining;
- aggregate or fill removal;
- livestock grazing;
- landfills;
- wastewater treatment;
- roadways and new utilities;
- agricultural uses;
- conversion of ranch lands;
- golf courses;
- parks;
- hunting and trapping;
- archery, target shooting;
- fishing;
- hiking;

- horseback riding;
- off road driving;
- mountain biking;
- picnicking and camping;
- wood cutting;
- logging / timber management;
- fire suppression;
- organized recreation and sports uses;
- increased immigration;
- increased drug trafficking;
- air to ground bombing; and
- low level overflights.

Scope of Watershed Subarea Planning Unit Analysis

Pages 23 through 198 of the *Biological Stress Assessment* contain an analysis of each of the eight watershed subarea planning units within Pima County, covering the topics of potential threats and stressors, biological resources, and existing and proposed reserves. Under the category of potential threats and stressors, the report covers issues related to land use and landscape character, transportation, water uses, stream characteristics, and recreation uses. Under the category of biological resources, the report covers issues related to vegetation, critical habitat designations, vulnerable species, the potential threats to vulnerable species within the watershed subareas, and the level of threat based on the conservation status.

Middle San Pedro Subarea (Subarea 1):

The Middle San Pedro subarea is discussed in pages 23 through 40 of the text. A summary of the stress analysis is available in Table 31, and reproduced in part below. (Read as columns, not rows.)

Areas and Habitats of Concern	Species, Federal Concern	Sources of Stress
Perennial stream flows, San Pedro	Gila topminnow	Population growth
Designated CFPO critical habitat	Pygmy-owl	Conversion of ranches
Proposed spikedace critical habitat	SW willow flycatcher	Groundwater pumping
Proposed Loach minnow c. habitat	Mexican spotted owl	Developable land by river
Potential YB cuckoo crit. habitat	Yellow billed cuckoo	High mineral resource areas
Bingham Cienega marsh habitat		Mining in Buehman Canyon
Sacaton grass areas		Recreational uses
Tributary canyon connections		Invasive species

Potential threats and stressors to other vulnerable species in the Middle San Pedro, including species of federal concern, are discussed in the report such as the Gila chub, Weeping muhly, Desert sucker, Sonora sucker, Speckled dace, Apache northern goshawk, Needle-spined pineapple cactus, Western red bat, and Lowland leopard frog.

Cienega-Rincon Subarea (Subarea 2):

The Cienega-Rincon subarea is discussed in pages 41 through 65 of the text. A summary of the stress analysis is available in Table 32, and reproduced in part below.

Areas and Habitats of Concern	Species, Federal Concern	Sources of Stress
Perennial stream flows	Gila topminnow	Population growth
Shallow ground water areas	Pygmy-owl	Conversion of ranches
Associated aquatic habitats	Huachuca water umbel	Groundwater pumping
Cottonwood-willow riparian areas	Mexican spotted owl	Increased lot splitting
Cienega marshlands	Yellow billed cuckoo	Existing zoning near preserve
Sacaton grassland areas	Lesser long nosed bat	Excavation of Pantano Wash
Cave habitats	Pima pineapple cactus	Recreational uses
Tributary connections		Invasive species
		Developable land near preserve
		High mineral resource areas

Potential threats and stressors to other vulnerable species in the Cienega-Rincon subarea, including species of federal concern, are discussed in the report such as the:

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

Upper Santa Cruz Subarea (Subarea 3):

The Upper Santa Cruz subarea is discussed in pages 66 through 88 of the text. A summary of the stress analysis is available in Table 33, and reproduced in part below.

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

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

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

Middle Santa Cruz Subarea (Subarea 4):

The Middle Santa Cruz subarea is discussed in pages 89 through 114 of the text. A summary of the stress analysis is available in Table 34, and reproduced in part below.

Areas and Habitats of Concern	Species, Federal Concern	Sources of Stress
Shallow ground water areas	Gila topminnow	Population growth
Effluent-dominated stream flow	Pygmy-owl	Existing overdraft
Remaining xeroriparian	Mexican spotted owl	Groundwater pumping
Pygmy-owl critical habitat	Lesser long nosed bat	Increased lot splitting
	Yellow billed cuckoo	Invasive species
	Pineapple cactus	Recreational uses
		Developable land near preserve

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

- Trelease agave;
- Sabino canyon damselfly;
- Desert pupfish;
- Gila chub;
- Box Canyon Muhly;
- Weeping Muhly;
- Apache northern goshawk;
- Goodding onion;
- Needle-spined pineapple cactus;
- Pale Townsend's big-eared bat;
- Lowland Leopard Frog;
- Mexican Garter Snake; and
- Tumamoc globeberry.

Tortolita Fan Subarea (Subarea 5):

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

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

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

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

Altar Valley Subarea (Subarea 6A):

The Altar Valley subarea is discussed in pages 136 through 156 of the text. A summary of the stress analysis is available in Table 36, and reproduced in part below.

Areas and Habitats of Concern	Species, Federal Concern	Sources of Stress
Pygmy-owl critical habitat	Gila topminnow	Lot splitting
Areas of perennial flow	Pygmy-owl	Historic range degradation
Areas with shallow groundwater	Masked bobwhite	Groundwater pumping
Cottonwood-willow woodlands	Jaguar	Water quality
Semi-desert grasslands	Pineapple cactus	Invasive species
	Yellow-billed cuckoo	Developable land near preserve

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

- Kearney's Blue Star;
- Desert pupfish;
- Weeping Muhly;
- Chiricahua leopard frog;
- Western red bat;
- Pale Townsend's big-eared bat;
- Lowland Leopard Frog;
- Mexican garter snake; and
- Tumamoc globeberry.

Avra Valley Subarea (Subarea 6B):

The Avra Valley subarea is discussed in pages 157 through 173 of the text. A summary of the stress analysis is available in Table 37, and reproduced in part below.

Areas and Habitats of Concern	Species, Federal Concern	Sources of Stress
Groundwater east of SB mine	Pygmy-owl	Lot splitting
Ironwood community	Turk's head cactus	Conversion of ranches
Low elevation land along washes	Pineapple cactus	Groundwater pumping
		Mining
		Invasive species
		Developable land near reserve

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

- Desert pupfish;
- Gila topminnow; and
- Tumamoc globeberry.

Western Pima County Subarea (Subarea 8):

The Western Pima County subarea is discussed in pages 180 through 198 of the text. A summary of the stress analysis is available in Table 39, and reproduced in part below.

Areas and Habitats of Concern	Species, Federal Concern	Sources of Stress
Areas of shallow groundwater	Pygmy-owl	Overflights
Riparian and xeroriparian habitat	Lesser long nosed bat	Livestock grazing, recreation
Aquatic and riparian habitat	Sonoran pronghorn	Groundwater pumping
Mine adit	Desert pupfish	Mining
Ironwood plant communities		Invasive species
Palo verde mixed scrub		Resource damage at boarder

Potential threats and stressors to other vulnerable species in the Western Pima County subarea, including species of federal concern, are discussed in the report such as the:

- Trelease Agave;
- Organ Pipe shovelnosed snake;
- Red-backed whiptail lizard;
- Acuna cactus;
- Sonoyta mud turtle;
- Ajo rock daisy;
- Quitobaquito tryonia (snail); and
- Tumamoc globeberry.

Recommendations

Pages 213 through 216 contain these recommendations based on the stress analysis.

- A strategy for addressing the issue of groundwater pumping in the context of the development of conservation alternatives will be necessary.
- Additional mining and mineral resource information is needed to assess threats.
- The importation of invasive and non-native species will hinder future conservation goals and should be addressed.
- The impact of sand and gravel operations should be evaluated.
- Conservation efforts will need to encompass State lands.
- Conservation efforts will need to encompass uncontrolled impacts of border crossings.

MEMORANDUM

Date: April 17, 2000

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

From: C.H. Huckelberry
County Administrator

Re: **Review of Vulnerable Species List**

Summary

The attached report submitted by Recon as part of the biological evaluation for the Sonoran Desert Conservation Plan is a companion to the study released today under separate cover, the *Biological Stress Assessment*. This document, the *Review of Vulnerable Species List*, analyzes the November document from the Science Technical Advisory Team and recommends which of the over 100 vulnerable species of concern in Pima County should be considered for coverage under the County's future permit. The report makes an initial recommendation that Pima County consider and further analyze approximately 50 animals and plants as potentially covered species under the multi-species conservation plan. In order to arrive at this recommendation, a review process was undertaken which essentially screened the larger list of vulnerable species by several criteria, including that:

- If insignificant or non-viable numbers of species occur in the planning area, and conservation is best accomplished elsewhere, then the species was recommended for removal from consideration for potential coverage;
- If the species does not occur in the study area, and it is not likely to occur in the study area within the planning horizon, the species was recommended for removal from consideration for potential coverage; and
- If it is unlikely that a species will occur on private, state, or county lands, then the species was recommended for removal from consideration for potential coverage.

After more than half of the vulnerable species were screened from the list of species recommended for coverage under the permit, sixteen species were added for consideration. As stated above, approximately 50 plants and animals are recommended for greater analysis and consideration by the Science Technical Advisory Team. The tables in the attached report summarize the species, stressors, and known distribution within Pima County, in the context of the screening criteria. This memorandum will briefly list the plants and animals, and general habitat element of species recommended for coverage. This memorandum will also summarize the species recommended for removal from consideration for potential coverage based on the above analytical standards.

Species Recommended for Potential Coverage

1. Mammals Recommended for Potential Coverage

Common Name	General Habitat / Element
Western Red Bat	Riparian
Southern Yellow Bat	
Lappet-eared Bat	
Lesser Long-nosed Bat	Saguaro, caves, mines
California Leaf-nosed Bat	
Pale Townsend's Big-eared Bat	Caves, mines
Mexican Long-tongued Bat	
Merriam's Mouse (Mesquite Mouse)	Mesquite

2. Birds Recommended for Potential Coverage

Common Name	General Habitat / Element
Western Yellow-billed Cuckoo	Riparian, Mesquite
Cactus Ferruginous Pygmy-Owl	Riparian, Mesquite
Song Sparrow	Riparian, Aquatic
Abert's Towhee	Riparian, Mesquite
Bell's Vireo	Riparian
Swainson's Hawk	Grasslands
Rufous-winged Sparrow	Grasslands
Burrowing Owl	

3. Reptiles Recommended for Potential Coverage

Common Name	General Habitat / Element
Tucson Shovel-nosed Snake	
Organ Pipe Shovel-nosed Snake	
Giant Spotted Whiptail	Riparian
Red-backed Whiptail Lizard	
Ground Snake	Grassland
Desert Box Turtle	Grassland
Mexican Garter Snake	Aquatic

4. Amphibians Recommended for Potential Coverage

Common Name	General Habitat / Element
Chiricahua Leopard Frog	Aquatic
Lowland Leopard Frog	Aquatic

5. Fish Recommended for Potential Coverage

Common Name	General Habitat / Element
Gila Chub	Aquatic
Gila Topminnow	Aquatic

6. Plants Recommended for Potential Coverage

Common Name	General Habitat / Element
Pima Pineapple Cactus	
Gentry Indigobush	
Nichol's Turk's Head Cactus	Limestone
Acuna Cactus	
Needle-spined Pineapple Cactus	Limestone
Huachuca Water Umbrel	Aquatic
Tumamoc Globeberry	

7. Invertebrates Recommended for Potential Coverage

The San Xavier Tallussnail, along with other snails and the invertebrate pseudoscorpion are recommended for further study and consideration.

Species Recommended for Removal from Consideration for Potential Coverage Because They are Not in the Planning Area:

If insignificant or non-viable numbers of species occur in the planning area, and conservation is best accomplished elsewhere, then the species is recommended for removal from consideration for potential coverage. The following species are discussed in the report in this context:

- Sonoran pronghorn;
- Masked bobwhite;
- Northern shrike;
- Jaguar;
- Arizona shrew;
- Blue silverspot butterfly;
- Le Conte's thrasher;
- Cincta rothschildia;
- Santa Rita water beetle;
- Mountain plover; and
- Gentry Indigobush.

If the species does not occur in the study area, and it is not likely to occur in the study area within the planning horizon, the species is recommended for removal from consideration for potential coverage. The following species are discussed in the report in this context:

- Northern aplomado falcon;
- Ocelot;
- Desert pupfish;
- Jaguarundi;
- Speckled dace;
- Desert tryonia (snail);
- Southwestern willow flycatcher;
- Desert sucker;
- Sonora sucker;
- California floater (clam);
- Mexican gray wolf; and
- Tarahumara frog.

If it is unlikely that a species will occur on private, state, or county lands, then the species is recommended for removal from consideration for potential coverage. The following species are discussed in the report in this context:

- Trelease agave;
- Sabino Canyon damselfly;
- Kearney's blue star;
- Saiya;
- Quitobaquito desert pupfish;
- Sonoyta mud turtle;
- Box Canyon muhly;
- Weeping muhly;
- Ajo rock daisy;
- Tarahumara frog;
- Quitobaquito tryonia (snail);
- Apache northern goshawk;
- Mexican spotted owl;
- Goodding onion;
- Bagnara's talussnail; and
- Mexican leaf-cutter ant.

Similarly, if all records of the species occur on Tohono O'odham Nation lands, then the species is recommended for removal from consideration for potential coverage. The following species are discussed in the report in this context: Kearney's blue star, Hohokam agave, Thurber mallow, and Papago talussnail.

Conclusion

It is likely that the list of covered species will be debated right up until the time of permitting. The attached report provides the analytical framework for conducting this discussion, and an initial recommendation about potential coverage. All species described in the November 1999 Science Team report as vulnerable are still recommended to be contemplated in the larger Sonoran Desert Conservation Plan, but it is suggested that many will not become compliance problems under the Endangered Species Act for private and local government parties.

Future reports from the biological consultant that provide (1) detailed species accounts, (2) vulnerable species goals, (3) vulnerable species habitat data analysis, (4) reserve design and management recommendations, and (5) adaptive management plan recommendations, will both refine the list and provide the parameters of coverage so that a conservation plan can be crafted that both meets the standards of the science community in protecting species and provides regulatory assurances to the community.

MEMORANDUM

Date: June 8, 2000

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

From: C.H. Huckelberry
County Administrator

Re: **Priority Vulnerable Species, Data Compilation and Synthesis**

Background

The attached 300 page document entitled *Priority Vulnerable Species, Data Compilation and Synthesis* is submitted by the Recon Consulting team as part of the biological evaluation of the Sonoran Desert Conservation Plan. It provides a detailed description of plants and animals that are being considered by the Science Technical Advisory Team as potentially covered under the multi-species program. Organized by taxonomic group, the priority vulnerable species accounts include:

- 9 mammals
- 8 birds
- 7 reptiles
- 7 plants
- 6 fish
- 2 amphibians
- Invertebrates

Two strong themes emerge when this compilation of species accounts is read together: one is the enormous importance of aquatic and riparian-based habitats to the majority of priority vulnerable species, and the other is the very bleak biological status of the riparian system.

This memorandum provides an introduction to the potentially covered species of the Sonoran Desert Conservation Plan. Like the *Land Cover Data Assessment* study produced by Recon in March 2000, the *Priority Vulnerable Species* study provides a context for research efforts of recent decades and will allow the scientific community to avoid duplication in future planning initiatives, and target data gaps with greater precision.

Furthermore, the *Priority Vulnerable Species* study has a place in the long history of local conservation scholarship. Citing the work of early naturalists from the 1800s, collectors of the period from 1850 to 1940, and great desert ecologists of the past century, the *Priority Vulnerable Species* study continues to increase this community's ability to describe its resource base and begin to carry out meaningful conservation planning.

Data Compilation and Synthesis for Vulnerable Species

The workplan for the biological evaluation includes this task, which has resulted in the *Priority Vulnerable Species* study:

Compile existing biological and management information: For vulnerable species described in the April 2000 *Review of Vulnerable Species* report and accepted by the Science Technical Advisory Team, the Recon team shall compile existing biological and management information.

Sources: All sources of data must be documented and include at a minimum: Arizona Game and Fish Department (AGFD) records, State and Federal government reports and data compilations, AGFD species Abstracts and BISON-M compilations, as well as the relevant scientific literature.

Written species accounts: For each vulnerable species the Recon team shall prepare a written summary of information, including

1. Federal status.
2. State and federal recovery goals.
3. Other status (global rankings, state lists, other lists).
4. Taxonomy, especially of Pima County populations.
5. Past and present distribution.
6. Habitat requirements, including home range requirements and ability to utilize major human land use categories.
7. Life history.
8. All available demographic (population density, status, trend, survival rates, reproductive rates, sex and age ratios, etc.) and distributional information within Pima County and range-wide. Define population or (sub-population) basis in the planning area, and identify any areas of special significance to the Pima County populations.
9. Habitat trends within the planning area, if known.
10. Current and potential threats to species or populations in Pima County, considering the location, amount, and quality of habitat already protected, as well as existing and potential pest species. Identify the mechanism of threats.
11. Management needs, including sensitivity to human activity and densities, corridor needs, key relationships, migratory requirements, etc.
12. Results of past mitigation activities.
13. Existing monitoring and research programs.

Maps: Maps will be prepared depicting distribution of species within Pima County and, where appropriate, range-wide.

The *Priority Vulnerable Species* report organizes information by this workplan and provides a readable account of biological and management information about the members of the animal and plant community that are vulnerable, and that present potential compliance dilemmas.

Mammals

Detailed accounts of nine mammals considered to be priority vulnerable species are included in the first 69 pages of the attached study.

Number of Priority Vulnerable Mammal Species by Subarea

WATERSHED SUBAREA	NUMBER OF PRIORITY VULNERABLE SPECIES
Middle San Pedro	4
Cienega-Rincon	7
Upper Santa Cruz	7
Middle Santa Cruz	6
Tortolita Fan	6
Altar Valley	7
Avra Valley	6
Western Pima County	7

Priority Vulnerable Mammal Species

SCIENTIFIC NAME	COMMON NAME
Choeronycteris mexicana	Mexican long-tongued bat
Idionycteris phyllotis	Allen's big-eared bat
Lasiuris blossevillii	Western red bat
Lasiurus xanthinus	Southern yellow bat
Leptonycteris curasoae yerbabuena	Lesser long-nosed bat
Macrotus californicus	California leaf-nosed bat
Peromyscus merriami	Merriam's mouse
Plecotus townsendii pallescens	Pale Townsend's big-eared bat
Sorex arizonae	Arizona Shrew

A number of the bat species depend on, or occur along, riparian corridors. Riparian losses have had a negative impact on the Merriam's mouse, listed above, and water is thought to be important to the Arizona shrew.

Birds

Eight birds are considered to be priority vulnerable species, and they are described in detail on pages 70 through 127 of the attached study.

Number of Priority Vulnerable Bird Species by Subarea

WATERSHED SUBAREA	NUMBER OF PRIORITY VULNERABLE SPECIES
Middle San Pedro	5
Cienega-Rincon	7
Upper Santa Cruz	7
Middle Santa Cruz	7
Tortolita Fan	6
Altar Valley	7
Avra Valley	6
Western Pima County	5

Priority Vulnerable Bird Species

SCIENTIFIC NAME	COMMON NAME
Aimophila carpalis	Rufous-winged sparrow
Athene cunicularia hypugaea	Burrowing owl
Buteo swainsoni	Swainson's hawk
Coccyzus americanus occidentalis	Western Yellow-billed Cuckoo
Empidonax traillii extimus	Southwestern willow flycatcher
Glaucidium brasilianum cactorum	Cactus ferruginous pygmy-owl
Pipilo aberti	Abert's Towhee
Vireo bellii	Bell's Vireo

The report traces records back to the earliest naturalists in Pima County. Captain Charles Bendire's records from the 1870s along the Rillito are cited. Again, the importance of riparian habitat is a recurring theme in the species accounts. Six of the eight birds described in the text have an association with riparian areas. These areas have been seriously altered from baseline conditions and continue to decline.

Reptiles

Detailed accounts of seven reptiles considered to be priority vulnerable species are included in pages 128 through169 of the attached study.

Number of Priority Vulnerable Reptile Species by Subarea

WATERSHED SUBAREA	NUMBER OF PRIORITY VULNERABLE SPECIES
Middle San Pedro	1
Cienega-Rincon	2
Upper Santa Cruz	2
Middle Santa Cruz	4
Tortolita Fan	2
Altar Valley	4
Avra Valley	2
Western Pima County	2

Priority Vulnerable Reptile Species

SCIENTIFIC NAME	COMMON NAME
Chionactis occipitalis klauberi	Tucson shovel-nosed snake
Chionactis palarostris organica	Organ Pipe shovel-nosed snake
Cnemidophorus burti stictogrammus	Giant Spotted whiptail
Cnemidophorus burti xanthonotus	Red-backed whiptail
Sonora semiannulata	Ground snake
Terrapene ornata luteola	Desert box turtle
Thamnophis eques megalops	Mexican Garter Snake

Mixed riparian scrub (xeroriparian) and Mesquite Bosque are identified as important to the Tucson shovel-nosed snake. Giant spotted whiptail lizards are found in riparian areas, as are Desert box turtles and Mexican garter snakes. In addition to the importance of riparian areas, the species accounts, read one after another, reflect the importance of the natural system outside Pima County boundaries. The footprint made by range and distribution maps consistently includes areas to the south of Pima County and across administrative boundaries where land use and resource protection can not be controlled.

Amphibians

Detailed accounts of two amphibians considered to be priority vulnerable species are included in pages 170-186 of the attached study.

Number of Priority Vulnerable Amphibian Species by Subarea

WATERSHED SUBAREA	NUMBER OF PRIORITY VULNERABLE SPECIES
Middle San Pedro	1
Cienega-Rincon	2
Upper Santa Cruz	2
Middle Santa Cruz	1
Tortolita Fan	0
Altar Valley	2
Avra Valley	0
Western Pima County	0

Priority Vulnerable Amphibian Species

SCIENTIFIC NAME	COMMON NAME
Rana chiricahuensis	Chiricahua Leopard Frog
Rana yavapaiensis	Lowland Leopard Frog

The perilous status of species dependent on aquatic habitats, such as the frog population, is captured in descriptions within the accounts, such as this one for the Chiricahua leopard frog: "Massive historical loss and isolation of local populations has disrupted the metapopulation structure of this species. Multiple threats impact local populations, and without a healthy metapopulation structure, recovery of local populations is not possible."

A series of management proposals to assure available habitat are outlined on page 177, including: (1) maintenance or development of permanent water sources within a metapopulation area, while preventing further groundwater pumping; (2) development and maintenance of heterogeneous habitats that include cover, shelter, breeding micro habitats; (3) increase depth, duration, and surface area of water to increase mean annual oxygen levels; (4) prevent overgrazing to recover bank vegetation and to increase water quality; (5) prevent introduction of non-native predators and eradicate such species whenever possible..."

Pima County staff is currently working with biologists and agency scientists to draft a reintroduction proposal that will be issued in June, 2000.

Fish

Detailed accounts of six fishes considered to be priority vulnerable species are included in pages 187-226 of the attached study.

Number of Priority Vulnerable Fish Species by Subarea

WATERSHED SUBAREA	NUMBER OF PRIORITY VULNERABLE SPECIES
Middle San Pedro	4
Cienega-Rincon	3
Upper Santa Cruz	0
Middle Santa Cruz	1
Tortolita Fan	0
Altar Valley	2
Avra Valley	0
Western Pima County	0

Priority Vulnerable Fish Species

SCIENTIFIC NAME	COMMON NAME
Agosia chrysogaster	Longfin dace
Catostomus clarki	Desert sucker
Catostomus insignis	Sonora sucker
Cyprinodon macularius macularius	Desert pupfish
Gila intermedia	Gila Chub
Poeciliopsis occidentalis occidentalis	Gila Topminnow

Like the status of Amphibians, the dire state of fish species reflects the state of our aquatic and riparian systems. As early as 1904, the mining, grazing and range practices of the day, combined with the presence of non-native fish, were identified by the aquatic biologist Frederic Morton Chamberlain as predictors of the demise of our aquatic systems. After surveying the area for native fish he concluded: "The only hope for fish in this region lies in pond culture." In reprinting the Chamberlain survey and reflecting on the further decline since 1904, Dr. W.L. Minckley provides this perspective: "Of the 16 native species Chamberlain caught, one is extinct and eight are listed as Threatened or Endangered by the U.S. Department of the Interior. Eleven also are formally listed by the Republic of Mexico, and most of the remainder are considered imperiled by state agencies or private conservation groups and may soon be proposed for listing." (*Chamberlain's 1904 Survey of Arizona Fishes*, J. of the Southwest)

Plants

Seven plants considered to be priority vulnerable species are included in pages 256 through 303 of the attached study, following a discussion of invertebrates on pages 227 through 255.

Number of Priority Vulnerable Plant Species by Subarea

WATERSHED SUBAREA	NUMBER OF PRIORITY VULNERABLE SPECIES
Middle San Pedro	0
Cienega-Rincon	3
Upper Santa Cruz	3
Middle Santa Cruz	2
Tortolita Fan	1
Altar Valley	2
Avra Valley	2
Western Pima County	2

Priority Vulnerable Plant Species

SCIENTIFIC NAME	COMMON NAME
Coryphantha scheeri var. robustispina	Pima pineapple cactus
Dalea tentaculoides	Gentry indigo bush
Echinocactus horizonthalonius var. nicholii	Nichol's Turk's head cactus
Echinomastus erectocentrus var. acunensis	Acuna cactus
Echinomastus erectocentrus var. erectocentrus	Needle-spined pineapple cactus
Lilaeopsis schaffneriana recurva	Huachuca water umbel
Tumamoca macdougalii	Tumamoc globeberry

Again, riparian or aquatic habitat plays an important role for some of these species, including the Gentry indigo bush and the Huachuca water umbel. A number of plants have federal status.

Summary of Priority Vulnerable Species by Subarea

The chart below combines the total number of priority vulnerable species from the categories mammals, birds, reptiles, amphibians, fish, invertebrates, and plants.

WATERSHED SUBAREA	NUMBER OF PRIORITY VULNERABLE SPECIES
Middle San Pedro	16
Cienega-Rincon	29
Upper Santa Cruz	23
Middle Santa Cruz	22
Tortolita Fan	17
Altar Valley	31
Avra Valley	16
Western Pima County	17

Conclusion

The attached report on *Priority Vulnerable Species* is now in draft form. The Science Technical Advisory Team and peer reviewers will discuss and amend this draft report. It is likely that the list of species to include within the Sonoran Desert Conservation Plan will be among the highest priority discussions for the local science community. This attention will ensure that the plan is carefully crafted, and the subsequent adaptive management programs are effective and permanent aspects of future resource protection and land use decision making.

Attachment

MEMORANDUM

Date: July 5, 2000

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

From: C.H. Huckelberry
County Administrator

Re: **Cactus Ferruginous Pygmy-Owl Investigations in Pima and Pinal County, 1997-1999**

Background

Pima County contracted with the Arizona Game and Fish Department to conduct telemetry analysis and gather information that would lead to effective conservation and recovery initiatives for the cactus ferruginous pygmy-owl. Questions posed as part of the study include:

- *Is there exchange between pygmy-owl populations?*
- *Are pygmy-owls residents of specific areas, rather than migratory?*
- *Where do pygmy-owls go upon dispersal and how far do they travel?*
- *How tolerant are pygmy-owls of various urban occurrences? How adaptable?*

The attached studies entitled *Cactus Ferruginous Pygmy-Owl Investigations* provide observations related to these and other questions about the behavior of pygmy-owls. During 1997, banded birds were monitored. Beginning in 1998 and during 1999, pygmy-owls were radio-marked with backpack transmitters and followed on foot, by vehicle, and on two occasions aerial location of dispersing pygmy-owls took place using the Arizona Game and Fish aircraft. This memorandum provides a summary of highlights from these reports which collectively represent three years of field observations.

Study Area

Pages 2 through 7 of the 1999 report, and pages 2 through 6 of the 1997-1998 report, describe the study area covered by scientists from the Arizona Game and Fish Department.

- Cienega Creek Preserve (1997-1998)
- Pichacho Peak / Suizo Mountains (1999)
- Marana / Redrock (1997-1998, and 1999)
- Northwest Tucson (1997-1998, and 1999)
- Organ Pipe Cactus National Monument (1999)
- Saguaro National Park (1997-1998, and 1999)
- Tucson Mountain Foothills (1997-1998, and 1999)
- Santa Catalina Mountain Foothills (1997-1998, and 1999)
- Altar Valley (1999), Buenos Aires (1999), and Sopori Wash (1997-1998)

Results and Discussion

Following a section on methods used for surveys, monitoring, capture techniques, banding, radio-marking and telemetry, pages 12 through 31 of the 1999 report, and pages 13 through 60 of the 1997-1998 report, describe the results of field efforts during the past three years. A few highlights are reproduced below:

- "Arizona Game and Fish Department (AGFD) survey and monitoring efforts in 1999 resulted in confirmation of 25 occupied territories prior to dispersal of young." [Page 13, 1999 study]

- "In cooperation with U.S. Fish and Wildlife Service contract biologists and National Park Service biologists at Organ Pipe National Monument, we located 11 active pygmy-owl nests. Five other territories were believed occupied by unpaired males due to sustained and vigorous territorial calling throughout the nesting season." [Page 13, 1999 study]

- "After dispersal of young, we identified three newly occupied territories defended by pygmy-owls that were tracked using radio telemetry. We recognized 28 total territories when pre and post-dispersal sites are combined." [Page 13, 1999 study]

- During 1999, eleven pygmy-owl nests were located and monitored in Pima and Pinal counties. From these nests, 32 young fledged (average of 2.9 per nest), and 16 were known to survive dispersal. [Page 17, 1999 study]

Table: Nest Productivity in Pima and Pinal Counties, 1999

AREA	# NESTS	# FLEDGED	AVERAGE/NEST
Marana / Redrock	2	5	2.5
Altar Valley	4	11	2.75
Northwest Tucson	4	16	4.0
Organ Pipe National Monument	1	?	?
Totals	11	32	2.9

- During 1998, three nests fledged a total of 11 young (average of 3.66 per nest).

- During 1997, one nest produced 4 young; all 4 fledged and survived dispersal.

- Between 1996 and 1998, 19 of 22 fledglings survived dispersal, whereas in 1999, only 16 of 32 fledglings were known to survive dispersal.

- The 1997-1998 report describes fledgling interactions: "Fledglings maintained a relatively close association from the time of fledging until near dispersal. ... We were not able to characterize any juvenile interactions as overtly aggressive, but did observe position swapping, pushing, and following each other from perch to perch. During prey deliveries and feeding, fledglings would tend to congregate closer to each other, but frequently on separate perches. While intently watching the adult feeding prey to one or two siblings, the remaining young appeared to simply wait their turn and allow the adult to bring prey to them. In contrast, observations of young being fed by adults in Texas suggest greater aggression or squabbling between siblings over prey." [Pages 24-25]

- The 1997-1998 report also describes aggressive defense of young: "When observers searched for recently fledged young during 1997 and 1998, one or both adults would frequently fly to a nearby perch to investigate ... and often use the alarm call. When searching for fledglings at two different nest sites in 1998, three observers were struck on the back of the head during three separate incidents. During searches we would sometimes get very close to fledglings and would not be aware of their presence until hearing adult alarm calls. Adults swooped on observers shortly after the calls were heard. This very aggressive behavior by adults seemed to decrease as young matured." [P. 25]

- Mobbing episodes are described in the 1997-1998 report: "The noise and movement of mobbing birds often attracted our attention and resulted in detections of pygmy-owl adults and young that may otherwise have gone unseen. Sixteen different species were observed engaging mobbing behaviors. These birds ranged in size from hummingbird species to as large as greater roadrunners." [Page 26]

- "The reaction of pygmy-owls to mobbing birds was variable. Sometimes pygmy-owls appeared to ignore the harassment and remained on their perch until the offenders stopped and moved away. In 1998, a recent fledgling appeared stunned or indifferent while being attacked and struck on the head repeatedly by a black-tailed gnatcatcher. On other occasions, owls simply flew off to escape their tormentors, though often were followed from perch to perch." [Page 26, 1997-1998 report]

- Nesting chronology, from the 1997-1998 report

ACTIVITY	APRIL	MAY	JUNE	JULY	AUGUST
Incubation	mid April	to mid May			
Hatching		early - mid			
Nestling/Fledging		early May to	first of June		
Dispersal				start late July	earlyAugust

- The report from 1997-1998 provides observations of nestlings, fledging, and first flights:

  Nestlings: "Our first direct observations of nestlings were approximately one week prior to fledging, after down was lost and feathers were nearly grown in. ... One nestling would work its way up to the cavity entrance and we could observe its head, neck and breast. Remaining near the entrance appeared difficult at first and may have been the result of several nestlings jostling for position or poor strength and balance. ... One characteristic behavior of both nestlings and fledglings is circular or bobbing head movements which assist the observer in distinguishing perched adults from young."

  Fledging: "As nestlings become stronger and balance is increased, they begin to spend more time in the cavity entrance, standing on the bottom ledge of the entrance opening. Older nestlings have been observed leaning their entire bodies outside the cavity opening and almost falling. ... Just prior to fledging, both male and female adults with prey in their possession, appear to increase their time calling from perches, instead of going directly to the cavity. ... We suspect this adult behavior is an attempt to entice the nestlings to leave the cavity in order to obtain the prey."

  First flights: "The first flights for all directly observed fledglings during 1997 and 1998 were free of injury and entanglement. Most fledglings traveled successfully to the nearest tree or large shrub and began moving to different perch positions. Subsequent flights were more problematic with some birds landing near or on the ground, others became briefly entangled in branches and one was found a few feet from a road. One fledgling in 1997 was rescued from a cholla where it was unable to extract itself. Observations of distances traveled during initial flights at one nest site in 1998 were surprising as all three fledglings reached a patch of paloverde trees approximately 25 meters away from the nest cavity. Flights were high, floating or bobbing similar to the flight of butterflies, rather than the direct level flights of adult birds. Once a fledgling arrived at its first perch, it was immediately joined by the adults on nearby perches. One nestling fledged directly toward the perched and calling adult female." [Pages 51-52, 1997-1998 study]

- Providing observations about flight patterns and dispersal during 1997 and 1998, the report states at page 54:

  Road crossing: "Radio-marked pygmy-owls crossed several two-lane roads with vehicle traffic that ranged from light to moderately heavy in areas with trees and large shrubs on both sides of the road."

  Flight style: "The pygmy-owl flight style is typically two or four feet off the ground or just over the tops of shrubs and ground cover plants. It may fly in short hops of several meters in distance and up to 50 meters, as it moves from one tree or shrub to another within desert scrub communities. This flight pattern was also observed during dispersal." Collisions with cars and structures (such as a fence) have been observed.

- In 1999, 11 juveniles were captured and equipped with backpack style radio transmitters. Eight juvenile owls were tracked through dispersal, and the dispersal routes are found on pages 24 and 25 of the report.

  A few notes from the report include:

  Juvenile 1 dispersed on July 28, 1999, 61 days after fledging, and traveled 24.4 miles during 41 days of monitoring. A new territory was established when the dispersing owl paired with a resident male, 13 direct linear miles from the dispersal site.

  Juvenile 2 dispersed between July 27 and July 30, 1999, and traveled 10.95 miles during a 39 day monitoring period. The last radio location site of the owl on September 27, 1999 was 3.14 direct linear miles from the dispersal site.

  Juvenile 3 dispersed on July 31, 1999, only 49 days after fledging, and traveled 18.68 miles during 17 days of monitoring. A total of 6.15 direct linear miles separated the new territory from the juvenile's nest site.

  Juvenile 4 dispersed on July 30, 1999, and traveled 1.93 miles in 17 days of monitoring. Direct linear distance to the last know detection area was about 1.5 miles from the nest site.

  Juvenile 5 dispersed on July 30, 1999, from the same nest site as Juvenile 4. Monitoring during 33 days reflects that the owl traveled 11.26 miles, leaving it 5.3 direct linear miles from the fledge location, when the last detection was recorded.

  Juvenile 6 dispersed between July 22 and July 26. After six days of monitoring the signal was lost but a distance of 9.85 miles, or 9.45 direct linear miles, was covered in that time.

  Juvenile 7 dispersed late in the season (September 9), but early in its life (48 days after fledging). Monitoring efforts were complicated and after three days of tracking, observers lost the signal for the juvenile. An aerial survey took place on the 13th of September and then the owl was lost again after the fifth day of tracking. Total distance covered was 6.27 miles, or 4.35 miles direct linear distance from the nest site.

  Juvenile 8, the even-more-daring sibling of Juvenile 7, took off between September 4th and 7th, only 43 to 46 days after fledging. It took three days to lose the observers, and aerial surveys relocated this owl for another two days of data gathering before the signal was lost again. During six days of observation, Juvenile 8 covered 7.89 miles, or 6.37 direct linear miles.

Conclusions Following the 1999 Survey Season

In pages 27 through 31 of the 1999 report, the authors offer some insights and conclusions based on field investigations of the past years, including:

- Altar Valley: "Fourteen new territories that included at least 4 nest sites were documented in the Altar Valley in 1999. Most territories were located in mesquite-grassland and Sonoran desertscrub transition areas near mountain foothills. These detections reveal an important new component of the known population of pygmy-owls in southern Arizona and may represent the largest known concentration of pygmy-owl activity in Pima and Pinal counties." [Page 27]

- Telemetry: "As dispersal information is recorded over consecutive years, annual use patterns of certain dispersal routes are beginning to emerge. One explanation for these common dispersal routes, at least in the developed parts of northwest Tucson, is that areas of open, undeveloped desertscrub are limited. Pygmy-owls do not disperse with long distance flights, but rather make short flights from tree to tree, foraging and using the habitat as they go. Connected, undisturbed vegetation facilitates such dispersal. Monitoring has indicated that dispersing juveniles often choose to move through undisturbed desert areas and go around, rather than over high density residential developments. Such developments appear to present barriers to dispersal while open desert with natural washes and mature native vegetation, provide unobstructed and less hazardous dispersal routes. Radio telemetry during 1998 and 1999 has shown these limited habitat connections are being used annually by dispersing juveniles in northwest Tucson." [Page 28-29]

- Population Segments: "Currently, there are four distinct pygmy-owl population segments in Arizona. These are Pinal County, NW Tucson, Altar Valley and Organ Pipe Cactus National Monument. No exchange between these segments has been documented with [one] exception. An additional population segment is known to occur on the Tohono O'odham [Nation], but no species specific surveys, banding or radio-marking has been done in that area. ... Overall CFPO population viability in Arizona will be very dependent on exchange of pygmy-owls between these population segments. Barriers and habitat fragmentation which may prevent this should be considered hurdles to recovery of pygmy-owls in Arizona." [Page 30]

Recommendations from the Studies

Three recommendations for land managers are found on page 31 of the 1999 study: (1) protect remaining dispersal corridors in northwest Tucson; (2) identify and protect an interconnected system of habitat to facilitate exchange between population segments. "The identification of some of these areas has been done by the establishment of critical habitat (by USF&W), ... however, further efforts need to occur in conjunction with local planning efforts by federal agencies and local municipalities; and (3) work with the Tohono O'odham Nation.

MEMORANDUM

Date: July 6, 2000

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

From: C.H. Huckelberry
County Administrator

Re: **Habitat Selection by Cactus Ferruginous Pygmy-Owls in Southern Arizona**

Background

The attached report on the *Habitat Selection by Cactus Ferruginous Pygmy-Owls in Southern Arizona* is a companion to the study issued under separate cover on July 5, 2000 entitled *Cactus Ferruginous Pygmy-Owl Investigations in Pima County*. Pima County contracted with the Arizona Game and Fish Department to conduct habitat analysis for the pygmy-owl.

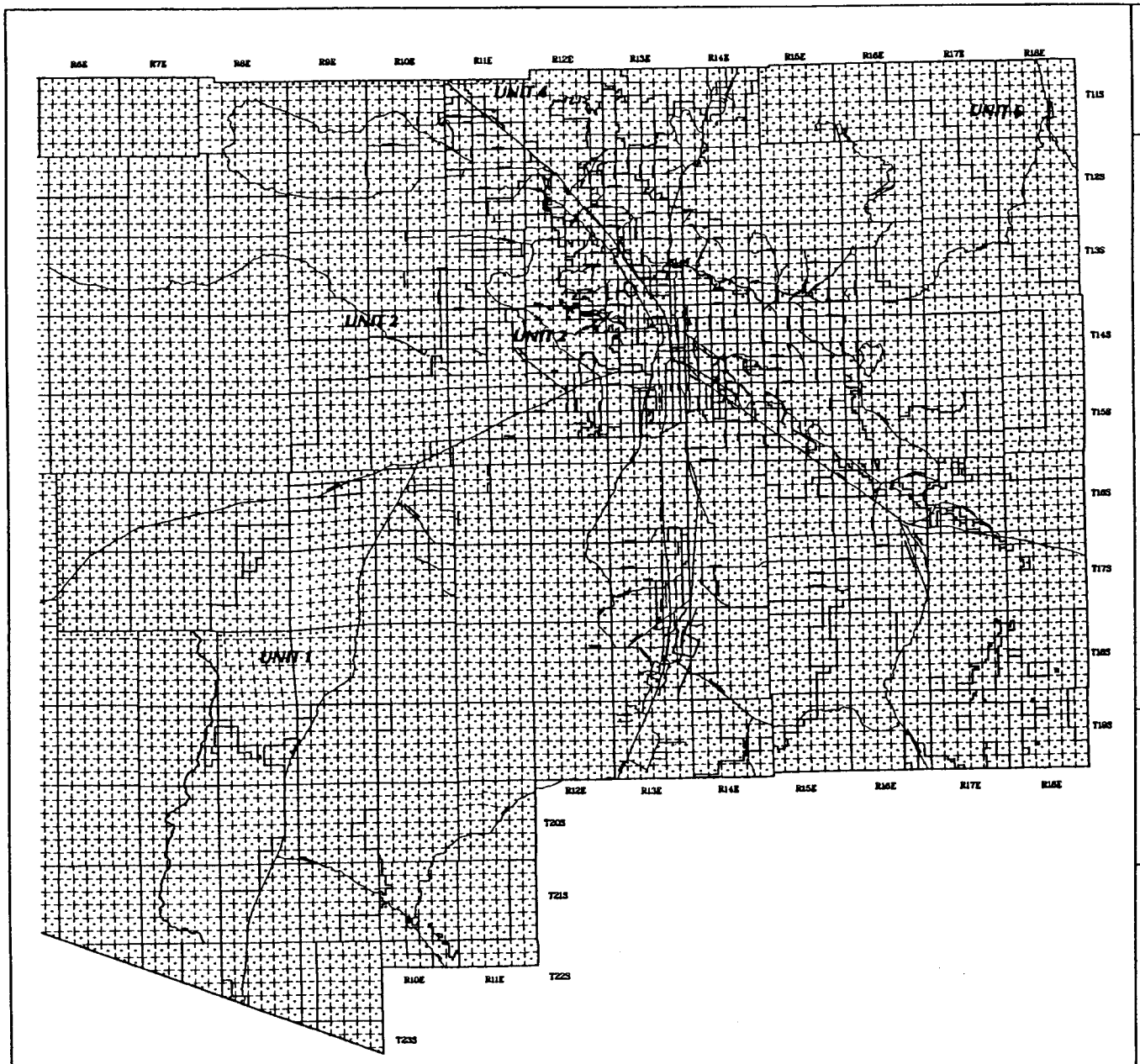
Objective

The major objective of the study was to determine whether pygmy-owls chose nest sites or perch trees with characteristics that differ from other available sites within a nesting territory. Scientists from the Game and Fish Department conducted field studies designed to gather information about these issues:

- Whether distances from sample plot centers to washes, paved roads, and dirt roads in use areas differ from randomly placed sample plots;
- Whether ground cover within sample plots of nests or perch trees differ from randomly placed contrast plots;
- Whether plant species diversity at used areas differ from random sample plots;
- Whether the number of tree, shrub, or cactus species at used areas differ from random sample plots; and
- Whether vertical vegetation densities within sample plots of used areas differ from randomly placed plots?

Need for Habitat Analysis

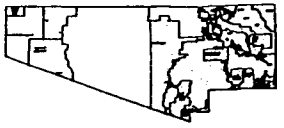
In March of 1997 the pygmy-owl was listed as endangered by the United States Fish and Wildlife Service. Critical habitat was designated for the pygmy-owl in 1999. In Pima County this includes land within the Altar Valley (Unit 1), the Tucson Mountain Park and land north of the Garcia Strip (Unit 2), northwest Tucson (Unit 4), and the San Pedro River (Unit 6).



Designated Pygmy-owl Critical Habitat

- Major Streets
- Township and Range
- Section Lines
- Administrative Boundaries
- Fish and Wildlife Designated Pygmy Owl Critical Habitat
- Urban Exclusion Area

Pima County Index Map



Scale 1: 150,000

TECHNICAL SERVICES

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Plotted: 4/27/00

Over time pygmy-owls have been associated with these areas and habitat types:

- "Early Arizona records indicate the pygmy-owl occurred along the Gila, Salt, Santa Cruz, San Pedro, and Verde rivers in their major tributaries. However, no pygmy-owls have been documented along these drainages since the 1980s. Habitat along these riparian areas contained cottonwood forests, mesquite-cottonwood woodlands and mesquite bosques. Pygmy-owls were also recorded in Sonoran desertscrub, but from areas that supported xeroriparian and riparian vegetation." [Page 2]

- "During the 1990's, nesting pygmy-owls have been detected in Sonoran desertscrub and semi-desert grasslands below 1,220 m elevation. Areas associated with pygmy-owl locations in the Sonoran desertscrub community have been characterized as gently sloping bajadas drained by a complex of large and small ephemeral washes with dense vegetation. " [Page 2]

- On the issue of owls found in grassland areas such as Altar Valley, the report clarifies: "A number of detection sites initially considered within semi-desert grassland, may actually be within a transition area between Sonoran desertscrub and semi-desert grassland. In general, habitat conditions for pygmy-owls seem to include dense wood thickets or woodlands for foraging and protection of juveniles, and large trees or cacti for nesting." [P. 2]

Method

Habitat characteristics were assessed at eight nest sites, seven guard trees, and random sites within the Tucson Basin, Altar Valley and Organ Pipe Cactus National Monument.

- Nest sites consisted of seven saguaros and a velvet ash tree.

- A guard tree is a perch in the line of sight of the nest cavity where male or female adults station themselves to guard the nest cavity during incubation and the nestling period. Species used as guard trees include mesquite, foothills paloverde, ironwood and velvet ash trees.

Results

These potentially important habitat variables were identified:

- Stem densities at the upper canopy levels appeared greater at actual nest sites;

- Ground cover at nest sites was dominated by litter and bare ground; and

- Plant species diversity was higher at nest sites (mean of 13.5) than random plots (10.8).

Recommendations from the Study

The authors caution against the over application of these results, given the small sample size, but recommend consideration of this series of questions for those evaluating potential impacts to pygmy-owl habitat or potential mitigation action to conserve habitat.

- "Does the area fall within Sonoran desertscrub or semi-desert grassland vegetation types in Southern Arizona?"
- "Is the vegetation in the area characterized by high plant diversity and presence of trees and shrubs providing structural layers at the mid-story and canopy levels?"
- "In semi-desert grassland types, does the area contain washes or drainages supporting tree species such as mesquite, ash, cottonwood or hackberry?"
- "What is the proximity of the site to an occupied pygmy-owl territory?"
- "Does the area fall within any known pygmy-owl dispersal corridors?"

The authors state that under the conditions described above, potential impacts of projects on pygmy-owls "should be considered likely, until further site evaluation, protocol based surveys and monitoring is completed." [P. 9]

MEMORANDUM

Date: July 7, 2000

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

From: C.H. Huckelberry
County Administrator

Re: **Issues of Non-Indigenous Species in Public Reserves, Pima County, Arizona**

Overview

In the publication from the Arizona-Sonora Desert Museum called *Buffelgrass, Bullfrogs and other Bioinvaders of the Sonoran Desert,* Dr. Gary Paul Nabhan states: "Few people understand the severity of the current impact of exotic [species] upon natives in the U.S./Mexico borderlands. ... It is likely that at least one of 600 species of non-native plants and animals can be found within a few steps of where we stand. They are welcoming us to the Planet of Weeds." The attached study entitled *Issues of Non-Indigenous Species in Public Reserves* is the first of a series of investigations on the impact of non-native species. County staff reviewed the management plans and discussed the management practices for non-native species with employees of the major reserves in Pima County. The results of this survey and a compendium of federal rules about non-indigenous species are contained in the attached study. An assessment of the biological impacts of non-native species at the system level is being drafted by the consulting team at this time.

CONTENTS

Scope of the Problem - Estimates of Non-Native Species Established in the Sonoran Desert

In describing *The Conservation Dilemma of Non-native Versus Native Fishes*, the preeminent fish biologist Dr. W. L. Minckley provides this perspective:

- "When the Spanish arrived, the pristine Sonoran Desert region had little surface water and relatively few fishes, with at most only 36 species within Arizona's present borders. ... Far more water is impounded today in reservoirs and the number of species has soared! About 80 species, more than 50 from elsewhere, now swim in Arizona waters. Of the original 36, only 6 species persist throughout much of their natural ranges. One is extinct, 12 are endangered, 7 threatened, and 10 are of special concern. Although 8 of the threatened or endangered species survive in adjacent states, they have vanished from Arizona." [ASDM, *Buffelgrass, Bullfrogs & Other Bioinvaders* at 11.]

- "Since all native fishes tested so far do well in artificial waters without exotics, many indict non-native fish species as today's greatest deterrent to conserving our native species. Along with exotic fishes, other aliens including plants, crayfish, clams, snails, and bullfrogs, are proving just as dangerous." [ASDM, *Buffelgrass ...* at 12.]

By taxonomic group, the number of non-indigenous species established in the Sonoran Desert system runs on the order of more than 50 fishes, more than 230 plants, and more than 170 invertebrates, in addition to significant numbers of reptiles, amphibians, birds and mammals. [ASDM, *Buffelgrass ...* at 5.]

"Least Wanted", from *Buffelgrass, Bullfrogs & Other Bioinvaders* by Desert Museum

Non-native species that show up on the list of "least wanted" published in the Desert Museum document, or as problematic non-indigenous species cited by others, include at a minimum:

- Tamarisk; Sahara or Asian Mustard; and Filaree
- Bullfrogs, Crayfish; Green Sunfish; Western Mosquitofish; Red Shiner
- Non-native grasses: Buffelgrass; Johnson Grass; Red Brome; Fountain Grass; and Mediterranean Grass.

Conclusion

The attached study introduces the scale of the problem of managing for non-natives, and the particular species that have come to the attention of the land managers of existing reserves. Since the issue is not widely understood and the regulatory schemes are fragmented, some predict that within five or six human generations non-indigenous species might so out compete native species that "the list of species that constitute 'everything' will be small." [ASDM, *Buffelgrass ...* at 2, quoting David Quammen.]. In light of such considerations, the Sonoran Desert Conservation Plan biological assessment is examining both native and non-native species management issues.

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.

MEMORANDUM

Date: July 20, 1999

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

From: C.H. Huckelberry
County Administrator

Re: **Attached Discussion Paper -- *Water Resources and the Sonoran Desert Conservation Plan***

I. Background

The attached paper entitled *Water Resources and the Sonoran Desert Conservation Plan* describes a comprehensive regional policy direction to achieve meaningful riparian restoration necessary for endangered species compliance. 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.

The County has made a commitment to pursue a high conservation standard, however, under any standard that seeks to comply with the Endangered Species Act, the Sonoran Desert Conservation Plan will have to include significant riparian restoration in order to prevent the decline and extinction of some of our imperiled riparian-dependent species, given the largely decimated status of the riparian ecosystem. There is an over-representation of riparian-dependent endangered, extirpated and imperiled species, which we have lost along with most of our perennial streams and the associated ground-water dependent riparian habitat.

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.

II. Report

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.

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;

(5) integrates effluent, recharge and reclamation water programs into the regional conservation program so that the best use of renewable resources is made for the community.

The Sonoran Desert Conservation Plan offers the community the opportunity to consider water resource policy from a comprehensive, integrated, regional perspective, rather than a narrow or interest based perspective. 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. Also, by acknowledging federal purposes, the Sonoran Desert Conservation Plan anticipates that simply to comply with federal law, we will have to find ways to accommodate more than just the traditional consumptive users of water. As a practical matter, the region must begin to make the right choices now with regard to water resource policy in order to accommodate current and future users.

III. Applicability -- The Gridlock of Local Water Decisionmaking has been Overcome by Protection of Federal Purposes

Public confidence in the direction of water resource policy has eroded to such a point that options offered at the local level are viewed with great skepticism and often destined to fail. Significantly, the major water policy decisions that have succeeded in overriding local concerns, entrenched interests, and the credibility problems created by our history of utilizing the resource within an artificial legal and administrative construct, share certain important characteristics. They are all **regional** and **comprehensive** in nature, and involve a **federal** connection. The most profound interruption to the rules of the local water decisionmaking process has involved the federal government's protection of federal purposes.

(1) Indian Water Rights: During this century, federal purposes have been protected through litigation and settlement attempts which make room within the community's water budget for the reserved right of water for Native American Tribes or Nations. The 1908 United States Supreme Court decision of *Winters v. United States* held that "the Government of the United States has the power to reserve waters of a river flowing through a Territory and exempt them from appropriation under the laws of the State which that Territory afterwards becomes." Pima County would like to see an end to the long negotiation of claims of the Tohono O'odham Nation, and a settlement which benefits the Nation and the natural resource base of the region.

(2) Federal Purposes Will Increasingly Include Wildlife Protection on Land Under the Jurisdiction of the United States: In 1964, the Supreme Court made it clear that federal purposes includes protection of wildlife on land under the jurisdiction of the United States. In *Arizona v. California,* which predates enactment of the Endangered Species Act, the Court upheld a reserve right in water sufficient to protect wildlife on federally designated land. In another case thirteen years later, the Supreme Court applied the *Winters* doctrine to stop groundwater pumping which interfered with the habitat needs of a "unique species of desert fish," the Devil's Hole Pupfish. *Cappaert v. United States* held: "since the implied-reservation-of-water rights doctrine is based on the necessity of water for the purpose of the federal reservation, we hold that the United States can protect its water from subsequent diversion, whether the diversion is of surface or ground water." Next century, protection of federal purposes such as wildlife and related habitat protection will require accommodation within water resource policy. Federal purposes, when established, override local laws and policies which have depleted water and natural resources by ignoring hydrologic reality and environmental impacts. In light of the current state of the riparian ecosystem, new proposals for groundwater pumping will face credible challenges from those who assert claims to protect federally listed species and their habitats, as such species are threatened or endangered by the proposed water use. A June 8, 1999 speech by the Secretary of the Interior entitled *From Reclamation to Restoration* encourages Western communities to elevate water policy discussions and deliberations to the level which envisions "a river [as] a living resource, entitled to at least parity with consumptive uses." The Sonoran Desert Conservation Plan will carry forward the protection of federally listed species and their habitats and in doing so, propose a regional and comprehensive approach to water resource utilization, inspired by natural resource protection goals outlined in federal law.

IV. Conclusion

Pima County's participation in water resource management issues is critical to the region's future. Some time ago, it appeared that Tucson Water, along with the smaller water providers, could develop a coherent water strategy for the metropolitan portion of the county. Today, the lack of a coherent water management strategy for the region makes it imperative that each jurisdiction carefully monitor and participate in the development and implementation of a regional water policy.

Furthermore, Pima County is not simply interested in the metropolitan area -- water resources are everywhere precious, no less in rural areas than urban ones. Water supply is not the only issue involved, either. Flood control, wastewater treatment, upland watershed management, land use planning, exotic species, and many other issues must be considered together in formulating regional water policy. These issues have been treated only peripherally in the past.

The Sonoran Desert Conservation Plan provides an effective process for the community to begin more nearly at the beginning with water resource issues.

Last century a conservation ethic expressed itself in Arizona's first policy statements about the scarcity of water, and publicly owned nature of the resource. Next century, beneficial use will have to recognize hydrologic principles and environmental realities in addition to consumptive uses.

The measure of our success will be quantifiable to the degree we reach a positive bottom line with our water budget, and meet the needs of various users.

In a civic sense, we will succeed when rational water policy is the creation of local cooperative efforts, and not always the result of enforcement of federal purposes. The Sonoran Desert Conservation Plan, because it is keyed to the Section 10 process which requires a regional, comprehensive, inclusive and collaborative process, will allow us to make that showing of leadership at the local level.

MEMORANDUM

Date: December 15, 1999

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

From: C.H. Huckelberry
County Administrator

Re: Environmental Restoration in Pima County in Cooperation with the U.S. Army Corps of Engineers

On December 14, 1999, Dr. Joseph Westphal, Assistant Secretary of the Army for Civil Works, and Congressman Ed Pastor visited Pima County to review progress and implementation on a number of Corps of Engineers/Flood Control District environmental enhancement projects. These projects begin to form the basis for the riparian restoration and protection element of the Sonoran Desert Conservation Plan. The federal resources of the Corps of Engineers are considerable and will greatly assist in implementing the riparian restoration and protection element of the Conservation Plan. While the Corps continues to be thought of as primarily a structural flood control organization, more and more of the projects sponsored by the Corps and those particular to Pima County are for environmental purposes.

The attached discussion paper entitled *Environmental Restoration in Pima County in Cooperation with the U.S. Army Corps of Engineers*, brings together and updates prior analyses of the Riparian Restoration Element of the Sonoran Desert Conservation Plan to include not only the considerations of the Endangered Species Act as administered and enforced by the United States Fish and Wildlife Service, but also the Clean Water Act, as administered by the United States Army Corps of Engineers.

As the lead local entity overseeing the development of the Plan, Pima County supports and promotes a regional Riparian Restoration 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.

This report defines the scope of environmental and legal issues. It also describes a few of the riparian restoration projects underway between Pima County and the Army Corps, including: Paseo de las Iglesias; the Rillito River Habitat Restoration; and the Ajo Detention Basin. Finally, the report describes a method for further integrating efforts to address environmental and regulatory issues.

On November 16, 1999, a letter was forwarded to request a meeting with the District Engineer of the Los Angeles District to discuss a cooperative effort between Pima County Government and the Army Corps of Engineers to address the issues that were raised as part of the October 1999 United States District Court Order enjoining the Corps from authorizing certain Nationwide Permits under Section 404 of the Clean Water Act until a regionally based programmatic environmental impact statement is prepared. The letter stated that since Pima County is developing a regional multi-species habitat conservation plan, the Sonoran Desert Conservation Plan, we have a long-range interest in the programmatic assessment and in the consultation ordered by the District Court between the Army Corps of Engineers and the United States Fish and Wildlife Service. Because we have conducted a great deal of work with the local science community and are in the process of requesting proposals from biologists to conduct a regional biological evaluation, the existing habitat conservation planning process could serve to assist the Army Corps of Engineers as it assesses cumulative impacts of the Section 404 permit program on the endangered cactus ferruginous pygmy-owl.

CHH/jj

Attachment

MEMORANDUM

Date: January 26, 2000

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

From: C.H. Huckelberry
County Administrator

Re: *Coverages of Perennial Streams, Intermittent Streams and Areas of Shallow Groundwater*

I. Report

The attached final project report entitled *GIS Coverages of Perennial Streams, Intermittent Streams, and Areas of Shallow Groundwater* was prepared by the Pima Association of Governments as part of the Sonoran Desert Conservation Plan. This report is the fifteenth in the Conservation Plan technical series and was undertaken to fill a data gap that otherwise might have limited the quality of the broad biological evaluation the County began last week.

With the attached document and the Geographic Information System file that is now a part of the County library of over 1000 coverages, the scientific community has access to mapping that better differentiates perennial, ephemeral and intermittent watercourses, and provides more comprehensive coverage of shallow groundwater sources.

This data is significant to the Sonoran Desert Conservation Plan because riparian habitat is one of the most important and least protected of the habitat types in Pima County. Previous technical reports have emphasized the need for Riparian Restoration initiatives that have a long term goal of effecting some level of recovery of natural functions within riverine systems.

II. Perennial and Intermittent Streams

The attached report defines streams to include springs, ponds, pools, wetlands, rivers, and washes. United States Geological Survey distinctions apply so that:

- a perennial stream is one that has continuous flow;
- an intermittent stream is one that has flow at certain times of the year; and
- an ephemeral stream has a channel above the water table, and flows only in direct response to precipitation.

As a result of the attached study, fifty-five perennial stream reaches and eighty-two intermittent stream reaches were identified across 74 different streams.

III. Shallow Groundwater

Shallow groundwater is defined for purposes of the report as groundwater within 50 feet of the land surface. At this depth, groundwater can sustain mesquite bosques. Depth-to-groundwater ranges for other Sonoran riparian tree species are also described in the report. Nearly one hundred potential shallow groundwater sites are listed within the report, and many of the larger zones are mapped.

IV. Conclusion:

The purpose of the attached study is to identify and map intermittent streams, perennial streams and shallow groundwater so that these data layers are available to carry out the regional biological evaluation in a timely and comprehensive manner.

The Pima Association of Government staff, working with a Technical Advisory Committee and the public, exceeded expectations in delivering the extensive GIS product described in detail within the report. In addition to filling a significant data gap, the text of the report provides an index of relevant literature; it identifies tree species and other environmental features associated with each stream reach; it provides justifications for the delineations of water sources; and the report makes recommendations for future research priorities.

These work products have been forwarded to the consultants who are undertaking the biological evaluation for the Sonoran Desert Conservation Plan. County staff will continue to work with the Pima Association of Governments to maintain and improve the database of water resources described within the attached study.

Attachment

MEMORANDUM

Date: April 5, 2000

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

From: C.H. Huckelberry
County Administrator

Re: **Prioritization of Streams for Conservation in Pima County**

Summary

The attached report contributes to the Riparian Protection Element of the Sonoran Desert Conservation Plan by describing a number of streams within watershed planning units and prioritizing these streams according to their existing contribution to the overall conservation of biological diversity in Pima County. Streams that ranked in the top 20 by the following parameters are recommended for priority consideration in identifying areas for further analysis by the scientists assisting in the development of the Sonoran Desert Conservation Plan:

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

Over 50 percent of the priority streams within the County are found within the Altar Valley and the Cienega Rincon area.

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

Perennial Stream Length -- Perennial stream lengths are the greatest in these areas:

- Sabino Canyon in the Middle Santa Cruz subarea (15 miles);
- Upper Cienega Creek of the Cienega Rincon subarea (7.7 miles);
- Santa Cruz River in the Middle Santa Cruz and Tortolita Fan subareas (6.8 miles);
- Buehman Canyon of the Middle San Pedro subarea (5.2 miles);
- Canada del Oro in the Tortolita Fan subarea (4.2 miles); and
- Arivaca Creek within the Altar Valley subarea (2.7 miles).

Intermittent Stream Length -- Intermittent stream lengths are the greatest in these areas:

- Tanque Verde Creek the Middle Santa Cruz subarea (17.2 miles);
- Santa Cruz River in the Middle Santa Cruz and Tortolita Fan subareas (15.7 miles);
- Agua Verde Creek of the Cienega Rincon subarea (15 miles);
- Bear Canyon the Middle Santa Cruz subarea (12.3 miles);
- Rincon Creek of the Cienega Rincon subarea (11.3 miles);
- San Pedro River of the Middle San Pedro subarea (10.6 miles);
- Ventana Canyon of the Middle Santa Cruz subarea (9.3 miles);
- Sutherland Wash in the Tortolita Fan subarea (6.5 miles);
- Molino Canyon in the Middle Santa Cruz subarea (5.2 miles);
- Lower Cienega Creek in the Cienega Rincon subarea (4.8 miles); and
- Romero Canyon in the Middle Santa Cruz subarea (4.8 miles).

Hydro-mesoriparian Habitat -- Hydro-mesoriparian habitat covers that greatest area in:

- Santa Cruz River in the Middle Santa Cruz and Tortolita Fan subareas (3499 acres);
- San Pedro River of the Middle San Pedro subarea (2306 acres);
- Tanque Verde Creek in the Middle Santa Cruz subarea (1115 acres);
- Arivaca Creek within the Altar Valley subarea (1051 acres);
- Agua Caliente Canyon in the Middle Santa Cruz subarea (1011 acres);
- Sopori Wash in the Altar Valley subarea (970 acres);
- Upper Cienega Creek in the Cienega Rincon subarea (897 acres); and
- Sabino Creek in the Middle Santa Cruz subarea (839 acres).

Xeroriparian -- This habitat, associated with upland species, covers the greatest area in:

- Sabino Wash in the Altar Valley subarea (353 acres);
- Agua Verde Creek in the Cienega Rincon subarea (291.3 acres);
- Penitas Wash in the Altar Valley subarea (230 acres);
- Buehman Canyon of the Middle San Pedro subarea (228.4 acres);
- Mescal Arroyo in the Cienega Rincon subarea (218.3 acres);
- Upper Cienega Creek in the Cienega Rincon subarea (159.8 acres);
- Thomas Canyon in the Altar Valley subarea (194.8 acres); and
- Medera Canyon in the Upper Santa Cruz subarea (105 acres).

Shallow Groundwater -- Shallow groundwater covers that greatest area in:

- Tanque Verde Creek in the Middle Santa Cruz subarea (5528 acres);
- Arivaca Creek within the Altar Valley subarea (3311 acres);
- Upper Cienega Creek in the Cienega Rincon subarea (2911 acres);
- Agua Caliente Canyon in the Middle Santa Cruz subarea (2863 acres);
- San Pedro River of the Middle San Pedro subarea (2102 acres);
- Sabino Creek in the Middle Santa Cruz subarea (1753 acres);
- Lower Cienega Creek in the Cienega Rincon subarea (1651 acres);
- Sopori Wash in the Altar Valley subarea (1551 acres);
- Gardner Canyon in the Cienega Rincon subarea (1210 acres);
- Agua Verde Creek in the Cienega Rincon subarea (1057 acres); and
- Davidson Canyon in the Cienega Rincon subarea (907 acres).

Number of Recorded Native Fish Species -- The following streams have more than 1 recorded native fish species:

- San Pedro River of the Middle San Pedro subarea (6 native fish species);
- Buehman Canyon of the Middle San Pedro subarea (3 native fish species);
- Upper Cienega Creek of the Cienega Rincon subarea (3 native fish species);
- Mattie Canyon of the Cienega Rincon subarea (3 native fish species);
- Sabino Canyon in the Middle Santa Cruz subarea (3 native fish species);
- Davidson Canyon of the Cienega Rincon subarea (2 native fish species);
- Canada del Oro in the Tortolita Fan subarea (2 native fish species).

Conclusion

The priority streams analysis provides a basis for developing the Riparian Element of the Sonoran Desert Conservation Plan not only by describing the relative resource values of the different streams within Pima County, but also by conveying a sense of the overall fragile nature of these streams. The chart below shows that only a few streams -- whether perennial or intermittent -- have a reach of more than two miles. Next week a more detailed analysis will be issued as part of a report entitled *Overview of Pima County's Watersheds and Watercourses*. Results of riparian mapping efforts by the consulting team will also be available.

Watershed within Pima County	Number of Streams in Study with more than 2 miles of Perennial Flow	Number of Streams in Study with more than 2 miles of Intermittent Flow
Tortolita Fan	3 (shares Santa Cruz)	3 (shares Santa Cruz)
Middle Santa Cruz	2 (shares Santa Cruz)	7 (shares Santa Cruz)
Cienega-Rincon	2	7
Middle San Pedro	2	5
Altar Valley	1	2
Upper Santa Cruz	0	1
Avra Valley	0	0

MEMORANDUM

Date: April 18, 2000

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

From: C.H. Huckelberry
County Administrator

Re: **Pima County's Watersheds and Watercourses**

Overview

The attached report, prepared by Barbara Tellman of the Water Resources Research Center at the University of Arizona and her co-authors, makes a significant contribution to the scientific evaluation for the Sonoran Desert Conservation Plan by building upon the *Biological Stress Assessment* drafted by Recon through the identification of threats and stressors to watercourses within Pima County. Entitled *An Overview of Pima County's Watersheds and Watercourses*, this document provides background on technical and water policy matters, describes potential and existing impacts to watercourses within Pima County, suggests options for reducing stressors, and outlines a number of issues for discussion within each watershed planning unit. A complete glossary of terms, and an appendix of relevant laws and regulations is included. In this memorandum, some of the highlights of the report will be summarized and discussed in light of the two reports by Recon issued on April 17, 2000: *Review of Vulnerable Species* and the *Biological Stress Assessment*.

Watercourse Types in the Subareas

SUBAREA	SHEET FLOW	DISTRIBUTARY FLOW	NATURAL TRIBUTARY	ENTRENCHED TRIBUTARY	CHANNELIZED WASHES	PERENNIAL/ INTERMITTENT
M.SAN PEDRO			yes			yes
CIENEGA-RINCON		yes	yes	at times	yes	yes
U. SANTA CRUZ		yes	yes	yes	yes	in mountains
M. SANTA CRUZ		at times	yes	yes	yes	effluent
TORTOLITA		yes	yes		yes	effluent
ALTAR VALLEY		yes	yes	yes		yes
AVRA VALLY	yes	yes	yes		yes	effluent
W. PIMA CO.		yes	yes		at times	at times

The report describes the variety of characteristics that define Pima County's watercourses, ranging from perennially flowing streams, to channelized washes, to effluent dominated reaches. The chart above summarizes the types of watercourses within the planning units of the Sonoran Desert Conservation Plan.

Generalized Effects of Human Activities on Stream Discharge

The *Biological Stress Assessment* described the effects of land and water use activities on biological resources with a particular focus on the effect of activities on species. The *Watercourse* study applies similar analysis to the effect of activities on watercourse function, noting in the opening chapters that:

- "Some 80% of all wildlife in Arizona depends on watercourses ... for some portion of the life cycle."
- "Because we have already damaged so many of the natural watercourses in Pima County, many native wildlife populations have been reduced or lost."
- "There are still a few locations in eastern Pima County where the water table is high enough to support riparian vegetation, but for the most part the water table is 200 feet or more below the surface -- too deep for roots to reach."

The chart below, found on page 40 of the Watercourse study, summarizes the generalized impact of eight major activities on stream discharge.

ACTIVITY	EFFECT ON FLOOD PEAK	EFFECT ON PERENNIAL FLOW	EFFECT ON SEDIMENT LOAD	OTHER EFFECTS
LAND CLEARING / CONSTRUCTION	increase	decrease	increase	Decreased vegetation
IMPERVIOUS SURFACES	increase	increase	either, depends	More water in channels with greater velocity; more sediment discharge downstream
STORM DRAINS	increase	decrease	either, depends	Decreased recharge to local groundwater; increased rate to conveyance system
MINING SAND OR GRAVEL	minimal	minimal	short or long term decrease	Lowering of stream bed; decreased extent of flooding; increased bank erosion; decreased local recharge.
VEGETATION PLANTED ON THE FLOODPLAIN	decrease	no change	decrease	Increased habitat and aesthetic values; can increase local depth of flooding
GROUNDWATER PUMPING	decrease	decrease	increase	Loss of riparian habitat; increase erosion and sediment load
INSTREAM RECHARGE	minimal increase	increase	minimal increase	May move local recharge downstream at low flow periods.
GRAZING	increase	decrease	increase	These effects do not occur with good grazing management.

Particular Effects of Activities on Riparian Function in Each Watershed Planning Unit

Pages 73 through 158 of the *Watercourse* study contain an analysis of each of the watershed subarea planning units within Pima County, covering the topics of watershed and watercourse characteristics, human impacts on the watercourses such as flood management and transportation, water and wastewater-related uses, waters supply, existing public land uses, existing private land uses, projected land uses, and issues for discussion. Each watershed analysis is summarized below in four parts:

- A table describing potential and existing impacts on the watercourses within the subarea;
- A table describing potential options for reducing stress on watercourses within the subarea;
- A list of issues suggested for discussion as part of the Sonoran Desert Conservation Plan; and
- A summary of the species of concern by watershed, as identified in the Recon reports.

Middle San Pedro Subarea (Subarea 1):

The Middle San Pedro subarea is discussed in pages 73 through 81 of the text. The summaries of the (1) potential and existing impacts on the watercourses within the subarea, and (2) potential options for reducing stress on watercourses within the subarea, are reproduced below.

Potential and existing impacts on the watercourses in the Middle San Pedro

REGION WITHIN THE SUBAREA	GRAZING	WILDCAT SUBDIVISION	PLANNED SUBDIVISION	COPPER MINE	SAND & GRAVEL MINE	PUMPING	AGRI CULT URE	REC
RIVER AREA	yes	potential	potential			yes	yes	yes
MOUNTAINS AND FOOTHILLS	yes			potential				yes

Potential options for reducing stress on watercourses within the Middle San Pedro subarea

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

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

- Are additional preserved areas needed? County owned? State land?
- Should ranches be purchased or conserved instead of sold for development?
- If developed, what provisions should be made to protect groundwater?
- Should the major north-south road in the area be improved?
- What should be done to protect watercourses from potential mining?
- Should efforts be made to revegetate the river or improve the habitat?

Summary of the species of concern within the watershed, as identified in the Recon reports

Suggested for potential coverage under the multi-species conservation plan:

- Gila topminnow
- Pygmy-owl
- Yellow billed cuckoo
- Gila chub
- Western red bat
- Lowland leopard frog
- Needle-spined pineapple cactus

Species of concern:

- Mexican spotted owl
- Weeping muhly
- Desert sucker
- Sonora sucker
- Speckled dace
- Apache northern goshawk
- Southwestern willow flycatcher

Cienega-Rincon Subarea (Subarea 2):

The Cienega-Rincon subarea is discussed in pages 81 through 90 of the text. The summaries of the (1) potential and existing impacts on the watercourses within the subarea, and (2) potential options for reducing stress on watercourses within the subarea, are reproduced below.

Potential and existing impacts on the watercourses in the Cienega-Rincon subarea

REGION WITHIN THE SUBAREA	GRAZING	WILDCAT SUBDIVISION	PLANNED SUBDIVISION	COPPER MINE	SAND & GRAVEL MINE	PUMPING	AGRI CULT URE	REC
CIENEGA CREEK	yes	yes	yes	potential	yes	yes		yes
RINCON VALLEY	yes	yes	yes		yes	yes		yes

Potential options for reducing stress on watercourses within the Cienega-Rincon subarea

REGION WITHIN THE SUBAREA	LESS PUMPING (ALT WATER)	NON STRUC FLOODPLAIN MANAGE	LAND USE MANAGE MENT	FEDERAL LAND, PROTECTION	STATE TRUST LAND PROTECTED	OTHER PRESERVE INCREASE	BETTER GRAZING
CIENEGA CREEK	potential	potential	potential	potential		potential	potential
RINCON VALLEY	potential	potential	potential	potential	potential	potential	

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

- Should efforts be taken to preserve surface water supplies?
- Should alternate sources of water, such as CAP, be provided to landowners?
- Are additional measures needed to prevent damage from downstream flooding?
- What should be done, if anything, to protect watercourses from mining?
- What measures, if any, should be taken to protect limestone caves and springs?
- Should the majority of the watershed become and NCA or have protection?

Summary of the species of concern within the watershed, as identified in the Recon reports

Suggested for potential coverage under the multi-species conservation plan:

- Gila topminnow
- Pygmy-owl
- Yellow billed cuckoo
- Gila chub
- Western red bat
- Lowland leopard frog
- Needle-spined pineapple cactus
- Huachuca water umbel
- Pima pineapple cactus
- Lesser long nosed bat
- Pale Townsend's big-eared bat
- Chiricahua Leopard Frog
- Mexican Garter Snake

Species of concern:

- Saiya
- Apache northern goshawk
- Box Canyon Muhly
- Weeping Muhly
- Mexican spotted owl
- Arizona Shrew

Upper Santa Cruz Subarea (Subarea 3):

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

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

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

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

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

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

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

Summary of the species of concern within the watershed, as identified in the Recon reports

Suggested for potential coverage under the multi-species conservation plan:

- Gila topminnow
- Yellow billed cuckoo
- Western red bat
- Lowland leopard frog
- Needle-spined pineapple cactus
- Pima pineapple cactus
- Lesser long nosed bat
- Pale Townsend's big-eared bat
- Chiricahua Leopard Frog
- Tumamoc globeberry
- San Xavier Talussnail
- Mexican Garter Snake

Species of concern:

- Apache northern goshawk
- Saiya
- Box Canyon Muhly
- Weeping Muhly
- Arizona Shrew
- Mexican spotted owl

Middle Santa Cruz Subarea (Subarea 4):

The Middle Santa Cruz subarea is discussed in pages 103 through 116 of the text. The summaries of the (1) potential and existing impacts on the watercourses within the subarea, and (2) potential options for reducing stress on watercourses within the subarea, are reproduced below.

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

REGION WITHIN THE SUBAREA	GRAZING	WILDCAT SUBDIVISION	PLANNED SUBDIVISION	COPPER MINE	SAND & GRAVEL MINE	PUMPING	AGRI CULT URE	REC
MOUNTAINS	yes			potential				yes
FOOTHILLS		yes	yes			yes		yes
RIVERS AND TRIBUTARIES		yes	yes		yes	yes		yes
CENTRAL CORE			yes			yes		

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

REGION WITHIN THE SUBAREA	LESS PUMPING (ALT WATER)	NON STRUC FLOODPLAIN MANAGE	LAND USE MANAGE MENT	FEDERAL LAND, PROTECTION	STATE TRUST LAND PROTECTED	OTHER PRESERVE INCREASE	BETTER GRAZING
MOUNTAINS				potential			potential
FOOTHILLS	potential	potential	potential	potential	potential	potential	
RIVERS AND TRIBUTARIES	potential	potential	potential			potential	
CENTRAL CORE	potential	potential	potential				

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

- How should higher priority washes be protected or rehabilitated?
- Are stronger city and county riparian ordinances needed?
- What kind of floodplain management should be utilized without soil cement?
- Are there important floodplain properties that should be acquired?
- Should road accessibility policies be coordinated with watercourse preservation?

Summary of the species of concern within the watershed, as identified in the Recon reports

Suggested for potential coverage under the multi-species conservation plan:

- Gila topminnow
- Pygmy-owl
- Lesser long nosed bat
- Yellow billed cuckoo
- Pima Pineapple cactus
- Gila chub
- Needle-spined pineapple cactus
- Pale Townsend's big-eared bat
- Lowland Leopard Frog
- Mexican Garter Snake
- Tumamoc globeberry

Other species of concern:

- Mexican spotted owl
- Trelease agave
- Sabino canyon damselfly
- Desert pupfish
- Box Canyon Muhly
- Weeping Muhly
- Apache northern goshawk
- Goodding onion

Tortolita Fan Subarea (Subarea 5):

The Tortolita Fan subarea is discussed in pages 117 through 128 of the text. The summaries of the (1) potential and existing impacts on the watercourses within the subarea, and (2) potential options for reducing stress on watercourses within the subarea, are reproduced below.

Potential and existing impacts on the watercourses in the Tortolita Fan subarea

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

Potential options for reducing stress on watercourses within the Tortolita Fan subarea

REGION WITHIN THE SUBAREA	LESS PUMPING (ALT WATER)	NON STRUC FLOODPLAIN MANAGE	LAND USE MANAGE MENT	FEDERAL LAND, PROTECTION	STATE TRUST LAND PROTECTED	OTHER PRESERVE INCREASE	BETTER GRAZING
S. Cruz River	potential	potential	potential				
Tortolita Fan	potential	potential	potential		potential	potential	
Oro Valley	potential	potential	potential		potential	potential	
Catalina	potential	potential	potential		potential	potential	
Public Lands							potential

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

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

Summary of the species of concern within the watershed, as identified in the Recon reports

Suggested for potential coverage under the multi-species conservation plan:

- Gila topminnow
- Pygmy-owl
- Lesser long nosed bat
- Swainson's hawk
- Lowland Leopard Frog
- Tumamoc globeberry

Other species of concern:

- Apache northern goshawk
- Trelease agave
- Goodding onion
- Mexican spotted owl
- Weeping Muhly

Altar Valley Subarea (Subarea 6A):

The Altar Valley subarea is discussed in pages 129 through 140 of the text. The summaries of the (1) potential and existing impacts on the watercourses within the subarea, and (2) potential options for reducing stress on watercourses within the subarea, are reproduced below.

Potential and existing impacts on the watercourses in the Altar Valley subarea

REGION WITHIN THE SUBAREA	GRAZING	WILDCAT SUBDIVISION	PLANNED SUBDIVISION	COPPER MINE	SAND & GRAVEL MINE	PUMPING	AGRI CULT URE	REC
Arivaca, Buenos Aires	yes	yes	yes	yes		yes		yes
Brawley Wash	yes		potential			yes		
Remainder of the Valley	yes	yes	yes			yes	yes	yes

Potential options for reducing stress on watercourses within the Altar Valley subarea

REGION WITHIN THE SUBAREA	LESS PUMPING (ALT WATER)	NON STRUC FLOODPLAIN MANAGE	LAND USE MANAGE MENT	FEDERAL LAND, PROTECTION	STATE TRUST LAND PROTECTED	OTHER PRESERVE INCREASE	BETTER GRAZING
Arivaca, Buenos Aires	potential		potential	potential			potential
Brawley Wash	potential			potential	potential		potential
Remainder of the Valley	potential	potential	potential			potential	

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

- Should measures be taken to limit groundwater pumping affecting Arivaca Creek?
- What is the best use of ranches that are sold by the owners?
- If Ryan Airfield is expanded, how should drainage issues be handled?
- Is recharge a good use for land in Altar Valley?
- Should efforts take place to restore the Brawley Wash?

Summary of the species of concern within the watershed, as identified in the Recon reports

Suggested for potential coverage under the multi-species conservation plan:

- Gila topminnow
- Pygmy-owl
- Pima Pineapple cactus
- Yellow billed cuckoo
- Chiricahua leopard frog
- Western red bat
- Pale Townsend's big-eared bat
- Lowland Leopard Frog
- Mexican garter snake
- Tumamoc globeberry

Other species of concern:

- Masked bobwhite
- Jaguar
- Kearney's Blue Star
- Desert pupfish
- Weeping Muhly

Avra Valley Subarea (Subarea 6B):

The Avra Valley subarea is discussed in pages 141 through 150 of the text. The summaries of the (1) potential and existing impacts on the watercourses within the subarea, and (2) potential options for reducing stress on watercourses within the subarea, are reproduced below.

Potential and existing impacts on the watercourses in the Avra Valley subarea

REGION WITHIN THE SUBAREA	GRAZING	WILDCAT SUBDIVISION	PLANNED SUBDIVISION	COPPER MINE	SAND & GRAVEL MINE	PUMPING	AGRI CULT URE	REC
Tucson Mountain Foothills		yes	yes			yes		yes
Marana West of the River		yes	yes			yes		
Valley Floor		yes	yes		potential	yes	yes	
Silverbell, Aguirre, Waterman Area	yes			yes		yes	yes	

Potential options for reducing stress on watercourses within the Avra Valley subarea

REGION WITHIN THE SUBAREA	LESS PUMPING (ALT WATER)	NON STRUC FLOODPLAIN MANAGE	LAND USE MANAGE MENT	FEDERAL LAND, PROTECTION	STATE TRUST LAND PROTECTED	OTHER PRESERVE INCREASE	BETTER GRAZING
Tucson Mountain Foothills	potential	potential	potential	potential	potential		
Marana West of the River	potential	potential	potential			potential	
Valley Floor	potential	potential	potential		potential		
Silverbell, Aguirre, Waterman Area				potential	potential	potential	potential

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

- Should measures be taken to minimize impacts on watercourses and flooding, in light of special sheet flooding problems of this area, as it develops?
- What can be done to reduce the detrimental impacts of downstream flooding as wildcat development proliferates in this area?
- What roads are needed and should be expanded?
- Is recharge a good use for land in Avra Valley?
- What is the best use/ uses for abandoned farmland in Avra Valley?

Summary of the species of concern within the watershed, as identified in the Recon reports

Suggested for potential coverage under the multi-species conservation plan:

- Pygmy-owl
- Turk's Head cactus
- Pima Pineapple cactus
- Gila topminnow
- Tumamoc globeberry

Other species of concern:

- Desert pupfish

Western Pima County Subarea (Subarea 8):

The Western Pima County subarea is discussed in pages 151 through 158 of the text.

Potential and existing impacts on the watercourses in the Western Pima County subarea

REGION WITHIN THE SUBAREA	GRAZING	WILDCAT SUBDIVISION	PLANNED SUBDIVISION	COPPER MINE	SAND & GRAVEL MINE	PUMPING	AGRI CULT URE	REC
AJO / WHY		yes	yes	yes		yes		
PUBLIC LANDS	yes							yes

Potential options for reducing stress on watercourses within the Western Pima County subarea

REGION WITHIN THE SUBAREA	LESS PUMPING (ALT WATER)	NON STRUC FLOODPLAIN MANAGE	LAND USE MANAGE MENT	FEDERAL LAND, PROTECTION	STATE TRUST LAND PROTECTED	OTHER PRESERVE INCREASE	BETTER GRAZING
AJO / WHY			potential				
PUBLIC LANDS							potential

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

- Are grazing management changes needed to protect watercourses?
- What measures are needed to minimize impacts of recreation?
- Should the current road between Lukeville and I-10 be widened?
- What should be done, if anything, to protect watercourses from mining?

Summary of the species of concern within the watershed, as identified in the Recon reports

Suggested for potential coverage under the multi-species conservation plan:

- Pygmy-owl
- Lesser long nosed bat
- Organ Pipe shovelnosed snake
- Red-backed whiptail lizard
- Acuna cactus
- Tumamoc globeberry

Other species of concern:

- Sonoran pronghorn
- Desert pupfish
- Trelease Agave
- Sonoyta mud turtle
- Ajo rock daisy
- Quitobaquito tryonia (snail)

Summary of Major Issues for Discussion to Determine Impact to Watercourses

Pages 159 through 168 contain a number of general issues for discussion based on the watercourse analysis. These issues are common to the region or several subareas:

- Bank erosion in flood events
- Flooding in sheet flow areas
- Flooding in distributary flow areas
- Flooding in tributary flow areas
- Street drainage and all weather access
- Planned development versus wildcat development
- Natural recharge or overbank storage
- Role of state trust land
- Loss of riparian vegetation
- Protection of xeroriparian washes with native vegetation
- Dewatering of streams
- Structural versus non-structural flood control
- Groundwater pumping affecting streamflow
- Preservation of natural watercourses
- Rehabilitation of watercourses
- Coordination between jurisdictions
- Use of CAP and effluent

Summary of Potential and Existing Impacts on the Watercourses in All Watershed Subareas

SUBAREA	GRAZING	WILDCAT SUBDIVISION	PLANNED SUBDIVISION	COPPER MINE	SAND & GRAVEL MINE	PUMPING	AGRI CULT URE	REC
U San Pedro	yes	potential	potential	potential	potential	yes	yes	yes
Cien- Rincon	yes	yes	yes	potential	yes	yes		yes
U Santa Cruz	yes	yes	yes	yes	yes	yes	yes	yes
M Santa Cruz		yes	yes		yes	yes		yes
Tortolita Fan	yes	yes	yes		yes	yes	yes	yes
Altar Valley	yes	yes	yes			yes	yes	yes
Avra Valley	yes	yes	yes	yes	potential	yes	yes	yes
W Pima Co	yes	yes	potential	yes		yes		yes

Summary of Potential Options for Reducing Stress on Watercourses in All Watershed Subareas

SUBAREA	LESS PUMPING (ALT WATER)	NON STRUC FLOODPLAIN MANAGE	LAND USE MANAGE MENT	FEDERAL LAND, PROTECTION	STATE TRUST LAND PROTECTED	OTHER PRESERVE INCREASE	BETTER GRAZING
U San Pedro			potential	potential		potential	potential
Cien- Rincon	potential	potential	potential	potential	potential	potential	potential
U Santa Cruz	potential	potential	potential			potential	potential
M Santa Cruz	potential	potential	potential	potential		potential	potential
Tortolita Fan	potential	potential	potential		potential	potential	potential
Altar Valley	potential	potential	potential	potential		potential	potential
Avra Valley	potential	potential	potential	potential		potential	potential
W Pima Co			potential				potential

MEMORANDUM

Date: April 27, 2000

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

From: C.H. Huckelberry
County Administrator

Re: **Cocio Wash and the Gila Topminnow**

Background

The early issues of the *Arizona Daily Star*, which in the 1880s was called the *Arizona Weekly Star*, provide a glimpse of attitudes and practices that have brought us to our difficult circumstances today with lost and destroyed riparian systems.

A few stories touted the success of introducing non-native fish to the desert riparian systems.

- One 1884 story announced that the Fish Commission of Washington D.C. planted one million non-native fish along intersections with the railroad.
- In 1886, an April 15th story described how "nearly if not all of the experiments made in carp culture in Arizona have proven successful."
- Months later, a September 16th story followed up on this theme with this more local report, stating that "among the many virgin industries inaugarated [sic] in Arizona, none will prove more profitable to investors than that of the carp culture. Wherever the experiment has been made success has been the result. The growth of the carp is almost phenomenal. ... Several of the larger ponds of the Santa Cruz have been stocked with marvelous success, and in less than two years, it is safe to say that this market will be entirely supplied with fish of home production."

Other stories reflect an early awareness of how land uses or simple resource practices can have a negative impact on fish populations.

- In August of 1886, a letter published in the *Star* stated that "a general copious rain ... has benefited not only the cattle and crops, but enabled residents to again take a refreshing swim. On the 10th the rains began to fall, and the next day the rivers were rushing down spreading the water all over the various ranches. The only drawback was the killing of all the fish in the lower San Pedro and Gila, caused from the tailings of the mammoth mill. They died by the ten thousand and it will take years to replace the loss ...."

- A January 28, 1887 article entitled "Destruction of Fish" observed that "There are several parties who are using the irrigation canals for fish, with good success, catching large quantities. There is a bad feature of this method of fishing; large and small are caught and instead of throwing the small ones back into the water they are left on the ground to die.... It is easy to see waste that is being done. Some measure ought to be adopted to stop it."

Eighty years after the *Star* article recommended adoption of a resource protection "measure," the Gila Topminnow, a native fish, was listed as endangered. This fish remains listed today, and in fact the most recent draft recovery plan for the Gila Topminnow states that "delisting of the subspecies is not considered feasible in the foreseeable future." Avoiding extirpation of the less-than-twenty populations that existed in 1997, and reintroduction of populations, constitute the modest strategies of the draft plan.

Report

The attached report entitled *Cocio Wash and the Gila Topminnow* chronicles how the intention to conserve a relic population of Gila Topminnow under current resource conditions is generally insufficient. As is true in most local riparian areas, and even in some upland areas, we have let the resource base degrade too far to expect project and site specific responses to stem losses, much less lead to recovery. The Gila Topminnow was considered to be among the most common of fishes in the Santa Cruz River system in the early 1940s. Three decades later it was considered endangered; and in another three decades time, its recovery is not foreseeable by the science community, given the piecemeal approach to protection efforts. I would add that the regulatory schemes offered by the Endangered Species Act, when applied on the project-by-project level, also serve as disincentives to proactive recovery programs. Recovery efforts have been concentrated on federal land, but as the attached report indicates, "most perennial waters in the Southwest are controlled by private parties." Therefore, meaningful recovery will have to involve private parties, and will have to provide rewards for conservation efforts.

Conclusion

Pima County has within its ownership at least two areas that could serve as potential sites for the recovery of Gila Topminnow and other native fish: the Agua Caliente Park and the downstream segment of the Cienega Creek Preserve. I have directed staff to work with fish biologists and resource agencies to open up County parks for recovery of native fishes. That collaboration has already started. I have also directed staff to work with the regulatory agencies to create an incentive program and safe harbor options as part of the Sonoran Desert Conservation Plan so that once the County model is established, private parties will have assurances that their willingness to play a proactive role in resolving our local endangered species dilemmas will be rewarded. Perhaps at that point the half century decline in native fish populations can begin to be reversed. As the attached report indicates, the system for protection that is currently in place is not going to be enough.

MEMORANDUM

Date: May 8, 2000

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

From: C.H. Huckelberry
County Administrator

Re: **Riparian Vegetation Mapping Pilot Study**

I. Background

Two studies are attached to describe the progress of riparian mapping that is being developed as part of the Sonoran Desert Conservation Plan: *Riparian Habitat and Riparian Vegetation Mapping Efforts for the Sonoran Desert Conservation Plan*, and the *Pima County Riparian Vegetation Mapping Pilot Study*. On January 18, 2000, the Board awarded Harris Environmental Group a contract to carry out riparian vegetation mapping, which is one of several tasks related to the biological evaluation. The biological evaluation workplan defined the riparian mapping task in this way:

A. The consultant shall produce the following:

1. Vegetation maps and a map showing field verification locations as Arc/Info vector coverages or in a format pre-approved by the Pima County Department of Transportation Technical Services GIS Section.

2. A complete reproducible set of mylars registered to 7.5 minute USGS quadrangle maps. Each mylar shall contain a legend, scale, index map, and title block. Each map shall portray the locations of boundaries and the geographic extent of vegetative communities. Each polygon shall be labeled numerically with the vegetation classification. In addition, one mylar index map shall be provided.

3. A report shall be prepared describing the methods, the scale and source of base information used, assumptions made, the nature of any interim products, and a non-statistical assessment of reliability in the mapping in terms of 1) positional accuracy and 2) classification accuracy as it varies by geographic area and by classification category. To the extent thought reliable, existing sources of information shall be used. Information to be reviewed includes but is not limited to the following:

   a) PAG maps of perennial, intermittent, and ephemeral streams and shallow groundwater zones (digital)

   b) Digital USGS orthophoto quadrangles for portions of Pima County

c) Unincorporated Pima County riparian habitat maps (digital)

d) Gap Analysis Program vegetation maps (digital)

e) NDVI map for portions of Pima County (digital)

f) PAG 208 maps for non-urban Pima County (paper)

g) Wildlife Habitat Inventory maps for metropolitan Tucson (digital)

h) Organ Pipe Cactus National Monument vegetation map (digital)

i) PAG 208 vegetation and soils data cards (paper)

j) Cienega Creek Natural Preserve vegetation map (paper)

k) USGS and Pima County stream center lines (digital)

l) USFWS wetland inventory maps (mostly paper)

Emphasis shall be placed on classifying the existing riparian areas as delineated on Pima County's riparian habitat maps, delineating additional riparian areas where no data currently exists, and addressing specific mapping requirements below. Work shall emphasize areas outside existing public reserves.

B. Vegetation Mapping Requirements

1. Discriminate the location of riparian vegetation versus upland vegetation with a minimum map area of 5 acres.

2. Identify physiognomy and dominance, discriminating among leguminous tree forests, broadleaf deciduous forests, tamarisk forests, other riparian forests, emergent marsh, tobosa or sacaton grassland, and riparian scrub. Units should be mapable on a 7.5 minute scale — i.e. 5 acres minimum unit.

3. Map unit classifications should be compatible with the National Vegetation Classification System. The hierarchical classification system used by Brown, Lowe and Pase is acceptable.

C. Procedure

1. Refine and develop a mapping protocol to meet the STAT vegetation mapping requirements, budget, and schedule.

2. Design and conduct a pilot vegetation mapping exercise covering several nonadjacent USGS 7.5 minute quadrangles, including field verification. The pilot study areas need to represent the range of vegetation types present in the study area, as well as the variation in available data sources. Evaluate and refine the mapping protocol and classification scheme.

II. Reports

The attached reports provide the context for prior mapping efforts, and the pilot study by Harris Environmental Group, as described in the paragraph immediately above. In *Riparian Habitat and Riparian Vegetation Mapping Efforts for the Sonoran Desert Conservation Plan*, a number of previous riparian mapping efforts are reviewed, including a 1976 initiative by Arizona Game and Fish, the U.S. Geological Survey's Gap Analysis map, the Pima County Wildlife Habitat Inventory Phase 2 study, the Pima Association of Governments 208 studies, and Pima County's Riparian Habitat Maps. More detailed mapping for riparian areas is required to develop the Sonoran Desert Conservation Plan since: the PAG maps are outdated; the USGS maps have classification errors; and the County's maps depict vegetation volume but do not distinguish plant species and plant structures, and such distinctions are necessary in order to understand wildlife associations to vegetation communities. To carry out the *Pima County Riparian Vegetation Mapping Pilot Study*, the Harris Group performed a qualitative riparian inventory within several sites in Eastern Pima County. Study areas included:

- the Black Wash in the Brown Mountain area;
- portions of the Canada del Oro Wash inhabited by the pygmy-owl;
- portions of the Santa Cruz river that has effluent dominated flow; and
- floodplain corridors to the southeast of Tucson.

Detailed descriptions of the vegetation within each area are found on pages 14 through 17 of the attached Harris report. Compared to previous efforts the Harris study classified vegetation communities by the dominant species at a finer level. Corrections to the GAP maps have been made. The pilot study enabled the Harris Group to determine that two existing data sets will be useful for mapping beyond the pilot areas: the Pima County Riparian Habitat Mapping project and the Arizona Game and Fish perennial riparian data base. Now existing riparian areas will delineated and vegetation communities at the biome level will be identified.

III. Conclusion

The template for multi-species conservation planning is the vegetation map of the study area. The fact that the Sonoran Desert Conservation Plan requires a detailed and comprehensive riparian vegetation map is a reflection of the importance of riparian habitats to the overall health of the plant and animal community in our region. Additional reports and studies have been completed or are underway to assess the potential for change in riparian vegetation based on the hydrologic conditions that shape these systems in Pima County. This combination of reports and maps will inform both habitat preservation and riparian restoration initiatives proposed as a result of the Sonoran Desert Conservation Plan.

MEMORANDUM

Date: May 23, 2000

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

From: C.H. Huckelberry
County Administrator

Re: **Springs in Pima County**

Background

During the past months a number of reports have been produced to contribute to the Riparian Protection Element of the Sonoran Desert Conservation Plan, including:

- *Water Resources and the Sonoran Desert Conservation Plan*
- *Perennial and Intermittent Streams, and Areas of Shallow Groundwater*
- *Overview of Watersheds and Watercourses*
- *Prioritization of Streams for Conservation in Pima County*
- *Cocio Wash and the Gila Topminnow*
- *Riparian Habitat and Riparian Vegetation Mapping Efforts*
- *Riparian Vegetation Mapping Pilot Study*

The attached report entitled *Springs in Pima County* continues this line of investigation and follows up on a recommendation in the March 2000 *Land Cover Data Assessment* by defining, discussing, and documenting the current information about springs in Pima County.

Defining Springs

As the name suggests, a spring is a place where water rises to the surface. Figure 1 on page 2 of the attached report shows various causes for spring formation: a bedrock outcrop may force water to the surface, or an alignment of water-bearing and less porous rock in a fault zone may create the circumstances that promote spring formation. Springs, sensitive to groundwater depletion, occur rarely in the southwestern United States but can support a disproportionate amount of the region's species.

In Pima County, springs provide the habitat for vulnerable species such as the Quitobaquito Pupfish and a rare grass known as Box Canyon Muhly. Springs also serve as the remaining refugia for some species that were widespread at one time, such as the Chiricahua and Lowland Leopard Frogs.

Table 1, found on page 3 of the report and reproduced here, lists some of the vulnerable species in Pima County that are associated with springs.

Vulnerable species associated with springs in Pima County, Arizona.

SCIENTIFIC NAME	COMMON NAME
Sorex arizonae	Arizona Shrew
Choeronycteris mexicana	Mexican Long-tongued Bat[@]
Lasiuris borealis	Western Red Bat[@]
Pipilo aberti	Abert's Towhee[@]
Vireo bellii	Bell's Vireo[@]
Melospiza melodia	Song Sparrow[@]
Coccyzus americanus occidentalis	Western Yellow-billed Cuckoo[@]
Trogon elegans	Elegant Trogon[@]
Rana yavapaiensis	Lowland Leopard Frog
Rana chiricahuensis	Chiricahua Leopard Frog
Thamnophis eques megalops	Mexican Garter Snake
Elaphe triaspis intermedia	Western Green Rat Snake[@]
Kinosternon sonoriense longifemorale	Sonoyta Mud Turtle
Cnemidophorus burti stictogrammus	Giant Spotted Whiptail[@]
Poeciliopsis occidentalis occidentalis	Gila Topminnow
Gila intermedia	Gila Chub
Cyprinodon macularius macularius	Desert Pupfish
Cyprinodon macularius	Quitobaquito Pupfish
Agosia chrysogaster	Longfin Dace
Rhinichthys osculus	Speckled Dace
Argia sabino	Sabino Canyon Damselfly
Zaitzevia parvula	Santa Rita Water Beetle
Tryonia protea	Desert Tryonia
Tryonia quitobaquitae	Quitobaquito Tryonia
Anodonta californensis	California Floater*
Speyeria nokomis caerulescens	Blue Silverspot Butterfly*
Lilaeopsis schaffneriana var. recurva	Huachuca Water Umbel
Salvia amissa	Arivaipa Sage
Eryngium sparganophyllum	Ribbonleaf Button Snakeroot
Carex ultra	Arizona Giant Sedge

Table 2, found on pages 5 through 10 of the report, lists the location and ownership of known springs. Springs have been identified on federal land within the jurisdiction of the United States Forest Service, the National Parks Service, the Bureau of Land Management, and the United States Fish and Wildlife Service. Springs are also known to exist within the Tohono O'odham Nation, state land, private land, and on land owned by Pima County. In the absence of a standard classification of springs, the attached report identifies known springs with these characteristics for conservation purposes:

- springs thought to have perennial flow
- springs known to have native fish, or suitable habitat for native fish
- thermal springs

Springs thought to have perennial flow

Agua Caliente Spring	Nogales Spring
Aguajita Spring	Papago Spring
Bingham Cienega Spring	Pidgeon Spring
Box Spring	Quitobaquito Springs
Busch Spring	Scholefield Spring
Cold Spring	Silver Spring
Flicker Spring	Simpson Spring
Green Spring	Unnamed spring
Huntsman Spring	Unnamed spring
Kingler Spring	Unnamed spring
La Cebadilla Spring	Wakefield Spring
Little Nogales Spring	Wild Cow Spring (Whetstones)
Lower Wakefield Spring	Wild Cow Spring (Santa Catalinas)
Mountain Spring	

Springs known to have native fish, or suitable habitat for native fish

Agua Caliente Spring
Little Nogales Spring
Mountain Spring
Nogales Spring
Quitobaquito Springs
Unnamed Spring in Davidson Canyon
Wakefield Spring

Thermal Springs in Pima County, Arizona

Agua Caliente Spring
Mercer Spring
La Cebadilla Spring
Nogales Spring

The value of perennial flow and suitable habitat for native fish justifies conservation of existing springs with such characteristics. Thermal springs provide a home to rare species, and are even more valuable for preservation purposes.

Springs within Pima County

Pages 14 through 27 of the attached report describe a number of springs in Pima County. A few are found on county-owned land, such as the Agua Caliente Spring, which is described in detail. A few highlights are reproduced below:

- "Agua Caliente Park is a 101 acre park, centered around a perennial spring and three ponds."
- "As a desert oasis, the area surrounding the spring was first occupied as early as 3500 B.C., by Archaic Period hunters and gatherers who moved throughout their range in a pattern following ripening plant foods. Near the end of the Archaic Period, Hohokam Indians established a village in the vicinity of the spring that has been named the Whiptail Site."
- "After this time, little is known about the happenings in the Agua Caliente region until the late 1800's. Agua Caliente was used as an encampment by soldiers before and after the Gadsen Purchase (1853), and up until the time of the ranching days of the early 1870's."
- "Between 1873 and 1984, the land was used as a ranch, resort, and small farms."
- In 1984, Pima County purchased the property, and the park was opened to the public in 1989.
- "The spring flows year-round, though discharge varies with rainfall. The flow rate varies from a low of 40 to 50 gallons per minute, to a high of 150 gallons per minute."

- "At one time, there were two different springs: a hot one with temperatures up to 100 degrees Fahrenheit, and a cool spring. The two springs were combined through the use of dynamite to provide a more consistent source of water, resulting in a combined temp averaging 87 degrees."

- "Agua Caliente is a source of perennial water. This feature, along with riparian plant communities, attracts many vertebrate species."

- "Wildlife found on the park include mule deer, javelina, bobcat, raccoon, ring-tail cat, skunk, and reptiles."

- "Many species of birds are found in the park including raptors and migratory species."

- "Fish are found in all three ponds. The fish species include grass crab, bluegill, tilapia, large-mouth bass, mosquito fish, koi, and goldfish. "

- "Vegetation near the spring consists of large palm trees lining the spring from source to Pond 1. Bermuda grass is also present."

- "The ponds and streams have existing habitat for several species of rare and endangered native fish and amphibians. The removal of existing non-native species of fish and amphibians is needed, as well as some minor habitat modifications."

Descriptions are also provided for the Bingham Cienega Spring, Mountain Spring (located in Posta Quemada Creek within Colossal Cave Mountain Park), Davidson Spring, La Cebadilla Spring (which flows from a spring located adjacent to Tanque Verde Creek), and the Quitobaquito Springs, probably the most well known of the Sonoran Desert springs.

Identification of Conservation Needs

Beginning on page 27, the report identifies a number of conservation actions that could be taken to protect springs, including the most obvious measure of ceasing spring water depletion where that is occurring. Management of non-native species is identified as a conservation need, as well as the simple need to inventory and monitor springs. The following conservation activities are taking place with springs owned by Pima County.

Conservation activities at spring habitats owned by Pima County

Conservation Activity	Bingham	Agua Caliente	Mountain	La Cebadilla
Vegetation Mapping	X	X		X
Plant Species Survey	X			
Hydrologic Investigations	X	X	X	
Vertebrate Survey				
Macroinvertebrates Survey		X		
Exotic Species Management	X			
Water Quality	X	X	X	
Flow Conditions	X			
Groundwater	X			
Surface Water Appropriation	X			
Recreation Management	X	X	X	

Recommendations

The report makes four recommendations.

- Improve and expand the springs database and GIS cover by reviewing existing surface water rights appropriations to determine the location and legal status of springs, incorporating U.S. Forest Service information, and compiling more complete information about regarding location, use, and biological or hydrological significance of springs.

- Obtain relevant scientific and legal information needed to protect County-owned springs from diversion or depletion.

- Obtain biological inventories of plants, and aquatic invertebrates and vertebrates associated with County-owned springs.

- Evaluate the protection offered to springs by the Sonoran Desert Conservation Plan, with particular emphasis on conserving springs which might protect native fish and frogs, and those which support such as travertine deposits, thermal conditions or cienega wetlands.

Conclusion

I have directed County staff to draft program proposals that will improve the conservation activities by Pima County for county-owned spring habitats. Conservation staff have also started to work with wildlife biologists and regulatory specialists to open up the Pima County owned springs to the reintroduction of native fish and frogs, where appropriate. Progress reports will be issued this summer as part of the Preliminary Sonoran Desert Conservation Plan.

MEMORANDUM

Date: July 10, 2000

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

From: C.H. Huckelberry
County Administrator

Re: **Water Usage Along Selected Streams in Pima County**

Overview

In January 2000 the Pima Association of Governments drafted a report as part of the Sonoran Desert Conservation Plan on the topic of *Perennial Streams, Intermittent Streams, and Areas of Shallow Groundwater.* The study identified and mapped fifty-five perennial and eighty-two intermittent stream reaches, along with nearly one hundred shallow groundwater zones. Based on the dataset created for the January 2000 report, a new study from Pima Association of Governments, *Water Usage Along Selected Streams*, contributes to the Riparian Protection Element of the Sonoran Desert Conservation Plan by characterizing water usage, including:

- The total number of wells within one mile of previously identified sources.
- The number of non-exempt wells within one mile of these water sources.
- The average annual withdrawal from non-exempt wells.
- The water users, water sources, and average annual system withdrawals (non-exempt).
- A discussion of known surface water diversions.

Potential Threat -- Cumulative Impact of Diversions and Groundwater Pumping

The findings of the report that are particularly relevant for the Conservation Plan indicate:

- Most streams and areas of shallow groundwater have at least one well located within one mile. Only twenty-four of the one hundred twenty-two streams in the data set did not have a well. These untapped sites are found along remote, rugged mountain slopes.

- The number of exempt wells is far greater than the number of non-exempt wells (those with pump capacities greater than 35 gallons per minute). Exempt wells do not require groundwater rights and are free from water measurement and annual reporting requirements under State law. Therefore the amount of water pumped is greater than figures provided within the study, which was limited to data available through the Arizona Department of Water Resources for non-exempt wells within the Tucson Active Management Area.

- Streams and springs subject to known surface water diversions include those most important to imperiled species that depend on these aquatic or riparian environments.

A map showing the location of perennial and intermittent streams and shallow groundwater in relation to the Tucson Active Management Area is found on the next page.

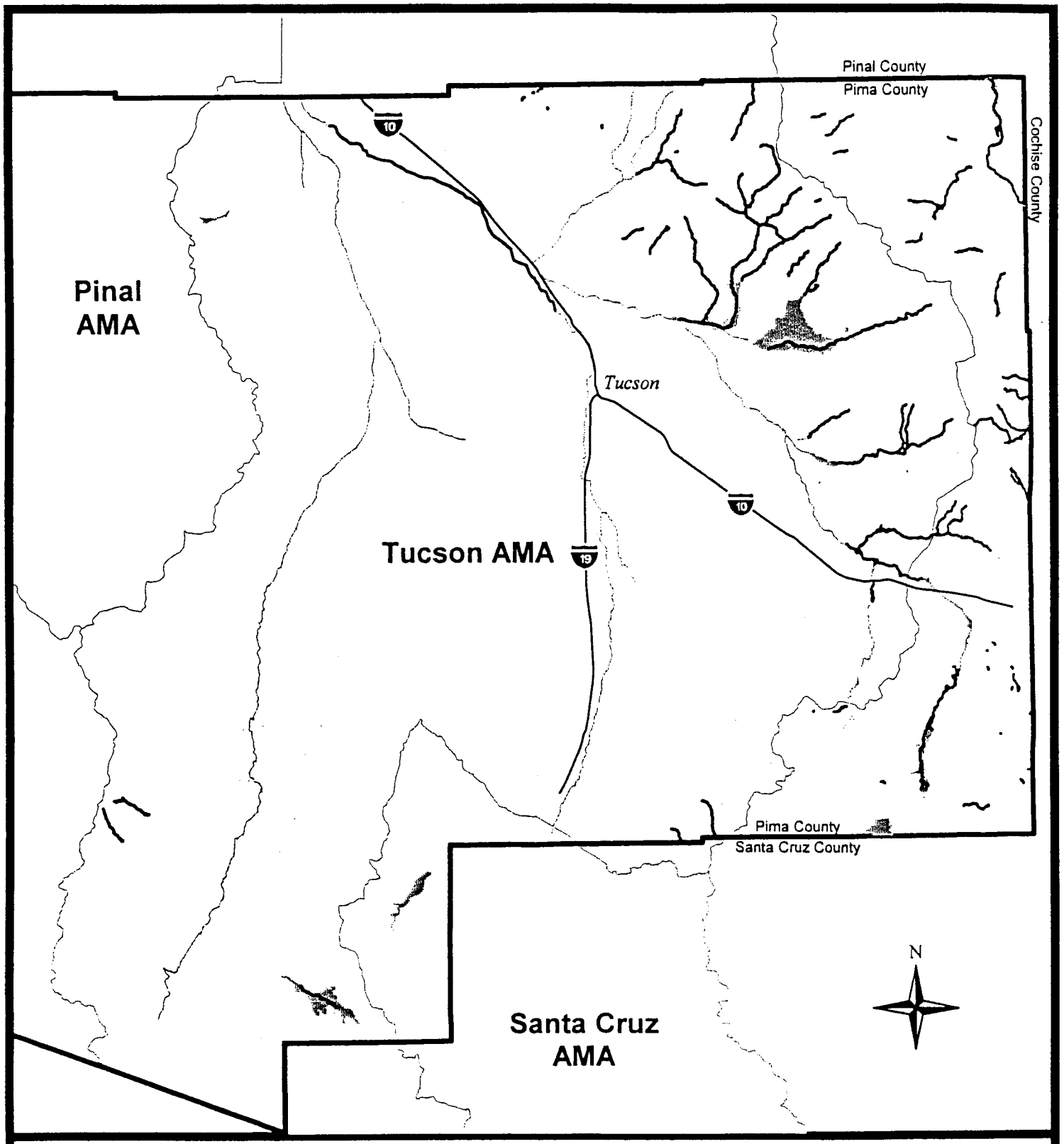


Figure 1. Active Management Areas (AMA)

Previously Identified Intermittent and Perennial Stream (PAG 2000)

Previously Identified Shallow Groundwater Area (PAG 2000)

Major Highway

Major Water Course

Note: Owners of wells outside an AMA are not required to report annual well withdrawals to ADWR.

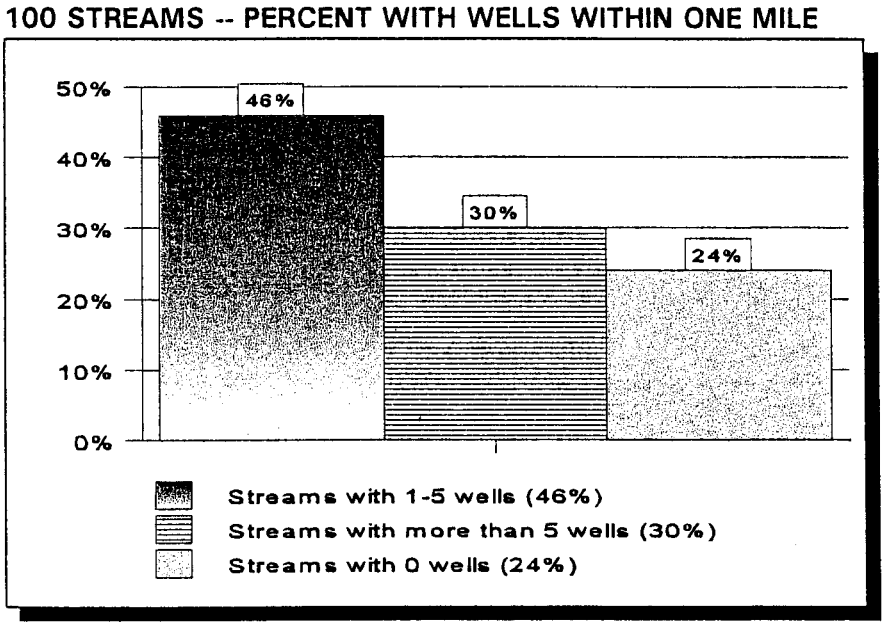
8 0 8 16 24 Miles

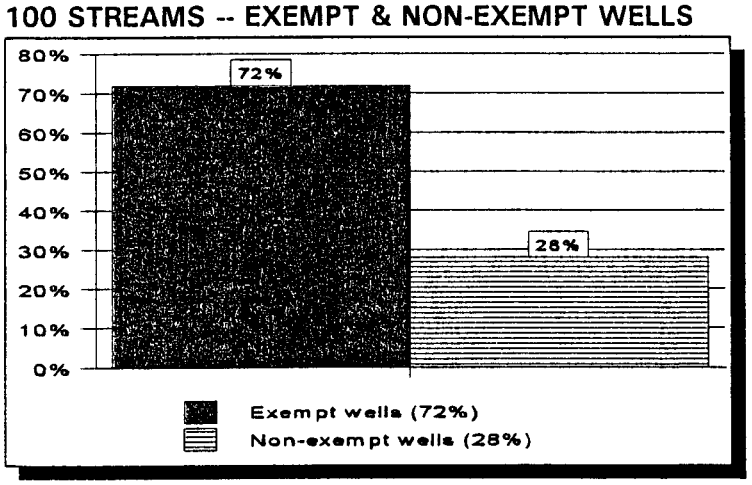
July 2000

Number of Wells Within One Mile of Perennial and Intermittent Streams

STREAM NAME	# non-exempt wells w/in 1 mile	# exempt wells w/in 1 mile	# total wells w/in 1 mile	% EXEMPT
1. Santa Cruz River	140	264	404	65%
2. Tanque Verde (mid)	59	170	229	74%
3. Tanque Verde (lower)	91	120	211	57%
4. Sabino Canyon (lower)	75	111	186	60%
5. Arivica Creek	17	88	105	84%
6. Rincon Creek	11	82	93	88%
7. Ventana Canyon	19	46	65	71%
8. San Pedro River	31	26	57	46%
9. Agua Verde Creek	4	26	30	87%
10. Mud Spring Canyon	0	24	24	100%
11. Sutherland Wash	5	19	24	79%
12. Cienega Creek (lower)	3	18	21	86%
13. Box Canyon (Rincon)	1	18	19	95%
14. Chiminea Canyon	3	16	19	84%
15. Canada Agua	1	17	18	94%
16. Sabino Creek (mid)	2	16	18	89%
17. Cienega Creek (upper)	6	6	12	50%
18. Bear Canyon (lower)	0	11	11	100%
19. Barrel Canyon	0	10	10	100%
20. Madrona Canyon	4	6	10	60%
21. Molino Canyon	0	10	10	100%
22. La Milagrosa Canyon	0	8	8	100%
23. Brown Canyon	0	7	7	100%
24. Distillery Canyon	0	7	7	100%
25. Florida Canyon	0	7	7	100%
26. Geesaman Wash	0	7	7	100%
27. Madera Canyon	0	7	7	100%
28. Buehman Canyon	1	5	6	83%
29. Sabino Creek (upper)	0	6	6	100%
30. Turkey Creek	2	4	6	67%
31-76. All streams/ 1-5 wells	18	80	98	82%
Total	**493**	**1,242**	**1,735**	**72%**

Perennial and Intermittent Stream Reach Comparisons





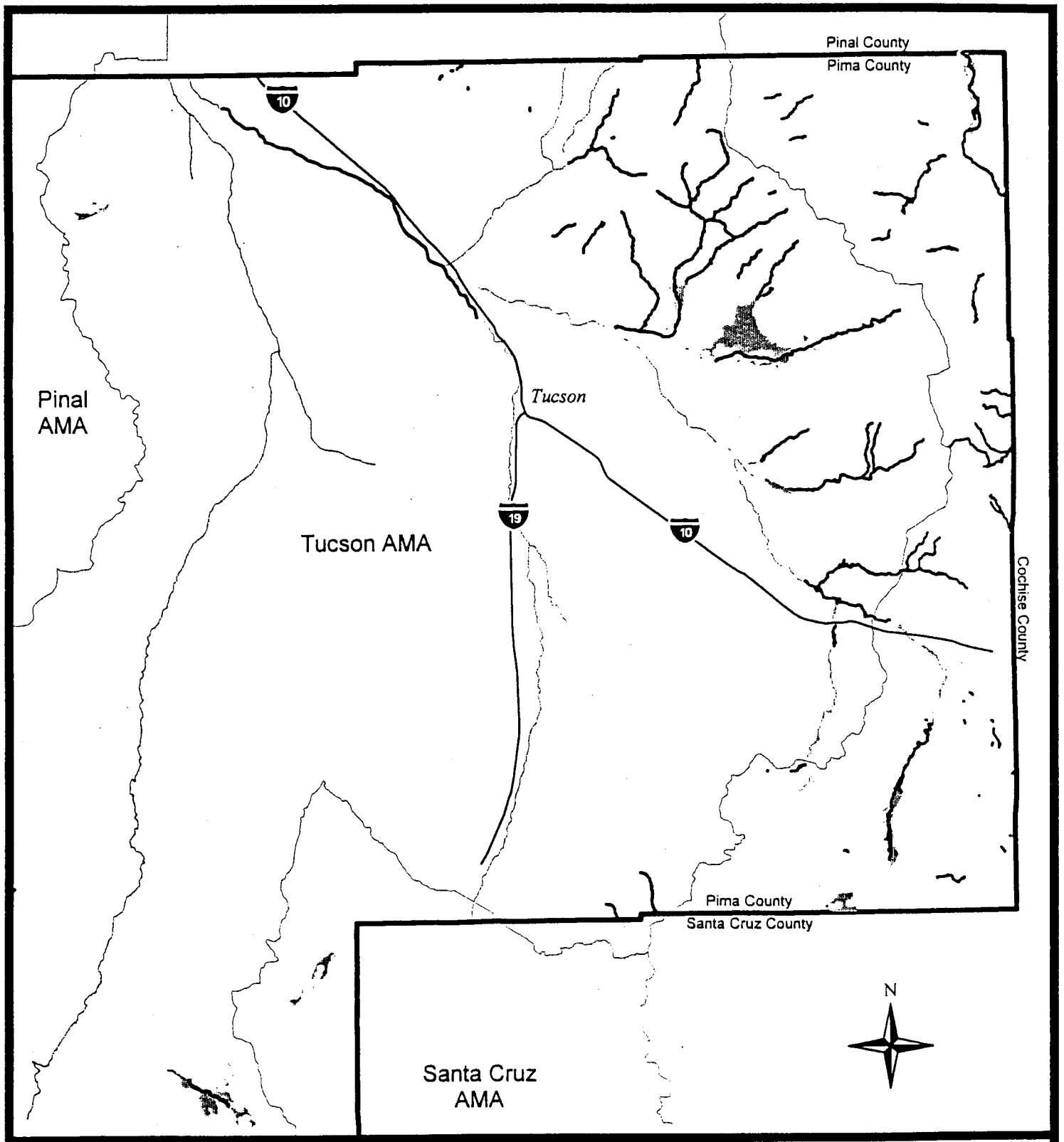


Figure 2. Locations of Non-Exempt Wells
within One Mile of Previously Identified Stream or Shallow Groundwater Area

Previously Identified Intermittent and Perennial Stream (PAG 2000)

Previously Identified Shallow Groundwater Area (PAG 2000)

Non-Exempt Well (ADWR Wells-55 Registry)

Major water course

Major Highway

Note: Owners of non-exempt wells outside an AMA are not required to report annual well withdrawals to ADWR.

8 0 8 16 24 Miles

July 2000

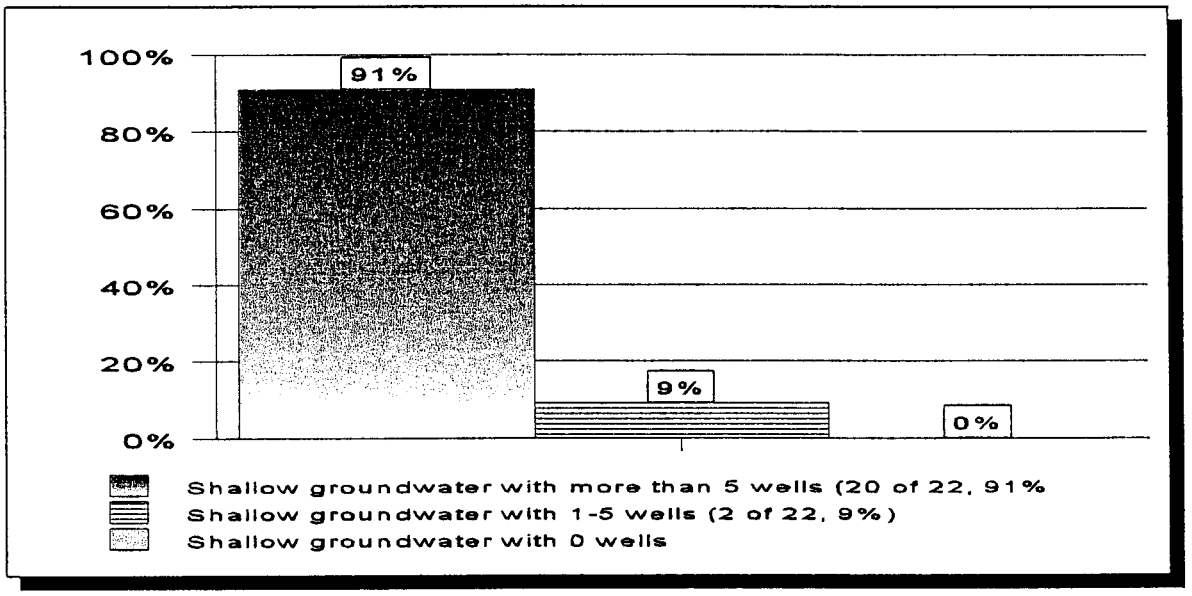
Number of Wells Within One Mile of Identified Shallow Groundwater Areas

Shallow groundwater is defined within the two reports by Pima Association of Governments as being within 50 feet of the land surface. This number was chosen based on the assumption that mesquite bosques can be sustained with groundwater at this depth. The January 2000 report lists more than 100 areas, and maps the areas prioritized by a technical advisory team assisting with the project. Larger more threatened areas were mapped. The chart below shows the number of wells within one mile of twenty-two shallow groundwater areas.

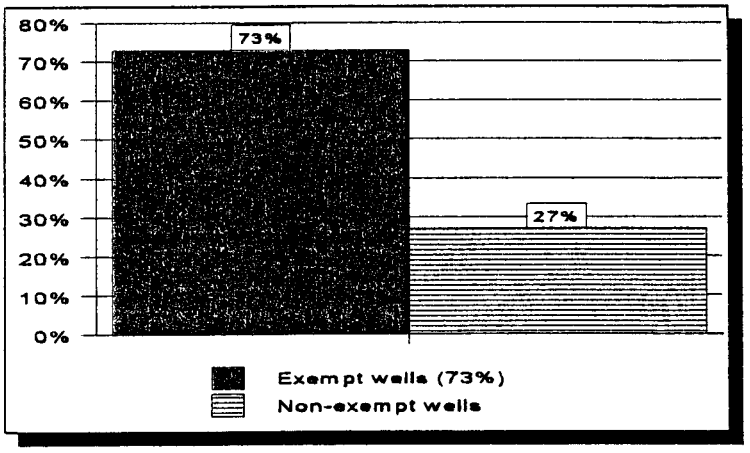
STREAM NAME	# non-exempt wells w/in 1 mile	# exempt wells w/in 1 mile	# total wells w/in 1 mile	% EXEMPT
1. Tanque Verde area	68	196	264	74%
2. Tanque Verde (lower)	98	129	227	57%
3. Sabino Canyon	88	132	220	60%
4. Agua Caliente Canyon	53	156	209	75%
5. Arivaca Creek	21	176	197	89%
6. Rillito Creek Area	43	55	98	56%
7. Davidson Canyon	0	79	79	100%
8. San Pedro River	25	42	67	63%
9. Sopori Wash	25	42	67	63%
10. Rincon Creek	11	54	65	83%
11. Cienega Creek (lower)	4	38	42	90%
12. Pantano Wash	8	31	39	79%
13. Box Canyon (Rincon)	7	30	37	81%
14. Gardner Canyon	4	30	34	88%
15. Agua Verde Creek	3	20	23	87%
16. Cienega Creek (lower)	5	18	23	78%
17. Sutherland Wash 1	3	18	21	86%
18. Cienega Creek (upper)	9	9	18	50%
19. Davidson Canyon (u)	0	10	10	100%
20. Cocio Wash	4	5	9	56%
21.Posta Quemada Canyon	2	3	5	60%
22. Sutherland Wash 2	1	1	2	50%
Total	**482**	**1,274**	**1,756**	**73%**

Shallow Ground Water Comparisons

SHALLOW GROUND WATER -- WELLS WITHIN ONE MILE



SHALLOW GROUNDWATER --
COMPARISON OF EXEMPT & NON-EXEMPT WELLS



Water Users Within One Mile of Perennial and Intermittent Streams and Shallow Groundwater

The water companies that have service areas extending to within a mile of shallow groundwater areas or perennial and intermittent streams are analyzed in the report. The authors made these findings:

- "Companies with the highest annual pumpage within one mile of a stream or shallow groundwater area are Tucson Water, Metropolitan Domestic Water Improvement District, Forty-Niner Water Company, and Cortaro Marana Irrigation District." (P. 10)

- "Tucson Water, Vail Water Company, Town of Marana, Metro Water, Flowing Wells Irrigation District, Oro Valley Water Company, and Spanish Trail Water Company have CAP allocations." (P. 10)

- "Existing reclaimed water lines are located in or comparatively close (less than 2 miles) to eight of the water companies identified in this project." (P. 11)

- "Thirteen water companies had boundaries between 2 and 10 miles from an existing reclaimed water line." (P. 11)

- "The following water users are located over ten miles from the nearest reclaimed water lines: Arivaca Township Co-op Water Company, and Anderson Water Company.' (P. 11)

Figures on the pages that follow show the boundaries of water company service areas in relation to streams or shallow groundwater areas for:

- Twenty-three water companies in Eastern Pima County
- Three water companies, and non-exempt wells in northeastern Tucson
- Seven water companies, and non-exempt wells in southeast Tucson
- Non-exempt and exempt wells near the San Pedro River
- One water company and wells near Arivaca and Sopori Wash
- Eleven water companies, and non-exempt wells near the Santa Cruz River.

Surface Water Diversions

The surface water diversions discussed in the study are limited to the present knowledge of the authors, including the:

- Cienega Creek
- San Pedro River
- Santa Cruz River
- headwaters of Sabino Creek

Conclusions

Based on the analysis in the *Water Usage* report, the authors conclude that the study provides "a very general assessment of water usage along perennial streams, intermittent streams and shallow groundwater areas in Pima County. From the results:

- "It appears to be very likely that the northeastern part of the Tucson Basin is associated with the largest amounts of nearby groundwater pumpage. Streams and shallow groundwater areas in this part of the Basin include Tanque Verde Creek, Sabino Creek, Ventana Canyon, Rillito Creek and the Agua Caliente area. However, [this] cannot be confirmed because groundwater pumpage data are not reported for areas outside the Tucson Active Management Area."

- "The stream with the largest reported pumpage within one mile is the Santa Cruz River."

- "Areas outside the Tucson Active Management Area with the largest number of registered wells include the San Pedro River and Mud Spring. Groundwater usage in these areas is presumably comparatively high as well." (P. 11)

A number of ideas for expanding this research are included and these will be forwarded to the Science Technical Advisory Team for the Sonoran Desert Conservation Plan. Future reports will incorporate the data and findings of this study. Studies issued to date to develop the Riparian Protection Element of the Sonoran Desert Conservation Plan include:

- *Paseo de las Iglesias*
- *Water Resources and the Sonoran Desert Conservation Plan*
- *Environmental Restoration in Pima County*
- *Stream Reaches and Shallow Groundwater*
- *Arivaca Resources*
- *Prioritization of Streams*
- *Overview of Watersheds and Watercourses*
- *Cocio Wash and the Gila Topminnow*
- *Pilot Riparian Mapping*
- *Draft Riparian Analysis*
- *Springs in Pima County*

In the near future, these reports will be issued to continue to develop the Riparian Element:

- *Aquatic Vertebrate Conservation in Pima County*
- *Recent Regulatory Developments in Aquatic and Riparian Protection*
- *Focus on Conserving the Cienega Watershed*
- *Riparian Protection, Management and Restoration -- An Element of the SDCP*

These reports, and the Riparian Element will be integrated with other Elements and discussed in the Preliminary Sonoran Desert Conservation Plan, which will be released later this summer.

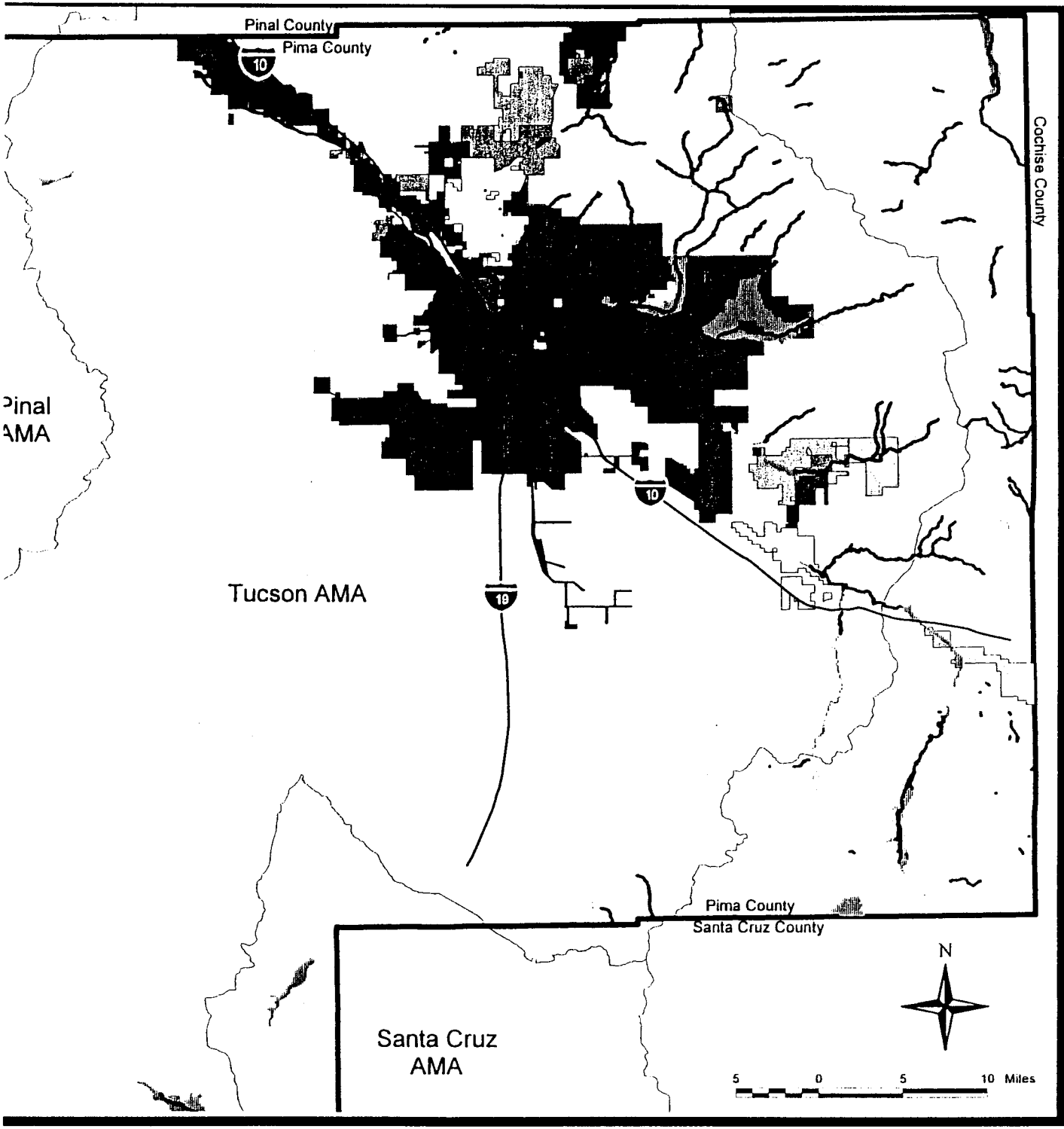


Figure 3.
Water System Boundaries within One Mile of Streams or Shallow Groundwater Areas

Water Systems within One Mile of Stream or Shallow Groundwater Area

- Anderson Water Company
- Arivaca Townsite Co-op Water Company
- Canada Hills Water Company Limited Pt.
- City of Tucson
- Cortaro-Marana Irrigation District
- Cortaro Water Users Association
- Flowing Wells Irrigation District
- Forty-Niner Water Company
- Lago Del Oro Water Company
- Los Cerros Water Company
- Lyn-Lee Water Company
- Marana Water Service
- Metropolitan Domestic Water Improve Dist
- Mt. Lemmon Cooperative Water Company
- Oro Valley Water Company
- Procter J. M.
- Rillito Water Users
- Rincon Creek Water Company
- Rincon Water Company
- Saguaro Water Company
- Spanish Trail Water Company
- Town of Marana Municipal Property Corp.
- Vail Water Company

- Previously Identified Stream (PAG 2000)
- Previously Identified Shallow Groundwater Area (PAG 2000)
- Major Highway

Note: All water system boundaries from ADWR Certificate of Convenience & Necessity (CCN) database, except Flowing Wells Irrigation District and the largest Tucson Water service area boundary (ADWR Water Providers database), and Cortaro-Marana Irrig. Dist., (ADWR Irrig. District database).

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July 2000

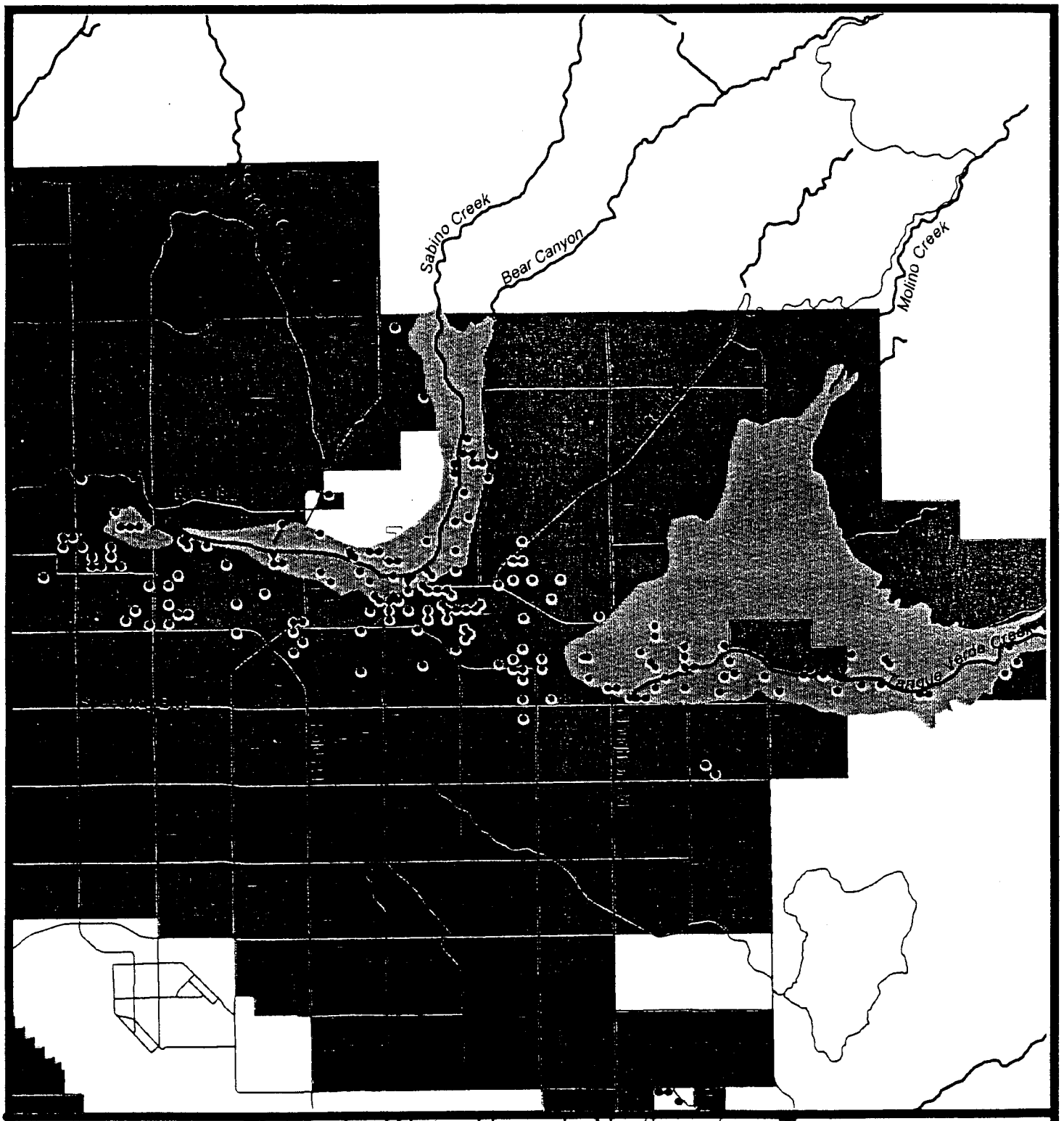

Figure 4. Water Users in Northeastern Tucson within One Mile of Streams and Shallow Groundwater Areas

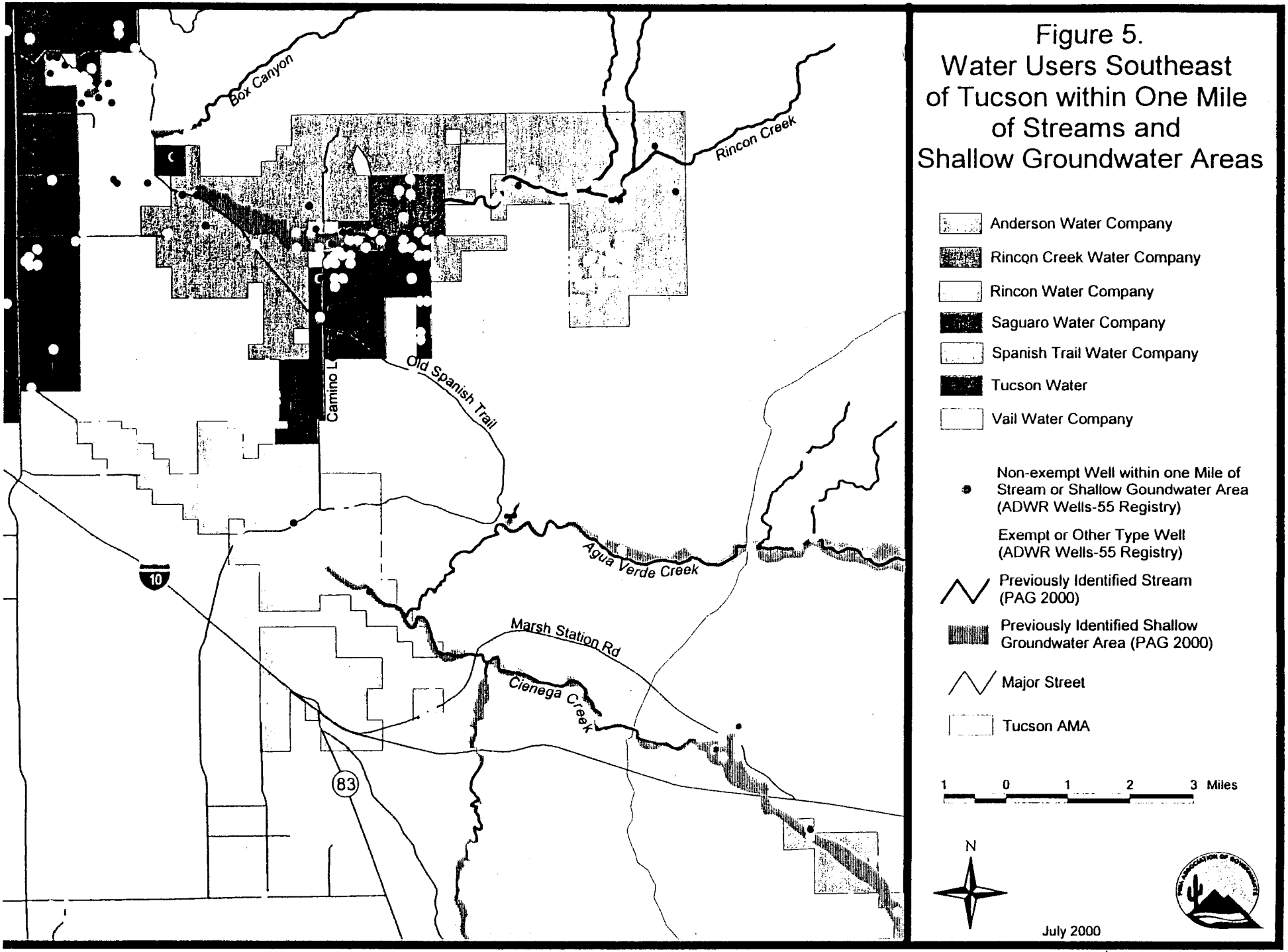

Figure 5.
Water Users Southeast of Tucson within One Mile of Streams and Shallow Groundwater Areas

- Anderson Water Company
- Rincon Creek Water Company
- Rincon Water Company
- Saguaro Water Company
- Spanish Trail Water Company
- Tucson Water
- Vail Water Company

- Non-exempt Well within one Mile of Stream or Shallow Goundwater Area (ADWR Wells-55 Registry)
- Exempt or Other Type Well (ADWR Wells-55 Registry)
- Previously Identified Stream (PAG 2000)
- Previously Identified Shallow Groundwater Area (PAG 2000)
- Major Street
- Tucson AMA

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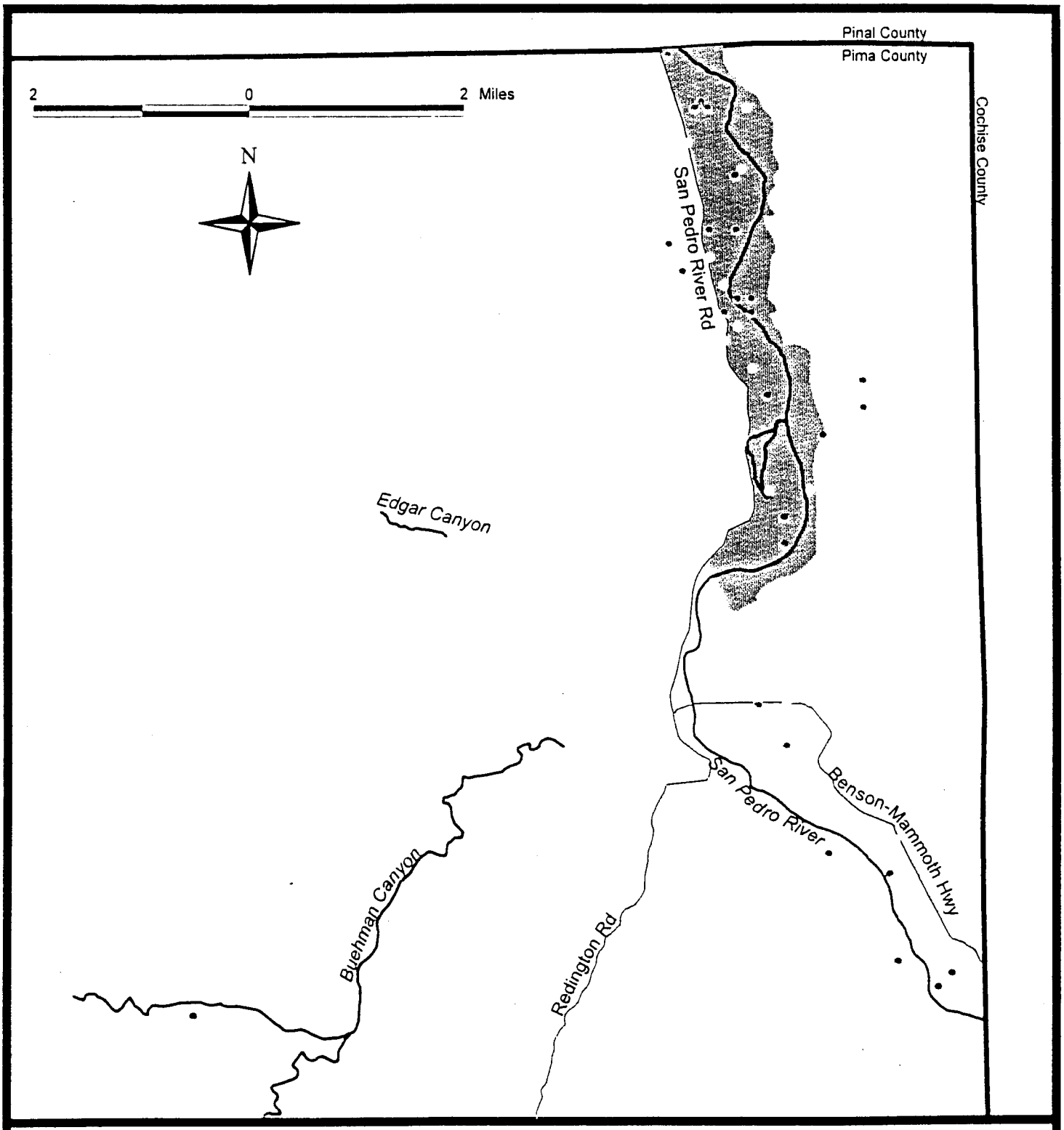

Figure 6. Water Users near the San Pedro River in Pima County within One Mile of Streams and Shallow Groundwater

Previously Identified Stream (PAG 2000)

Previously Identified Shallow Groundwater Area (PAG 2000)

Major Street

Non-exempt Well within one Mile of Stream or Shallow Groundwater Area (ADWR Wells-55 Registry)

Exempt or Other Type Well (ADWR Wells-55 Registry)

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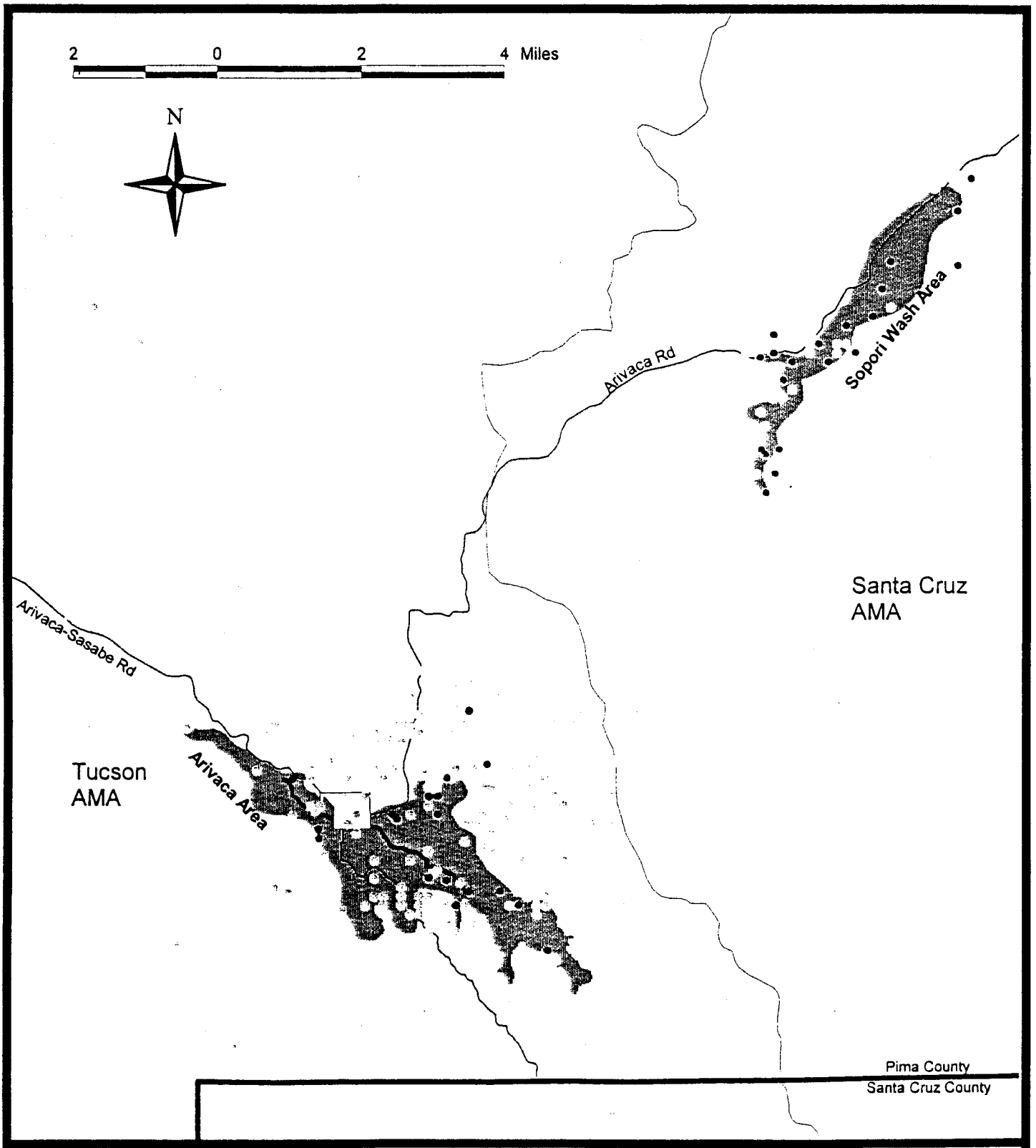

Figure 7. Water Users in Arivaca and Sopori Wash area within One mile of Streams and Shallow Groundwater Areas

Previously Identified Stream (PAG 2000)

Previously Identified Shallow Groundwater Area (PAG 2000)

Major Street

Arivaca Townsite Co-op Water Company

Non-exempt Well within one Mile of Stream or Shallow Groundwater Area (ADWR Wells-55 Registry)

Exempt and Other Type Well (ADWR Wells-55 Registry)

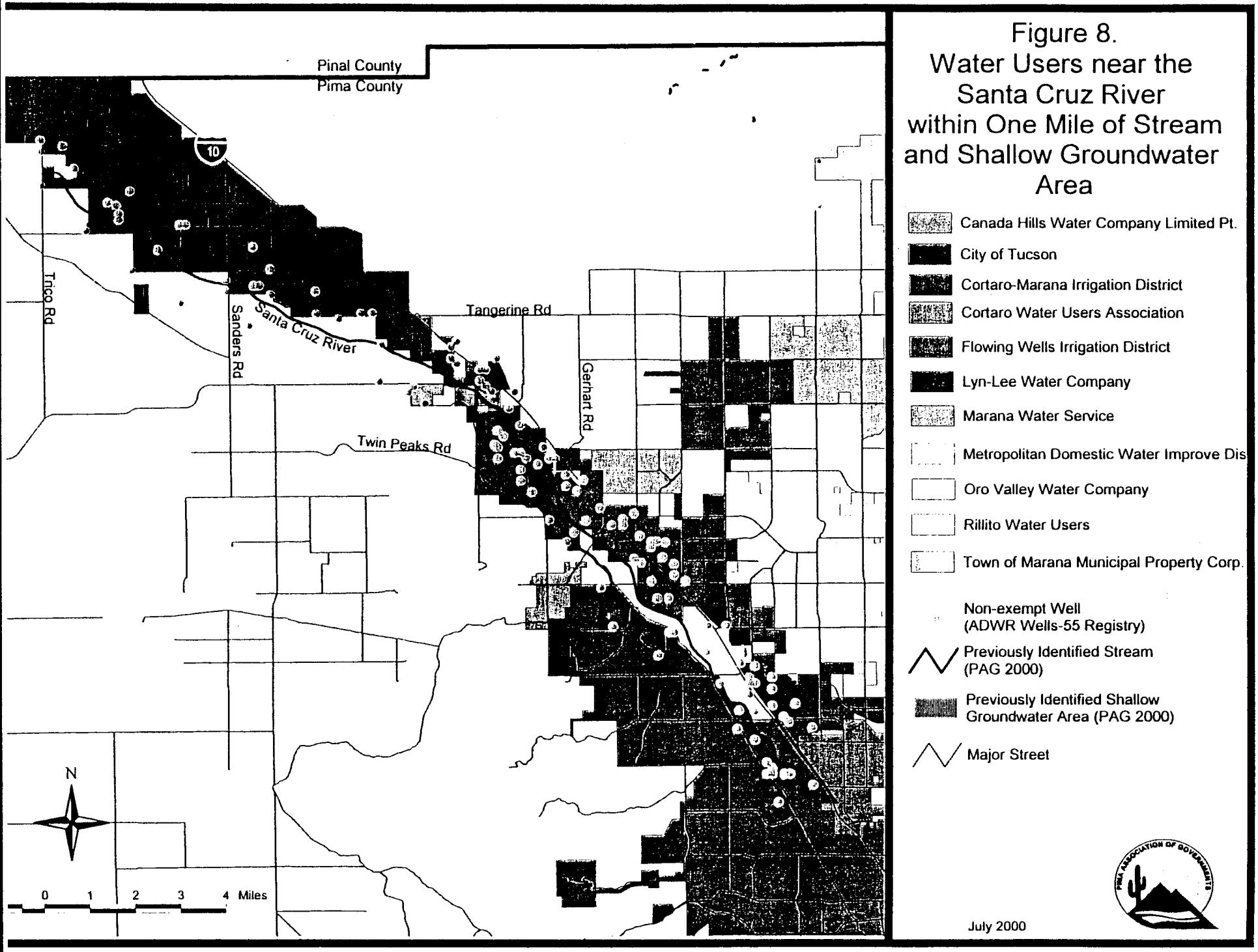

Figure 8.
Water Users near the Santa Cruz River within One Mile of Stream and Shallow Groundwater Area

- Canada Hills Water Company Limited Pt.
- City of Tucson
- Cortaro-Marana Irrigation District
- Cortaro Water Users Association
- Flowing Wells Irrigation District
- Lyn-Lee Water Company
- Marana Water Service
- Metropolitan Domestic Water Improve Dis
- Oro Valley Water Company
- Rillito Water Users
- Town of Marana Municipal Property Corp.
- Non-exempt Well (ADWR Wells-55 Registry)
- Previously Identified Stream (PAG 2000)
- Previously Identified Shallow Groundwater Area (PAG 2000)
- Major Street

July 2000

MEMORANDUM

Date: July 10, 2000

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

From: C.H. Huckelberry
County Administrator

Re: **Aquatic Vertebrate Conservation in Pima County, Concepts and Planning Development**

Overview

Among the many reports that have contributed to the development of the Sonoran Desert Conservation Plan thus far, the attached study by Dr. Philip Rosen on *Aquatic Vertebrate Conservation* stands as one of the most impressive, given the scope of the author's knowledge, and it is one of the most ingenious, given the proposed concepts for restoration and protection of native fish and frogs within the urban Tucson Basin. A three-faceted approach to wetland restoration on the floor of the Tucson Basin includes:

- Creation of in-channel perennial reaches for high-flood systems;
- Creation of spring-fed (or reclaimed water-supplied), quasi-cienega, small channel systems in natural sites with little flooding or with moderate flooding; and
- Creation of ponded habitats where native fishes that can control mosquitos.

Dr. Rosen also discusses the conservation potential of forty key canyons within the ex-urban areas of Eastern Pima County, identifying the presence of both native and non-native aquatic species, and suggesting specific actions ranging from removal of harmful exotics, to reintroduction of natives, to specific management prescriptions, to necessary partnerships and priority acquisitions. The "gazetteer" of key canyons provides alarming insight into the numerous crashes and disappearances that have occurred recently in native frog and fish populations. Stabilizing the aquatic species in isolated canyons is obviously a condition of restoring urban populations. "Ideally," Dr. Rosen writes, "conservation strategies both inside and outside the urban environments of Pima County should look toward both preservation in mountain canyons and restoration of valley floors." (P. 15)

This expert advice and review of the landscape arrives at an important moment. On June 14, 2000, the United States Fish and Wildlife Service proposed threatened status under the Endangered Species Act for the Chiricahua Leopard Frog. The Chiricahua Leopard Frog is just one in the line of native aquatic species that is sliding toward extirpation and extinction, earning, near the very end, status as a listed species, or as a Species of Special Concern. Going beyond a description of the ways in which our aquatic systems are failing, Dr. Rosen's report offers a remarkable gift: a comprehensive, innovative, multi-tiered, and at times aggressive blueprint for how to begin to repair these systems. This memorandum provides a summary of -- and support for -- Dr. Rosen's *Aquatic Vertebrate Conservation* report.

:PD-02

Abstract and Introduction

Pages 3 and 4 of the attached document are the abstract and introduction of Dr. Rosen's report. Highlights include:

- "This document outlines plans for conservation and restoration of native fishes, leopard frogs, Sonoran mud turtles, and garter snakes in Pima County." (P. 3)

- "Restoring natural perennial flow and flooding regimes, and controlling eliminating harmful non-native species are identified as the most important issues. Conservation of native fishes alone will lead to a proliferation of the non-native bullfrog, a predator and competitor which would then defeat conservation efforts for the reptiles and amphibians." (P. 3)

- "Small, in-channel streams segments created and maintained with reclaimed water are proposed to support lowland leopard frogs and fishes. These would be relatively resistant to invasion by harmful non-natives." (P. 3)

- "For natural springs, wastewater sites, and parks and golf courses, management plans are proposed to support a wide diversity of native aquatic species." (P. 3)

- "The native species involved in these plans are as follows: desert pupfish, desert sucker, Gila chub, Gila topminnow, longfin dace, Sonora sucker, speckled dace, canyon treefrog, Chiricahua leopard frog, lowland leopard frog, black-necked garter snake, checkered garter snake, Mexican garter snake, Sonoran mud turtle, and giant spotted whiptail lizard." (P. 3)

- "Introduced species present the greatest physical obstacle to successful re-establishment of native leopard frogs, Mexican garter snakes, Sonoran mud turtles, and native fishes that originally thrived in the Tucson Basin. The problem exotics include especially bullfrogs, catfish, sunfish, bass, and mosquitofish, although other exotics that may become widely involved are crayfish, African clawed frogs, and other fishes (especially carp and cichlids)." (P. 3)

- "Habitat modifications are the primary reason for the potent advantage introduced species over native species. Creation of ponds and lakes creates habitat suitable for bullfrogs and non-native fish. Streams and springs, where are natural habitat here, favor lowland and Chiricahua leopard frogs. Floods tend to favor native fishes, especially longfin dace, over introduced fishes." (P. 4)

- "[Non-native] fish are the easiest aquatic species to control, since they can be eliminated by drying or poisoning, and cannot disperse overland. Crayfish ... have limited dispersal probability, but are much more difficult to eradicate .... Bullfrogs have remarkable overland dispersal capability, are difficult to eradicate, and therefore are the most difficult to control." (P. 4)

Potential Species Recovery in the (Urban) Tucson Basin

Pages 4 through 12 of the *Aquatic Vertebrate Conservation* report outline a three-level plan structure for wetland restoration in the Tucson Basin. Highlights include:

- "Water supplies that can be turned on or off, or at least re-routed to allow drying up of habitat, are ideal for elimination of various exotic fish species that may invade re-establishment sites. Thus, effluents, reclaimed water, and highly managed waters in general, offer a key opportunity for multi-species recovery of our native wetland fauna. This opportunity is not readily available in natural water systems, because the flow is too difficult to regulate, divert, or turn on and off." (P. 4)

- "Placement of the various Tucson Basin core re-establishment sites should be done so that (1) leopard frogs and other amphibians and reptiles may disperse from one site to another during especially good and wet years and thus maintain a metapopulation structure; (2) the metapopulation structure also permits occasional immigration-emigration exchange between the valley floor and surrounding mountain canyons; and (3) fish are positioned in habitats in the landscape at which they can be expected to weather flooding and drying events." (P. 4-5)

- A three-faceted approach to wetland restoration on the floor of the Tucson Basin includes: (1) creation of in-channel perennial reaches for high-flood systems; (2) creation of spring-fed (or reclaimed water-supplied), quasi-cienega, small channel systems in natural sites with little flooding or with moderate flooding; and (3) creation of ponded habitats where native fishes that can control mosquitos. (P. 5)

- **Creation of in-channel perennial reaches for high-flood systems**

  "Dammed-up, non-flowing water systems should be replaced where possible by in-channel streams with longfin dace and lowland leopard frogs. This would likely involve use of reclaimed water. These two species are most tolerant of the powerful flooding that might occur in the major channels of the Tucson Basin. The natural flooding cycle should succeed in maintaining these native species at an advantage over any non-natives that may be present in the system. This kind of habitat generally consists of runs and riffles, with little pool development and little emergent vegetation." (P. 6)

  "Sites should be identified along the length of the major valley floor channels where bank conditions permit a possibility of escape from the floods into eddies or slower water. Eddy structures should be designed into the soil cement banks. These small sites should be about 1 km or more in length, but shorter reaches may suffice initially. The sites should be distributed as a sequential series of stepping stones, to maximize the ability of the native species using them to move on their own, during floods or long periods of higher flow, to other parts of the Tucson Basin." (P. 6)

  "An idealized model of this 'metapopulation' system is shown in Figure 2 [next page] and some possible sites, with existing, planned, or potential water facilities, where native species might survive with in-channel water are shown in Figure 3 [page after next]."

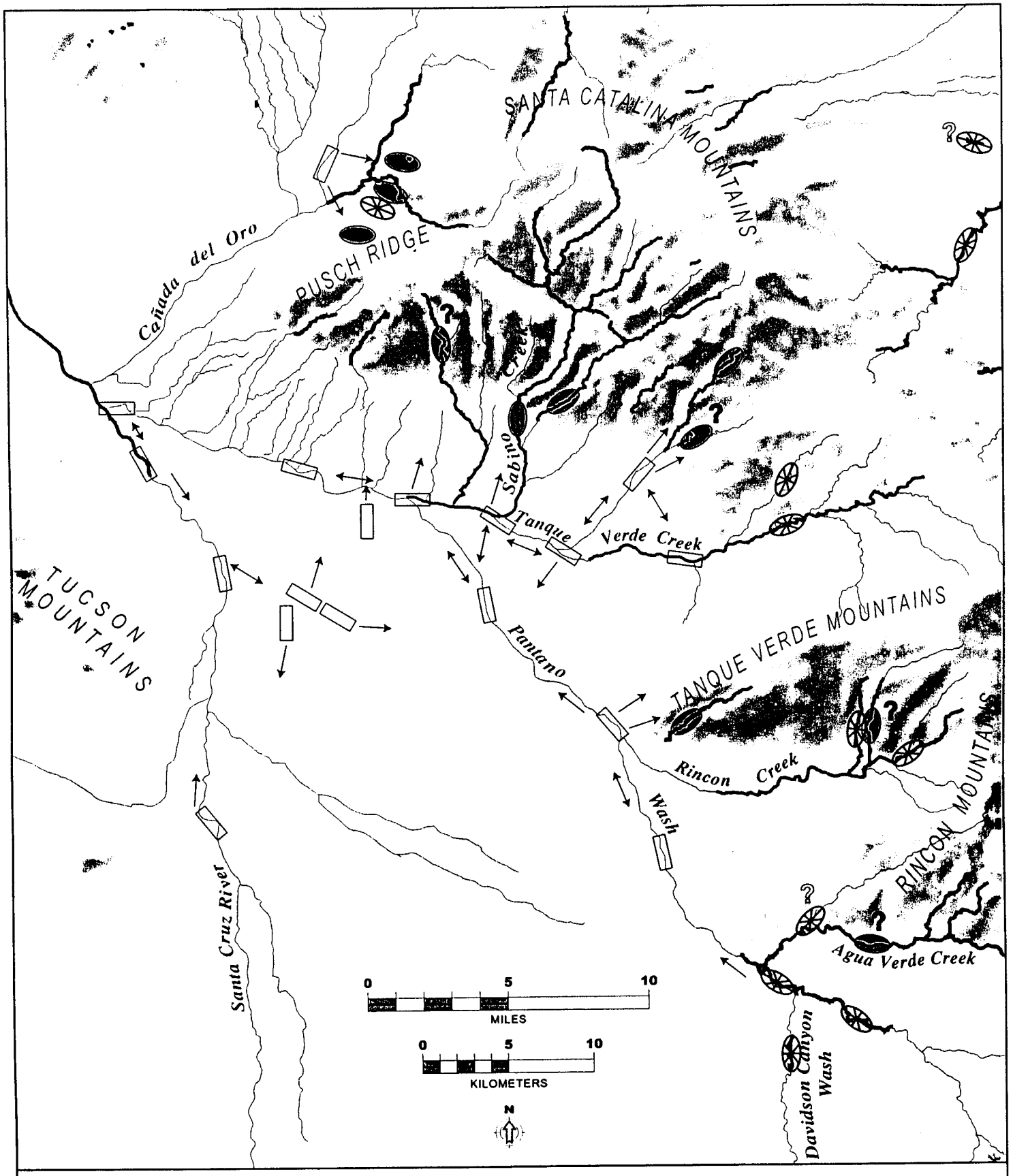

Figure 2.
Ideal Lowland Leopard Frog Metapopulation Structure

Pima County Graphic Design 6/00 ep

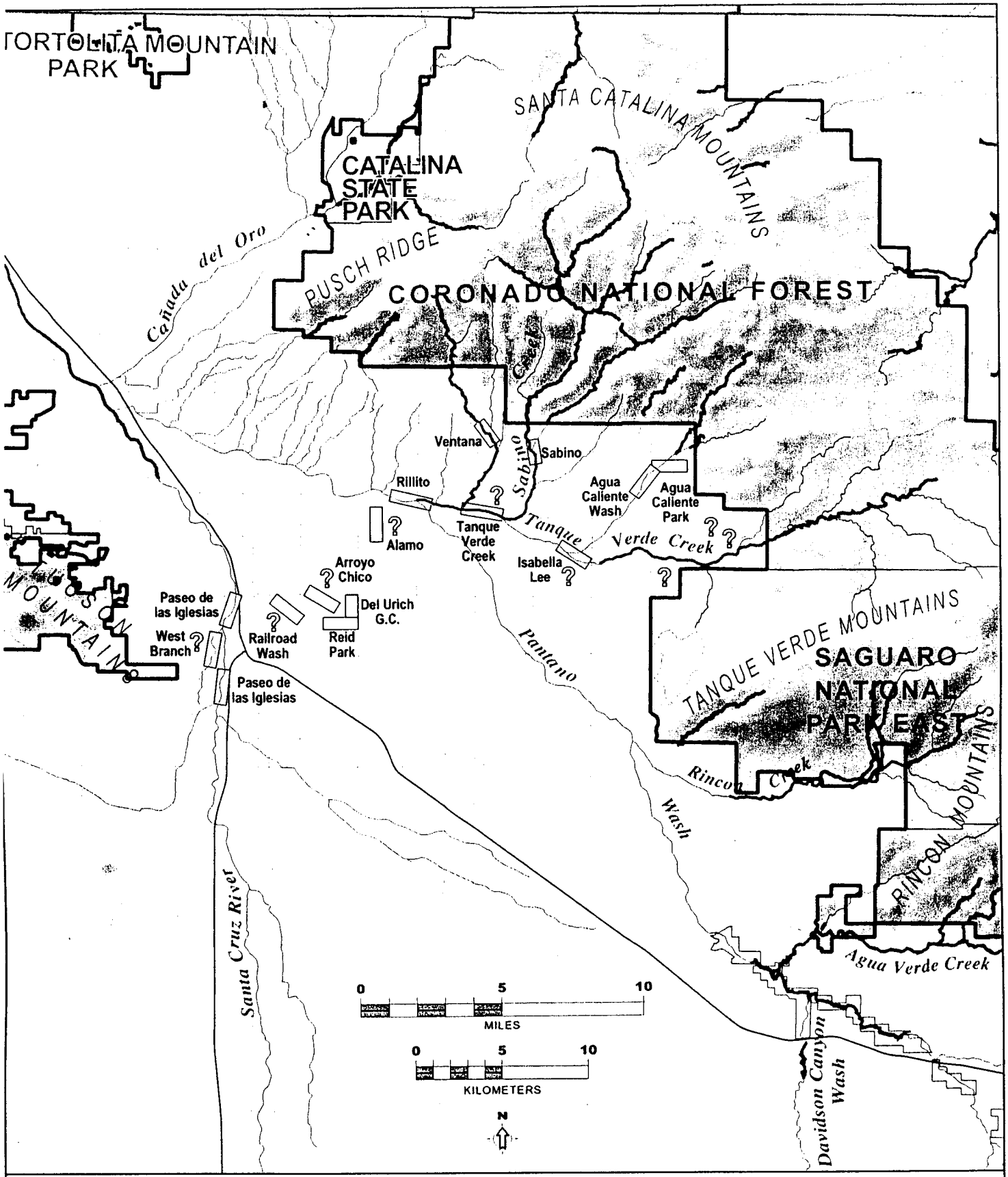

Figure 3.

Possible Lowland Leopard Frog Metapopulation Structure for Re-establishment on Tucson Basin Floor

- **Creation of spring-fed (or reclaimed water-supplied), quasi-cienega, small channel systems in natural sites with little flooding or with moderate flooding**

"At less powerfully flooded sites, critically imperiled native fish may thrive and native amphibians and reptiles may also persist. These systems would either be managed spring runs, or designed reclaimed water streams in arroyos with moderate flooding. Successful creation of the latter would take some artful hydrological planning and knowledge. In these systems, riffles or runs may alternate with slower or deeper water, and topminnow, pupfish, and chub could thrive." (P. 7)

"The substantial spring flow would be used to create ciénega-run conditions like those found now at the spring source of Agua Caliente. These waters could be landscaped into the existing uses--picnicking, weddings, and so on--in a rather attractive way. They would then be highly suitable for the most endangered species--pupfish and topminnow. A few deeper pools could also support Gila chub. Other native fishes (longfin dace, Sonora sucker, and desert sucker) might also exist, although they are normally found in rocky or more strongly flowing stream habitats. Bullfrogs are not known to thrive in flow-dominated, small-channel habitat types (as opposed to deep pools, ponds, and lakes, where they do thrive), and thus native lowland leopard frogs, Sonoran mud turtles, and Mexican garter snakes could also exist." (P. 7)

"This hypothetical ecosystem, then, could support all of the most critically-declining or endangered wetland vertebrates of the Tucson Basin--pupfish, topminnow, chub, leopard frog, and garter snake--and all in potentially substantial numbers. The spring should be capable of providing a very great linear extent of the habitat type. In fact, I suggest that this spring-run system could be extended to reach the bed of the Agua Caliente Wash itself at this location--which would variously be at about 1/4 to ½ miles from the present spring source. This channel system could then be attached directly to an arroyo-channel habitat type that would also support the native fauna but in a more flood-prone system. This could be the ideal arrangement of things: in wet springs, continuous flow in the major Tucson Basin floor streams would allow fish from the Agua Caliente area to reach and colonize other sites we might create. Regardless of the flood severity in the main arroyo channel at Aqua Caliente, re-colonization could readily occur from the spring-run system I have suggested for the park." (P. 7-8)

" Special and carefully designed measures would be required to sustain anything other than the deep, steep-sided ponds and pools that various exotics would thrive in. Such measures would have to involve either (1) concretized, natural-looking channels (like the one at Quitobaquito, which does, nevertheless, require periodic pulling of the encroaching cattails and tules), (2) periodic re-trenching of earthen runs, or (3) alternate flow channels that would permit drying of some portions of the system to cause the die-off or die-back of the cattails and tules. If such an approach is taken, very careful planning and construction would pay great dividends in the saving of the native fish populations and in efficiency of the maintenance regimen that would be required. .... Proper design of channel gradients and interconnections would allow small channel segments to be isolated and dried out for management purposes." (P. 8)

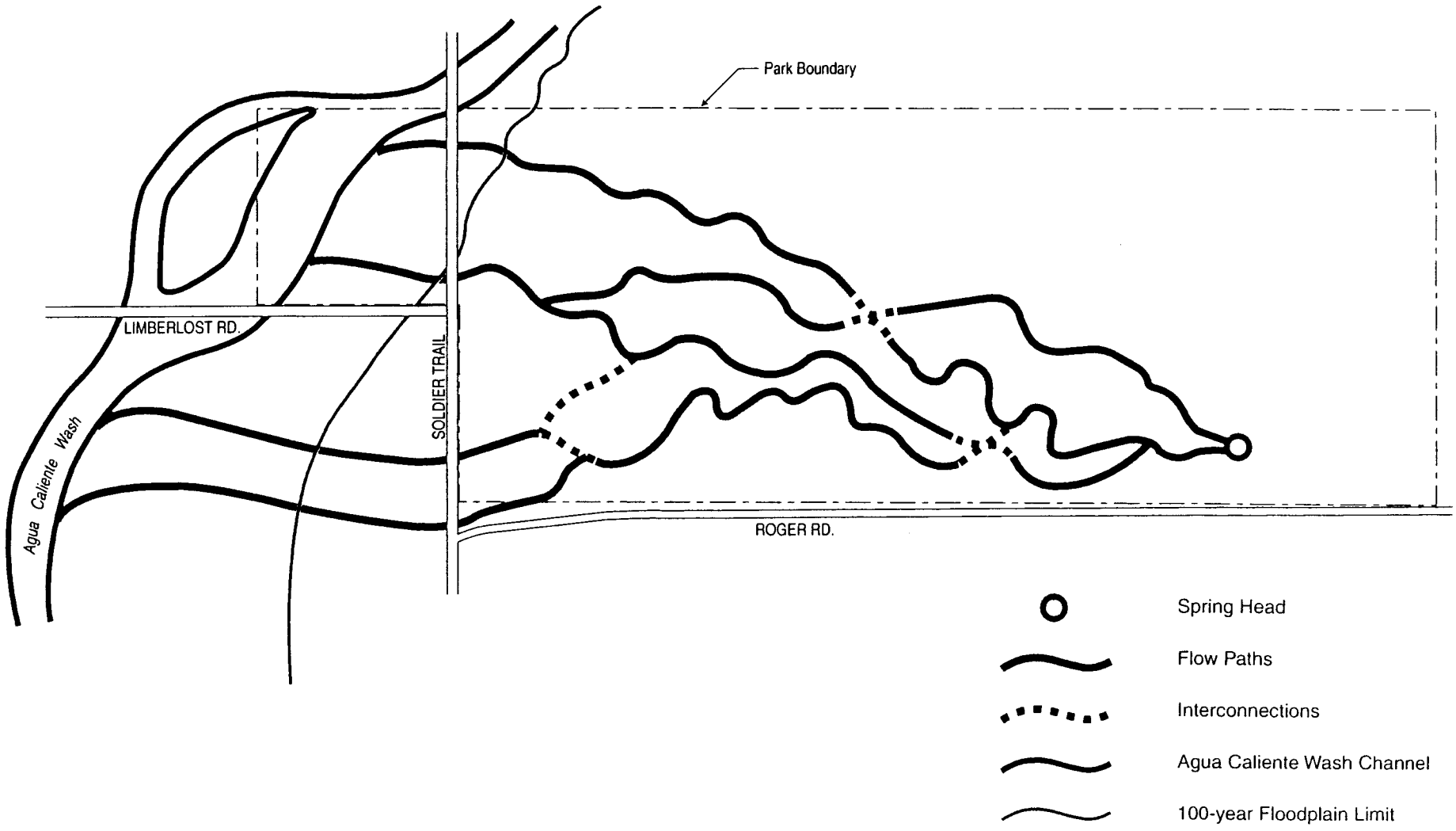

Figure 5.
Agua Caliente Park
Managed Cienega Flow Concept

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Ex-Urban Canyons and Valley Floors

Pages 13 through 22 of the *Aquatic Vertebrate Conservation* report shift focus from the valley floor to the outlying canyons. Highlights from a review of forty canyons include:

- "**Fishes:** Imperiled fishes in Pima County currently occur naturally at upper Ciénega Creek-Empire Ranch (Gila chub, topminnow, longfin dace), Sabino Canyon (Gila chub, and formerly, Gila topminnow), perhaps Buehman Canyon (Gila chub), and potentially in the Santa Cruz River at Arivaca Junction (Gila topminnow, Sonora sucker). Longfin Dace also occur in the County in lower Ciénega Creek, the northeast quadrant of the Santa Rita Mountains (Cave, Gardner, and Fish Canyons), the San Pedro River and some of its tributary canyons, and should be present in the Santa Cruz." (P. 13)

- "**Amphibians:** Lowland leopard frogs are abundant in the perennial stretches of the lower San Pedro and in lower Ciénega Creek (in the County's Natural Preserve). They also occur in the County in good numbers at about 7 isolated canyons in the Rincon, Santa Catalina, and Whetstone Mountains, and they are known in more limited numbers in about 4 additional, also isolated, canyons in these mountains. Canyons confluent with the lower San Pedro probably are the only currently viable population sites, since these and the river appear to form a metapopulation in which local extinction events may be balanced by emigrants or dispersers from other local populations. It is quite possible that the lowland leopard frog may be re-discovered in or near the Altar Valley just north of Buenos Aires National Wildlife Refuge. Otherwise in southern Arizona, this species has been extirpated except at the Muleshoe Ranch Preserve, and two isolated springs, in the Atascosa and Pajarito mountains. Isolated populations of lowland leopard frog have been disappearing at an alarming rate in the mountains around Tucson--at least 6 major populations have disappeared in the last three decades. They have disappeared due to introduced species (3 cases) and short-term drying (2 or 3 cases), and will not be naturally re-established without supportive management." (P. 13)

  "Chiricahua leopard frogs now occur in the County only at Buenos Aires National Wildlife Refuge and vicinity (2 known populations), at Empire Ranch (1 known, tiny population persisting), and in the northern Santa Rita Mountains (where 2 small populations may or may not be persisting). They were formerly widespread and abundant at Arivaca, the Altar Valley, Sierra San Luis, northern Santa Rita Mountains, and upper Ciénega Creek, occurring widely in natural streams, springs, and stock tanks. Major population losses are attributable to exotic species. Both species of leopard frogs are also suffering from a possibly newly acquired disease." (P. 13)

- "**Reptiles** - The Mexican garter snake persists in the County in Ciénega Creek. It formerly occurred, and was presumably extremely abundant, at Arivaca and in all perennial waters of the Santa Cruz, Rillito, Pantano, and Agua Caliente in the Santa Cruz Valley and Tucson Basin. This species is dwindling toward eventual extinction in the United States".

- "Mountain canyons currently contain much of the stock from which we must draw to preserve the native aquatic vertebrate fauna of the County. Gila chub, longfin dace, desert sucker, Sonora sucker, speckled dace, lowland leopard frogs, and Chiricahua leopard frogs are now primarily found in mountain canyons. Without significant efforts to preserve habitat and species in mountain canyons, the Gila chub and the lowland leopard frogs may face extinction--before we have any opportunity to return them to valley floors where they formerly were abundant. Therefore, it will be critical to identify and protect key mountain canyon waters, and to develop and implement conservation strategies in which current and developing land uses may be compatible with species preservation." (P. 14)

- **"Cienega Creek Natural Preserve**, from Pantano to the RR bridge. A well-known, major lowland leopard frog population site, and more recently with numerous records of the Mexican garter snake, this site is recovering from grazing. Under grazing, it was a desert stream with little pool development. Under protection as a county park, deeper and more stable pools have developed, and a ciénega-stream environment is apparently developing.

  "Bullfrogs and non-native soft-shelled turtles were reliably reported at the site starting in about 1995. These and exotic fishes (currently present in clay pit ponds dangerously close to the stream) may do better in the new, more stable conditions, and may pose a significant threat. Clearly, the non-native fish near the stream should be removed. A thorough survey of stock tanks in the region surrounding this critical resource should be initiated. New pond developments in the Pantano floodplain at Vail Valley below the county park threaten to produce a bullfrog explosion that will inundate the leopard frog population in the Natural Preserve. The Rancho Del Lago development situation is highly problematical. This situation should be monitored, and the private developers notified of the implications of what they are doing: perhaps some kind of compromise solution is possible. Local government should consider ordinances that prevent this type of situation from developing again. ... State representatives should be contacted concerning the contradictory nature of state statute and Arizona Game and Fish Department's rules and attitude toward bullfrog possession and introductions. State legislative action is required before the bullfrog can gain its richly deserved status in Arizona--totally prohibited. Currently, it is legal to purchase bullfrogs out of state, and release them on private land. Without legislative action, the Arizona Game and Fish Department cannot correct this situation. A successful, reasoned argument from the SDCP will benefit the entire state."

  "This site may well support a variety of native fish species, most notably the Gila chub and Gila topminnow, which are upstream in the Empire-Cienega Ranch reach of Ciénega Creek. Until very recently, the habitat in the Natural Preserve was shallow runs, with few pools, and unstable banks. Thus, chub and topminnow have probably not had time to recolonize the site. From the standpoint of future recolonization potential in the Tucson Basin, as envisioned in the present plan document, allowing natural downstream colonization processes would be more informative than immediate re-introduction of the species. Assuming the habitat is now suitable, it would be very strange if downstream colonization during floods did not occur, and confirmation would be important." (P 17)

- **"Empire-Cienega Resource Conservation Area -- BLM** (Empire-Cienega Ranch). This is the wetland gem of Pima County, with lowland leopard frogs (rare or extinct), Chiricahua leopard frogs (now rare), bullfrogs (rare), Mexican garter snakes (apparently still widespread and probably not uncommon), Sonoran mud turtles (abundant), longfin dace (abundant), and Gila chubs and Gila topminnows (both superabundant). The excellent wetland management practiced by the Bureau of Land Management, with the cooperation of the grazing permittee, at this site should be recognized. Efforts to eliminate all stock ponds with breeding populations of non-native fish and bullfrogs in the entire basin should be assisted and pursued with vigor." (P. 18)

  "Keeping exotic fish, which have apparently somehow never gained access to Ciénega Creek, out of the system is perhaps the County's highest priority for wetland conservation. There are several million endangered fishes in the system--probably 1-2 orders of magnitude greater than the sum total of all other individuals of Gila topminnow in the U.S., as well as large numbers of Gila chub. Loss of the site through spread of mosquitofish, green sunfish, bass, and bullhead catfish could possibly eliminate the long-term survival prospects for these two fishes. Removal of the offending pond habitat proximal to the stream may make it difficult for bullfrogs to persist in the area, as well."

  "The Chiricahua leopard frog and Mexican garter snake populations in Ciénega Creek are very important, and require study and monitoring. The Mexican garter snake population may be the best one left in the United States." (P. 18-19)

Summary

Pages 25 through 27 summarize the report as follows:

- "The loss of riparian forests, wetlands, and perennial streams is a widely-appreciated problem in Arizona. Less apparent is the spread of introduced, non-native aquatic species (bass, sunfish, catfish, carp, mosquitofish, other fishes, bullfrogs, other frogs, and crayfish). These non-native species have largely eliminated most of the native aquatic species from the remaining perennial waters, and they are a primary obstacle to re-establishment of native species. The impact of non-natives on natives has been greatly exacerbated by habitat modifications: introduced species are typically pond and lake species, and ponds and lakes we have created." (P. 25)

- "The native habitat is flowing water, of a highly variable nature, with sudden, severe flood scour, and, in many areas, drying or near-drying on a seasonal basis. Native species are well adapted to these variable hydrological conditions." (P. 25)

- "To significantly recover our decimated native aquatic fauna will require water, which we can supply upon suitable social consensus. However, it will also require that we plan carefully to eliminate the introduced species, or at least minimize their impacts. This can be done by a combination of traditional removal methods for fish (drying, short-lived toxicants) and habitat management (re-establishment of suitably natural conditions)."

- "Perennial ponds and lakes may potentially produce massive bullfrog populations that could contaminate large areas of habitat we may be managing for native species. This would be especially true if non-native fishes, which check bullfrog populations, are removed. Efforts to remove bullfrogs from complex wetlands have proven difficult or fruitless. Where pond habitats cannot be avoided, three solutions are possible:

  (1) they can be maintained in areas where bullfrogs will not colonize them (i.e., city parks);

  (2) they can be used for native fishes, which co-exist successfully with bullfrogs, but not for native frogs and garter snakes; and

  (3) they can be located in areas where bullfrogs could reach native species sites, but the bullfrogs might be managed by frequent drying, since bullfrogs have a long tadpole stage." (P.25-26)

- "The native aquatic fauna now persists primarily in isolated mountain canyons and small conservation refugia. These refugia are subject to random extinction processes, and they offer no habitat for many of the most endangered species. Formerly, the fauna's stronghold in Pima County was in the perennial waterways of the Tucson Basin floor--the Pantano, Tanque Verde, Agua Caliente, Rillito, and Santa Cruz. This document describes ways the native aquatic fauna may be re-established in abundance in the original area, the valley floor." (P. 26)

- "Mountain Canyon refugia, and the all-important Empire-Cienega Ranch section of Ciénega Creek, must of course be protected from de-watering. Further, renovations in many of them are needed, specifically the removal of harmful introduced species. This document provides an annotated list of most of the major canyons that support aquatic species in the County. A major step in recovery of the valley floor will be the elimination of upstream, in-drainage populations of introduced species, which otherwise will regularly recolonize downstream areas we are attempting to manage, sharply foreclosing our options." (P. 26)

- "This document focuses on examples of how and where aquatic habitats could be utilized on the valley floor of the Tucson Basin. First, small, in-channel stream segments supported by reclaimed water or natural springflow would permit the re-establishment of lowland leopard frogs, longfin dace, and other members of the original aquatic fauna. Periodic natural flooding in this habitat is expected to prevent non-natives from eliminating the native species, even if non-natives reach the sites." (P. 26)

- "Second, less flood-prone areas, such as natural springs and in-channel water developments in smaller drainages, could be designed to minimize their tendency to support harmful exotics. Non-native fishes can be physically eliminated from such systems to begin with, and the systems could be designed to facilitate dealing with re-introductions of harmful non-natives. By avoiding pond-like habitat, fewer non-native fishes could exist at a site, and the problem of bullfrogs would be minimized."

"Habitats of this kind can be expected to support our most threatened aquatic species--topminnows, pupfish, chubs, and Mexican garter snakes--as well as other species of concern, such as longfin dace, native suckers, lowland leopard frogs, and Sonoran mud turtles. If properly designed, these areas can also supply individuals of these species to the mainstream habitats proposed above, sustaining and augmenting populations there in processes called "metapopulation" dynamics." (P. 26)

- "In addition to detailing some aspects of these proposed restoration efforts, this document identifies and highlights some key immediate or important priorities:

  1. The Empire-Cienega Ranch area must be protected from invasive exotic species, especially fishes, by getting the exotics out of the surrounding drainage basin.

  2. Green sunfish (and a few other exotic fish populations) should be removed from key mountain canyons where they prevent native fish conservation (Romero Canyon; Bear Canyon--including Rose Canyon Lake; Agua Caliente Canyon; Tanque Verde Canyon; Paige Canyon).

  3. A long-term solution should be sought (in cooperation with Buenos Aries National Wildlife Refuge and Arizona Game and Fish Department) to the disastrous situation at Arivaca Ciénega and Arivaca Lake, where non-native species have overwhelmed the Chiricahua leopard frog, Mexican garter snake, and Gila topminnow.

  4. Pima County and the Sonoran Desert Conservation Plan should recognize and assist the development of cooperation between the Buenos Aires National Wildlife Refuge, Arizona Game and Fish Department, and area ranchers interested in conservation and re-establishment of native leopard frogs in ponds and springs in the desert grassland and oak woodland areas of the County." (P. 27)

Conclusion

The approach offered by *Aquatic Vertebrate Conservation* is not only remarkable for its scope and innovative nature. It stands out because it accepts the reality of our aquatic ecosystem and spells out a practical action plan for repairing that system -- improving on many conservation programs by adopting the wisdom that "the best way out is always through.[1]" In order to move forward in developing ideas proposed by Dr. Rosen and pro-actively address the compliance issues that will attach to listings such as the Chiricahua Leopard Frog, Pima County staff is working with the Army Corps of Engineers on an Expedited Reconnaissance Study to investigate and recommend solutions to accomplish ecosystem restoration as presented in concept by Dr. Rosen's blueprint. I have directed staff to work with the Science Team to continue to develop these ideas and to work with other stakeholders to set the stage for implementation and consideration as part of the Sonoran Desert Conservation Plan.

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[1] R. Frost, cited in *General Adjudication of Rights to Use Water, Gila River System*, 1999.

MEMORANDUM

Date: August 3, 1999

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

From: C.H. Huckelberry
County Administrator

Re: **Attached Report -- *Mountain Parks and the Sonoran Desert Conservation Concept Plan***

I. Background

The attached discussion paper entitled *Mountain Parks and the Sonoran Desert Conservation Concept Plan* describes the relation of the current and proposed system of mountain parks and preserves to the ongoing multi-species conservation planning process and the larger Sonoran Desert Conservation Plan. In the last two years, the listing of the pygmy-owl as an endangered species has created substantial federal compliance concerns for the region. Many people now understand that the establishment of a science-based preserve to reflect the region's commitment to effective multi-species conservation will lead to the issuance of a federal permit that will provide regulatory relief and greater economic certainty. Under this permit, business interests will be able to pursue land uses which impact habitat, so long as defined conservation standards are met. Before reserving open space became a condition of federal compliance, Pima County had a strong interest in the topic. In fact, the roots of Pima County's mountain park and natural preserve system can be found in the creation of Tucson Mountain Park, which was established by the Pima County Board of Supervisors on April 11, 1929. Since that time, two more mountain parks and a natural preserve have been added to the County's system, and the system's functions and goals have evolved over time to include:

- Protecting flood control capacity and recharge capability;
- Protecting viewsheds and signature scenic lands;
- Linking the open space network that surrounds the metropolitan area;
- Providing biological corridors that facilitate the natural movement of wildlife;
- Perpetuating a variety of plant and animal species through the preservation of habitat;
- Protecting cultural resources;
- Upholding the tourism basis of the local economy;
- Providing recreation, scientific research and environmental education opportunities;
- Enhancing the community's quality of life;
- Retaining local control of important natural resource areas; and
- Defining Tucson's urban form.

What we have learned from the federal listing of eighteen species in Pima County, the decline in many other wildlife populations, and the substantial loss of riparian habitat and other plant communities within the region, is that Pima County's incremental approach to conservation over the last 70 years has not been sufficient.

Regardless of the amount of open space that exists across Pima County, we have not assembled an open space system that effectively preserves and conserves local species. The Science Technical Advisory Team for the Sonoran Desert Conservation Plan has identified nearly 75 plants and animals as species of concern. Our riparian environments have experienced an estimated loss of 85 to 95% of quality riparian habitat during the last century, while an estimated 85% of wildlife depends on riparian habitat for some part of its life cycle. There are reasons for the mismatch between past preservation efforts and the reality of our declining natural systems.

- First, parks in Pima County and across the country have often been created to set aside areas of great beauty, but plant and animal communities do not make location decisions based on aesthetics.

- Second, areas that have been set aside for wildlife protection purposes often are too small to support a viable population of the species. It was not until 1985 that scientists in the relatively new field of conservation biology could calculate how badly we have misjudged the area needs of wide ranging carnivores. Large animals are becoming extinct within the boundaries of the very parks that were created to protect them.

- And third, existing protected areas are disconnected. This fragmentation between even large public areas relegates the existing open space patches to the role of a zoo, when the natural functions of the system are replaced by human management and maintenance of the plant and animal communities.

The difficult inheritance of past conservation decision making is that as a rule, federal and local public parks were established without a full understanding of the relationship between open space and species conservation, and, as currently configured, they simply will not support suites of species. This applies to parks on a national scale, and it is true in Pima County too. Unlike many communities, however, Pima County still has the opportunity to assemble an effective preserve. We are fortunate to have a number of open space areas, often connected by riparian linkages. The County's parks and preserve system is flexible so that a future open space and preserve system involving federal, state, and private land can include County-owned land managed at the level of conservation that is necessary. This gives the community an opportunity to meet conservation compliance requirements at a regional level, in part through the County's parks and preserve system, while at the same time creating and implementing an adaptive management strategy which can adjust over time to actually improve implementation of the Sonoran Desert Conservation Plan as better scientific information becomes available. The attached report begins to suggest where connections exist and it provides a preliminary look at the resources within existing and proposed parks and preserves, based on current management and planning documents. The comprehensive biological assessment conducted as part of the Sonoran Desert Conservation Plan is expected to result in changes to proposed preserve boundaries and preserve management. This report simply frames planning possibilities by outlining the known potential of twelve park and preserve areas in Eastern Pima County.

II. Potential to Protect, Enhance and Create Mountain Parks and Preserves

Since the establishment of Tucson Mountain Park in 1929, Pima County's mountain parks and natural preserves have played an important and diverse role in the life of the community. This role will be expanded with the development of the Sonoran Desert Conservation Plan through the design and implementation of a comprehensive open space parks and preserve system that meets endangered species compliance standards for the region. Twelve potential parks and preserves are described below in order to facilitate discussion of the regional reserve network.

1. Tucson Mountain Park -- The 18,422.4-acre Tucson Mountain Park, formed from volcanic and fault block activity that began an estimated 70 million years ago, is presently Pima County's largest Natural Resource Park and is one of Tucson's most-visited natural areas. Pima County manages 2,514 acres owned by the Bureau of Reclamation adjacent to the western boundary of the park. Saguaro National Park adjoins the County park to the north, adding 24,034 acres to this area. The acquisition of approximately 3,615 acres of high resource land has been discussed to create corridors which will prevent this area from becoming a biological island surrounded by development.

The vegetation within the Tucson Mountains is classified as a subtropical desertland located within the Arizona Upland subdivision of the Sonoran Desert. A variety of plant communities and associations are represented within this category, with the most prevalent being the palo verde-saguaro association. Several uncommon species, including night-blooming cereus and Tumamoc globeberry, are known to occur. The park is home to large and healthy populations of saguaro, prickly pear, barrel, cholla and ocotillo cactus, mesquite, palo verde and ironwood trees, and a variety of other Sonoran desert vegetation.

Animal species found in the park include coyotes, javelina, cottontail and jackrabbits, and mule deer. Other noteworthy wildlife found in the park include bobcats, gray foxes, mountain lions, desert tortoises, gila monsters and a variety of bats and bird species. More than 230 vertebrate species are common to the area, as well as literally thousands of invertebrates. Sensitive species that may be found in the park include the Lesser long-nosed bat and the California leaf-nosed bat. The possibility that the cactus ferruginous pygmy-owl may use the park, and the suitability of its habitat for this listed endangered species, led to the inclusion of Tucson Mountain Park in Unit 2 of the U.S. Fish and Wildlife Service's recent critical habitat designation for the owl.

Cultural resources -- Tucson Mountain Park contains a variety of valuable cultural resources, including prehistoric archaeological sites, rock art sites, historic structures, old mines and trails, traditional O'odham saguaro fruit gathering sites and other traditional cultural places, and natural features of the land that together form a significant cultural and historic landscape.

Recreation potential -- The park includes 26 miles of trails open to hikers, equestrians and mountain bicyclists, an archery range, a rifle range, a campground and picnic areas, and is home to the Arizona-Sonora Desert Museum, the Sonoran Arthropod Research Institute, and Old Tucson Studios.

2. Tortolita Mountain Park -- Tortolita Mountain Park was established in 1986, when the Pima County Board of Supervisors approved the expenditure of 1986 bond funds to acquire 3,055.75 acres of private property in the rugged backcountry of the Tortolita Mountains for park purposes. The first 2,426.75 acres was purchased in 1986, and another 629 acres was added in 1988. Several recent acquisitions have brought Pima County's current holdings in the Tortolitas to 3,445.75 acres. The Tortolita Mountains are one of the oldest geological features in the Tucson area, and include 4,651 foot tall Tortolitas Peak, the highest point in the range. On November 10, 1998, the Board approved County applications to the Arizona Preserve Initiative to expand Tortolita Mountain Park by 25,744 acres. The application includes the Tortolita alluvial fan and Ironwood Forest area, which would serve as a key area for the recovery of the pygmy-owl.

Vegetative communities located within the present boundary of the park include Sonoran Desertscrub, Paloverde-Cacti-Mixed Scrub Series, Interior Chaparral, Scrub Oak Series, Sonoran Riparian Deciduous Forest and Woodland, Mesquite Series; Sonoran Riparian Deciduous Forest and Woodland, Cottonwood-Willow Series, and Sonoran Riparian Scrubland, Mixed Scrub Series. The majority of the park is considered to be within the Sonoran Desertscrub biotic community. The alluvial fan area is home to a large and impressive ironwood forest, and some of the trees within the forest are believed to be hundreds of years old. The density and superlative quality of the ironwood forest make it prime potential habitat for the cactus ferruginous pygmy-owl, and led to its inclusion in the U.S. Fish and Wildlife Service's critical habitat designation for the owl. While Park's staff knows of no special status plant species identified within the current boundaries of the park, the lands do contain large, undisturbed, healthy stands of saguaro, barrel, ocotillo and cholla cactus, mesquite, palo verde and ironwood trees, as well as a wide variety of native grasses, bushes and other plants.

Animal species -- The Tortolita Mountains area supports a wide range of wildlife, and is capable of supporting certain special status wildlife species. The park's proposed expansion lands contain habitat considered suitable for the pygmy-owl. The Sonoran desert tortoise, a species of special concern, is commonly found within the kind of Paloverde-Cacti Mixed Scrub Series habitat found in and around the park, and may be present there. Other special status wildlife found on and around the subject lands include the American peregrine falcon, the Lesser long-nosed bat, the Mexican long-tongued bat, and the California leaf-tongued bat. A wildlife survey conducted as a part of the master planning process for the park in 1996 identified a wide range of animal and bird species, including mountain lion, peccary, mule deer, and large numbers of birds and lizards. The Tortolita Mountains are also home to a small herd of wild horses--one of the few such herds remaining in southern Arizona.

Cultural resources -- The Tortolita Mountains area is rich in cultural resources. Evidence of occupation by Hohokam Indians can be found throughout the area. On the eastern side of the park, the most significant resource is the large and well-known "Indian Town" site, which is the park's first priority acquisition area. However, this area has not yet been systematically surveyed, and additional sites are expected to exist -- particularly along Honeybee Canyon and Sausalito Creek within the adopted park expansion boundary, and along Big Wash in the proposed Tortolita East Biological Corridor.

3. **Colossal Cave Mountain Park** -- At 2,038 acres, Colossal Cave is Pima County's smallest existing mountain park, but it too has the potential to grow considerably to meet the region's conservation goals in the Rincon Valley area. While best known for the tourist attraction from which it draws its name, the park has outstanding scenic resources, and includes the 1870s Posta Quemada Ranch. As might be expected from a park that features a natural cave, the geology of Colossal Cave Mountain Park is extraordinary, and is undoubtedly its most significant characteristic. According to experts who have conducted studies on the site, the park's geology is uncommonly diverse, and represents a "mosaic" array of 20 different geologic units. Honoring a request received during the public comment period, the Sonoran Desert Conservation Concept Plan suggests, for planning purposes, that the park be expanded by 14,160 acres in addition to the 4,814 acres recommended by County staff.

Vegetation - Colossal Cave Mountain Park is also notable for its wide range of vegetative communities. This exceptional diversity can be attributed to its variety of rock and soil types (21 soil types occur within the park's planning area), as well as to the fact that the park is located in a transition area between the Chihuahuan and Sonoran deserts, and includes some of the characteristics of both regions. Six vegetative communities have been identified within the park's planning area, including the Creosote Bush, Palo Verde-Saguaro, Chihuahuan Desertscrub, Semidesert Grassland, Deciduous Riparian Forest, and Evergreen Woodland associations.

Animal species -- Special status wildlife species that are known to occur in the park include the desert tortoise, the American peregrine falcon, the Lesser long-nosed bat, the Mexican long-tongued bat, the California leaf-nosed bat, the western red bat, and Townsend's big-eared bat. The species that inhabit the park range from predatory mammals such as ringtail cats and mountain lions to at least 11 species of bats. The park is especially diverse in bird and reptile species, at least partly owing to the lush riparian habitat in the Posta Quemada Wash and along the nearby Agua Verde Creek.

Cultural resources -- Colossal Cave and the area surrounding it, including the suggested expansion lands, have considerable archeological and historical significance. The lands, with natural springs and riparian corridors, have long attracted the interest of humans and were inhabited for an extended period. To date, 13 prehistoric sites have been identified in vicinity of the park and the adjacent Pistol Hill area.

Recreation potential -- Colossal Cave Mountain Park presently offers a wide range of passive recreation opportunities, including picnicking, birdwatching, hiking, horseback riding and camping.

4. **Cienega Creek Natural Preserve** --The 3,979-acre Cienega Creek Natural Preserve was Pima County's first Natural Preserve. The Preserve encompasses approximately 12 miles of the Cienega Creek, and roughly half of the protected stretch of the creek experiences perennial stream flow. Important purposes served by keeping this reach of the Cienega Creek in its existing undiminished state are the facilitation of natural aquifer recharge, and the assistance it offers in lessening the severity of flood events capable of impacting the developed area of

the Tucson Basin. The utility of the Preserve's flood control capability alone makes it of exceptional value to the Tucson metro area. The lands within the preserve are in excellent natural condition, and few man-made improvements exist within its boundaries. The most significant of the existing improvements is the Vail Water Company diversion, where the perennial base flows of the river are diverted and carried off the preserve via a pipeline. For purposes of planning, the Sonoran Desert Conservation Concept Plan suggests the expansion of the preserve by 7,293 acres, and the protection of Mescal Arroyo which links to Cienega Creek, adding another 1,856 acres to the preserve.

Vegetation - The preserve, which is located within a transitional zone between the Sonoran and Chihuahuan Deserts and thus exhibits some of the features of each region, is home to nine plant associations. These associations include:[1]

- Mixed Grass - Mixed Scrub Association (2%)
- Burroweed - Mesquite Association (5%)
- Creosote - Mariola Association (12%)
- Ocotillo - Mixed Scrub Association (1%)
- Creosote Association (9%)
- Creosote - Mixed Scrub Association (14%)
- Velvet Mesquite Association (20%)
- Velvet Mesquite - Mixed Deciduous Tree Association (4%)
- Velvet Mesquite - Mixed Scrub Association (21%)

Two special status plants are known to occur in the area, and the possibility exists that these plants may exist in the preserve and/or on the preserve's adjacent expansion lands identified in the Sonoran Desert Conservation Concept Plan: the Needle-Spined Pineapple Cactus and the Pima Pineapple Cactus. The Pima Pineapple Cactus is a listed endangered species.

Animal species -- Two principal types of wildlife habitat exist within the existing boundary of the preserve and on its surrounding expansion lands -- those associated with the preserve's riparian areas, and those associated with its upland areas. The more significant of the two are the habitats associated with the preserve's riparian areas, because of the high level of biological productivity and species diversity they foster. As a result of its quality, the preserve's wildlife habitat sustains a diverse and large population of mammals, birds, fish, reptiles, amphibians, and invertebrates. Two special status species are know to exist in the preserve: the Lowland leopard frog and the Mexican garter snake. Other special status or species of concern may also be present in the preserve: the Mexican long-tongued bat, the Gila chub, the Gila topminnow, the Lesser long-nosed bat, and the Sonoran desert tortoise.

Recreation potential -- The Cienega Creek Natural Preserve's lush vegetation and scenic values, clean running water, outstanding mountain vistas, and sense of solitude and natural quiet make it a very attractive place to visit. However, because resource protection is the principal

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[1]The remaining 12% of the Preserve not included in one of the plant communities listed above consists of abandoned ag fields (4%) and bedrock/sandy wash channel (8%).

imperative in the preserve, recreational activities are limited to those that do not adversely impact its sensitive resources:

- Hiking, walking, backpacking, picnicking and related activities;
- Railroad train watching, photography and painting;
- Non-intrusive bird and wildlife observation, photography and painting;
- Wading in the creek's pools and stream;
- Scientific research and environmental education;
- Other low impact recreational or educational activities.

Access is limited to 50 people per day, and a permit is required to enter the preserve. Presently about 10 people per weekday visit the Cienega Preserve.

5. **Catalina State Park Expansion** -- The 5,511-acre Catalina State Park is situated in the western foothills of the Catalina Mountains adjacent to the Town of Oro Valley between the Coronado National Forest and the Oracle Highway. Catalina State Park's position and significance in the regional open space network led to its inclusion in both the 1997 Open Space Bond Program and the Sonoran Desert Conservation Concept Plan. The Bond Program identified about 1000 acres, and the Sonoran Desert Conservation Concept Plan identified approximately 2,500 acres of property north of the park for possible protection. The central purpose of the proposed expansion is to facilitate the establishment of a biological corridor that would link the Coronado National Forest, the Sutherland Basin, and Catalina State Park to the Tortolita East Biological Corridor and the Tortolita Mountains.

Vegetation -- Sections of two major wash corridors -- the Canada del Oro and the Sutherland washes--pass through the park, which protects the valuable riparian habitat within them. These washes and their tributaries support an extensive mesquite bosque. Other plant associations that occur within the park's riparian community include Arizona ash, cottonwood, sycamore, desert willow, oak, netleaf hackberry, Arizona walnut and Arizona cypress. Other major vegetation types found in the park include desert scrub, desert grassland, and foothill communities.

Animal species -- Species typically found throughout Catalina State Park and on the park's proposed northern expansion lands include javelina, coyote, jackrabbit, cottontail, bobcat, skunk, squirrels, mule deer, and bats, as well as a multiplicity of snakes, lizards and birds. The park provides habitat for migratory neotropical birds and also wintering peregrine falcon. Desert bighorn sheep have been sighted in the park and on surrounding lands in the past, although their numbers have declined to a bare few in recent years. The park's northern expansion lands contain habitat considered suitable for the endangered cactus ferruginous pygmy-owl. The Sonoran desert tortoise, a species of special concern, can be found within the habitat that exists in the area, and could conceivably be present on the expansion lands. Other special status wildlife that may exist on and around the subject expansion lands include the American peregrine falcon, the Lesser long-nosed bat, the Mexican long-tongued bat, and the California leaf-tongued bat.

Cultural resources -- The lands presently within the boundaries of Catalina State Park are home to a wide range of valuable cultural resources. Investigations conducted by the Arizona State Museum and others have found tools, flakes and projectile points that are believed to date back to 5000 B.C. These investigations also suggest that the area was occupied by Hohokam Indians from about 300 B.C. to around 1500 A.D. Some 38 archeological sites have been located and recorded in the park, the most significant of which is the Romero Ruin or "Pueblo Viejo." The Romero Ruin is a classic Hohokam habitation site and historic ranch compound that covers approximately 30 acres, and features a stone compound wall, several rooms of stone masonry construction, rock and trash mounds, rock alignments that are believed to have been irrigation troughs, and two depressions that may have been used as ball courts.

Recreation potential -- Catalina State Park offers approximately 12 miles of recreational trail opportunities for hikers, equestrians and mountain bicyclists.

6. Waterman-Roskruge Mountain Park -- Pima County's proposed Waterman-Roskruge Mountain Park occupies a large part of the western portion of the Avra Valley and is situated approximately 5 miles west of Tucson Mountain Park and the Tucson Mountain District of Saguaro National Park. At 56,031 acres in total size, Waterman-Roskruge Mountain Park, which is composed of a pair of connecting ranges -- the Waterman Mountains and the Roskruge Mountains -- will be one of the largest of Pima County's mountain parks, and more than twice the size of Tucson Mountain Park. The lands within the park boundary include 40,560 acres presently administered by the U.S. Bureau of Land Management, 12,460 acres of State Trust Lands, and 3,011 acres of private property. An attractive feature of the proposed park is the fact that it is bounded on the south and west by the Schuk Toak District of the Tohono O'odham Nation, which provides an opportunity to partner with the Nation in the interest of cultural and natural resource protection. The proposed park is anchored by two connecting low mountain ranges -- the Waterman Mountains, which are limestone-based, and the Roskrouge Mountains, an area volcanic in nature. Limestone mountains are unusual in the Sonoran Desert, and this characteristic contributes to the range's plant diversity. The highest point in the park is Waterman Peak, which rises to 3,808 feet.

Vegetation -- The park's Sonoran desertscrub vegetation, which includes both upland and riparian habitat, is dense and generally in excellent natural condition. The park supports a wide variety of plant and animal life. The area's notable vegetative diversity includes two very important cactus species -- the Nichol's Turk's head cactus, and the Pima pineapple cactus. Both are listed endangered species, and comprise two of the six types of endangered cacti that can be found within the state of Arizona. The Pima Indian mallow, a plant species of special concern, can also be found within the park.

Animal species -- Typical wildlife species that can be found inside the proposed park include desert tortoise, mule deer, bobcats, javelina, coyote, desert cottontail, and gray fox. A small herd of bighorn sheep visits the range from the nearby Silverbell Mountains from time to time. Migratory neotropical birds, Harris's hawks and burrowing owls are among the abundant bird life in the park, which may also include the endangered cactus ferruginous pygmy-owl.

Recreation potential -- The existing recreation pattern on the lands is sparse, owing to the distance of the site from metropolitan Tucson and the fact that the recreation opportunities in the area are little known. However, small numbers of hikers, equestrians, explorers and birdwatchers and mountain bicyclists presently use the area, as do off-highway vehicles, particularly ATVs.

7. Santa Rita Mountain Park -- The proposed 10,703-acre Santa Rita mountain park is situated in the picturesque foothills of the Santa Rita Mountains south of Sahuarita Road and west of Davidson Canyon. The extensive natural resources encompassed by the Santa Rita Mountain Park include Fagan Lake, a man-made pond just outside the Coronado National Forest.

Vegetation -- The dominant vegetative community within the park is Semi-desert grassland that includes a variety of grasses, including grama grasses at higher elevations. According to the U.S. Fish and Wildlife Service, the parklands formerly featured an oak savannah with large trees; however, the agency believes that this plant community has been diminished over time. Lehmann's lovegrass, an exotic grass species, has infiltrated the park and continues to propagate.

Animal species -- One of the most notable features of the Santa Rita Mountains is the tremendous diversity of wildlife that inhabits the range. In addition to the usual desert species that can be found in the area, such as mule deer, white-tailed deer, javelina, quail, cottontails and the like, the area is also home to the Mexican opossum, the coatimundi and mountain lions. A large variety of birds can also be found in the area, including hummingbirds, several kinds of hawks, Golden eagles, and the tropical kingbird. Reptiles are also plentiful, and include several kinds of rattlesnakes, frogs such as the lowland leopard frog, (a species of special concern) and the western barking frog, gila monsters, and the Sonoran desert tortoise. The area is noteworthy for its large population of bats, which features the Mexican long-tongued bat, the Pale Townsend's big-eared bat, the California leaf-nosed bat, the Ghost-faced bat, and the Western red bat. The Santa Ritas may also support a broad range of threatened and endangered species. Listed-endangered species known or believed to exist in the range and on surrounding lands include the American peregrine falcon, the cactus ferruginous pygmy owl, the jaguarundi, the Lesser long-nosed bat, the pima pineapple cactus, and the Gila topminnow. Listed-threatened species include the Mexican spotted owl.

Recreation potential -- The area is presently lightly used for recreational purposes, partially because of its distance from urban Tucson and partially because it is not well-known. The park does have several existing primitive roads and trails, some of which are listed on the Eastern Pima County Trail System Master Plan.

8. Davidson Canyon Natural Preserve -- Davidson Canyon is a broad, deep and impressive natural wash corridor approximately 12 miles long that contains high-quality riparian habitat and is extraordinarily picturesque. The canyon, situated a short distance east of the Sonoita Highway and south of Cienega Creek, connects the Cienega Creek Natural Preserve with the Nogales Ranger District of the Coronado National Forest. The proposed Davidson Canyon Natural Preserve, a 6,191-acre unit, and would encompass the roughly 11 miles or so of the

canyon not presently protected by Pima County or any other land management agency. The preserve's significance as a corridor between protected natural areas is difficult to overstate; no other linkage proposed in the Sonoran Desert Conservation Concept Plan would connect as many existing or proposed units. The canyon's hydrologic characteristics are also important. Davidson Canyon collects drainage from the northeastern slopes of the Santa Rita Mountains and the northern and western faces of the Empire Mountains, and this runoff ultimately flows into Cienega Creek and through the Tucson Basin. Protecting the canyon in its natural form will maintain its important flood control capacity, as well as its natural recharge capabilities.

Vegetation -- The Davidson Canyon Natural Preserve encompasses both riparian and Sonoran Desert upland habitat, and its plant associations include the Velvet Mesquite-Mixed Scrub Association, Velvet Mesquite Association, Burroweed-Mesquite Association and the Creosote Association. The canyon's riparian habitat and spring-fed stream flows are its most significant and valuable features. Like the Cienega Creek corridor, the canyon's interior hosts an exceptional variety of plant and animal species, including velvet mesquite, whitethorn and catclaw acacia, cottonwood trees, seepwillow, saltbush, desert hackberry, graythorn, prickly pear, sacaton and deergrass. Upland plant species include the mesquite, palo verde, creosote, barrel cactus, ocotillo, yucca, and potentially the Pima Pineapple cactus, a listed endangered species.

Animal species -- Wildlife species likely to be found within Davidson Canyon include endangered leopard frogs, fish such as the long-finned dace and potentially the endangered Gila topminnow, waterbirds, Mexican garter snakes, coyote, gray fox, skunk, collared peccary, bobcat, mule deer, and several varieties of bats, including the Mexican long-tongued bat. The Canyon's scenic values are another of its outstanding natural resources.

Recreation potential -- Davidson Canyon presently experiences only a small amount of recreational use. The area provides scenic hiking and horseback riding opportunities, but is not easily accessible south of I-10 and is not well known.

9. Cerro Colorado Mountain Park -- Compared to the sprawling mountain ranges that house other county mountain parks, the Cerro Colorado Mountains, which cover an area of about 13 square miles, are relatively small. Despite its less-than-imposing stature, this compact range, named for its rocky red volcanic form, is among the most scenic and biologically diverse in southern Arizona. The craggy peaks of the Cerro Colorados, located less than 6 miles due south of the Sierrita Mountains and immediately north of the Arivaca Road, rise above the surrounding countryside to a height of 5,319 feet.

Vegetation -- Plant communities in the mountains and its surrounding area include grasslands at lower elevations, as well as additional grassland and the Madrean evergreen-oak community at higher elevations. The Pima pineapple cactus, a listed endangered plant species, exists in the area and may also occur within the boundaries of the park.

Animal Species -- The Cerro Colorados boast an impressive roster of wildlife species, including, as previously noted, mule deer, white-trail deer, javelinas, and coatimundis, as well as cliff-

dwelling raptors such as the rarely-seen golden eagle. Special status wildlife species in the area include the spotted jaguar and the masked bob-white quail--both of which are listed endangered species--and the Northern gray hawk, Pale Townsend's big-eared bat and Sonoran desert tortoise, all species of special concern. The proposed park will also protect a key portion of the area's watershed. The Cerro Colorado's watershed features are of critical importance because they help sustain several nearby riparian areas, including riparian habitat in the nearby Buenos Aires Preserve. Wildlife authorities have noted that this habitat is especially important for migrating neotropical birds.

Recreation potential -- The Cerro Colorado Mountain Range and its surrounding area offers excellent recreation potential. Its remote location and unspoiled surroundings, located a considerable distance from any significant urbanization, are an ideal setting for a county mountain park, and will offer outstanding opportunities for solitude and natural quiet.

10. Buehman-Bingham Natural Preserve -- The proposed 7,489-acre Buehman-Bingham Natural Preserve would assure a permanent, viable link between the Catalina Mountains and the San Pedro River corridor and the protection of the sensitive plant and wildlife resources that presently exist in this area.

Vegetation -- The Buehman Canyon corridor is rich in vegetation, and is home to large stands of a variety of trees, including cottonwood, ash, walnut, willow, mesquite, hackberry, oak, sycamore, and juniper.

Animal species -- Riparian species are particularly abundant, and include such high-value inhabitants as leopard frogs (a species of special concern) and a variety of fish, including the longfin dace, desert pupfish, and Gila topminnow. The pupfish and topminnow are both listed endangered species. Over 300 species of birds can be found in the area, two-thirds of which are neotropical migrants. Seldom-seen bird species identified in the area include the western yellow-billed cuckoo, the northern gray hawk, the zone-tailed hawk, and others, including the endangered Southwestern willow flycatcher, which was seen in the Bingham Cienega in 1991. Other wildlife known to frequent the area include coatimundi, black bear, whitetail and mule deer, javelina, bobcat, and ring-tailed cats. Part of the San Pedro corridor was within the critical habitat designation for the pygmy-owl.

Recreation potential --Information regarding the existing recreation pattern in the vicinity of the proposed preserve is little known, but it is assumed that hikers and a handful of other recreationists presently use the area.

11. Silverbell Mountain Park -- In response to public comment the Silverbell Mountain Park was proposed as part of the Sonoran Desert Conservation Concept Plan. It covers 117,610 acres. The U.S. Bureau of Land Management administers a large quantity of land in the Silverbell Mountains region of Pima County northwest of the Tucson Basin -- in fact, more than 100 sections. These BLM and State Trust lands, located to the immediate north and west of the proposed Waterman-Roskruge Mountain Park, contain significant natural and cultural resources worthy of protection, including habitat for the desert big horn sheep and the desert

tortoise, and numerous prehistoric rock sites. The range also possesses considerable recreation potential. Like the Watermans and Roskruges, these lands share a substantial boundary with the Tohono O'odham Indian Reservation which provides an opportunity to partner with the Nation in the interest of resource protection.

12. Empire Mountain Park -- A Pima County Mountain Park encompassing the Empire Mountain range was first proposed more than 15 years ago. This park was identified for inclusion as a part of the Sonoran Desert Conservation Concept Plan during the public comment period and includes 11,720 acres. The Tucson Field Office of the U.S. Bureau of Land Management is already active in the Empire Mountains area and is committed to acquiring additional land in the range to complement its existing holdings for the purpose of natural resource conservation. The area is being analyzed and planned for as a part of the BLM's Sonoita Valley Planning Partnership (SVPP), which is producing a Resource Management Plan (RMP) for the Empire-Cienega Resource Conservation Area.

III. Conclusion

As we propose to define a parks and open space system which will take decades to implement, and should preserve in perpetuity both the beauty and long term sustainability of our resource base, it is interesting to travel back in time to see how the first proposals for open space were described. In 1937, the Governor of Arizona wrote to President Franklin Roosevelt to object to the withdrawal of land in Western Pima County, saying that it "would be disastrous to Arizona's present and future growth." The State Chairman of the Democratic Party, one day later, drafted a similar objection: "I am asking that Arizona's congressional delegation fight to the utmost this proposed withdrawal. Over 50% of our lands are already under Federal control. Therefore our remaining lands ... should be kept open for entry for Arizona's growth. Any compromise such as suggested to merely exclude only Gila Project irrigable lands would be fatal, unsatisfactory and detrimental to Arizona's present future and her principal gravity and pumping projects and vested property rights." Of course, more than one half century later, we can see that these dire predictions did not materialize.

In great contrast, Mr. C.B. Brown, the resident who persuaded the Board of Supervisors to create Tucson Mountain Park in 1929, had this to say about the value of open space. "Here are limitless views of desert vegetation, strange giant cacti forms, rock formations uprising sharply into forms and craggy peaks almost unreal to strangers, and ever fascinating in the changing flood of desert light. The scenic qualities, luxuriance and variety of desert flora, abundance of wild life and historical romance of the land are accepted material facts. More fascinating is the intangible charm and spell of this desert region where the haze of the distant mountain ranges meet the blue of the sky, and the desert impressive in its cloak of utter silence awaits the nature lover. Here the breeze from the canyon carries the voice of an unseen power to purify the soul and tune in on the Creator." There are many who agree with these sentiments expressed by the father of Tucson Mountain Park. And, it is perhaps safe to say that if the park had not been created 70 years ago, and a development project took its place, not many would be as inspired by the view that such a land use would offer us as an alternative today.

MEMORANDUM

Date: November 22, 1999

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

From: C.H. Huckelberry
County Administrator

Re: **Ranching in Pima County**

I. Background

One of the six elements of the Sonoran Desert Conservation Plan adopted in concept by the Board in March of 1999 is Ranch Conservation. By including ranch lands as a landscape form worthy of protection and preservation, the Board formalized Pima County's commitment to keep ranchers ranching as a way of achieving multiple community goals, including conserving natural and cultural resources, preserving open spaces, and defining urban form. Pima County has been involved in a number of successful ranch conservation efforts and retained ranchers as land stewards while preserving the land's scenic, wildlife and cultural resource values.

Empire-Cienega Ranch - In 1987, Pima County proposed to buy the Empire-Cienega Ranch to prevent development of some 30,000 homes within the Cienega watershed. The ranch was purchased in a cooperative effort by the Bureau of Land Management and made part of a National Resource Area, while a private ranching family took stewardship responsibility. In September of 1999, Congressman Kolbe submitted a legislative proposal in the House of Representatives to establish the Las Cienegas National Conservation Area. The National Conservation Area legislation provides the opportunity for Congress to consolidate public ownership and management of the watershed and set some specific management guidelines to ensure conservation of the riparian and grassland ecosystems. It also represents a milestone in the development of the Sonoran Desert Conservation Plan.

Empirita Ranch - In 1990, the Pima County Flood Control District purchased the Empirita Ranch along the lower Cienega Creek for its storm water and recharge values, and entered into a cooperative management agreement with a rancher who retains the traditional land use in balance with environmental needs of the land. The purchase has also served to protect the rich upland environment, open space and cultural resource values.

Posta Quemada Ranch - Similarly, Posta Quemada Ranch near Colossal Cave, also purchased for its watershed and quality riparian woodland values, is managed on-site by a rancher and offers educational opportunities through efforts of the Parklands Foundation.

II. Report

The attached paper entitled *Ranching in Pima County, A Conservation Objective of the Sonoran Desert Conservation Plan,* describes the local history and current practice of ranching. The report looks back as far as the 1600's when cattle were first introduced in Pima County by Spanish explorers; it covers the history of local ranches, which began to be established about 150 years ago; it outlines federal and state public land laws, and it tells about the practical aspects of the industry and ranching life, too. The report places Ranch Conservation in the context of the overall Sonoran Desert Conservation Plan by detailing the values of the Ranch Conservation element of the Plan, such as: (1) defining the metropolitan urban boundary; (2) preserving western heritage and cultural resources; (3) maintaining a traditional industry and diversifying the local economy; and (4) preserving unfragmented natural open space, wildlife habitat and water resources. A few highlights are found below.

(1) With regard to defining the metropolitan urban boundary, the report describes the fact that ranches -- along with existing reserves like the Saguaro National park, Coronado National Forest, and Tucson Mountain Park -- actually define the urban boundary of Tucson. The report also shows how, on the urbanizing edge, ranches are vulnerable to market forces and government practices. The State Land Department, for example, has established 5 year time limits on 16 grazing permits for land along the urbanizing edge of Tucson. These permits, called Special Land Use Permits, apply to a land base that totals 52,555 acres. The Sonoran Desert Conservation Plan's regional community based planning effort -- which involves the ranch community -- should result in a better system of defining urban form than simply yielding to development pressure.

(2) With regard to preserving western heritage and cultural resources, the report establishes that as ranching preserves the natural landscape and environment, archeological sites, prehistoric settlement systems, and traditional cultural places are also preserved.

(3) With regard to maintaining a traditional industry and diversifying the local economy, the report makes a number of points, including that:

In Pima County, many ranches are relatively small operations with an average net cash return of $29,746. Of 419 farms and ranches in Pima County, 311 had sales ranging from $2500 to $24,999; 51 had sales from $25,000 to $99,999; and 57 had sales over $100,000.

In 1992 there were around 51,000 head of cattle in Pima County (out of a state wide total of 930,000). By 1997, this number was reduced to 39,000 in Pima County (and about 822,300 state wide).

Of the 419 ranches, 294 (70%) are individually owned; 38 are owned by a family corporation; 9 ranches are owned by others in a corporation; and 24 are owned by a cooperative, trust, estate or institution.

(4) With regard to preserving unfragmented natural open space, wildlife habitat and water resources, the report describes the paramount role that ranch lands play in Pima County's open space landscape. In eastern Pima County alone, about 1.5 million acres of open space supports ranching and agriculture. Of this, 214,000 acres is private deeded lands. Deeded property tends to be in some of the most important riparian areas. Another 26,000 acres is cropland. State Trust Lands make up 813,000 acres, while 185,000 acres belong to the Bureau of Land Management and 318,000 acres belong to the Forest Service.

III. Conclusion

Traditional ranching areas are found in every valley system of Pima County. These areas define urban form and constitute much of our remaining open space. Development pressure and uncertain tenure threatens to fragment existing corridors that now protect numerous community values and resources. The Sonoran Desert Conservation Plan recognizes the contributions of ranching and the demonstrated and potential stewardship of ranchers in preserving what remains of natural and cultural landscape. Therefore, an important goal of the Plan is to identify the areas where this traditional land use is upholding and conserving sensitive habitat, wildlife and other natural and cultural resources, and find ways to keep these ranchers ranching for the good of entire community.

Attachment

MEMORANDUM

Date: May 18, 1999

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

From: C.H. Huckelberry
County Administrator

Re: **Attached Discussion Paper Entitled *Preserving Cultural and Historic Resources***

Background:

On April 30, 1999 I forwarded to the Board a discussion paper entitled *Determining Species of Concern* which was drafted to facilitate deliberations by the Science Technical Advisory Team in considering which species might be protected under the Sonoran Desert Conservation Plan. That work is ongoing, following a 3 ½ hour meeting of the Science Team on May 11, 1999, and will continue as we develop the data layers and scientific information necessary for a conservation plan. The species of concern discussion paper will be amended to incorporate comment, and we can expect that a series of technical reports will be issued as the subject matter becomes increasingly defined.

Today I am forwarding the report which launches a similar information gathering process in the area of cultural resources. The attached paper entitled *Preserving Cultural and Historic Resources,* was drafted by County staff to facilitate discussion of the Cultural and Historic Resources Technical Advisory Team about protection of cultural resources under the Sonoran Desert Conservation Plan. This memorandum summarizes the discussion paper, describes the ways in which Pima County's preservation policy can be made more effective, and outlines the workplan which staff is pursuing to establish a more complete data layer on cultural and historic resources.

Report:

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.

Historic Preservation in Pima County: Part 1 of the report describes the potential conservation objectives under the Sonoran Desert Conservation Plan through several sections:

- Cultural Resources Conservation
- A Cultural and Historical Summary of Pima County
- Cultural Resources and the National Register
- Status of Cultural Resource Inventory and Site Protection in Pima County

Sixteen major points of the report are summarized on page 34, 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 commemorate 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.

- There is a strong correlation between existing cultural sites and riparian areas, making the riparian restoration component of the Sonoran Desert Conservation Plan a natural ally of cultural and historic preservation.

Rewriting the Pima County Historic Zone - Analysis and Recommendations: Part 2 of the report compares existing Pima County protections for cultural resources to the ordinances of other jurisdictions and makes preliminary recommendations to improve the County's policy.

In 1972, Pima County established overlay requirements which could protect cultural and historic districts. Two districts were created but the zone is not functioning as originally intended, and it is not an effective tool in protecting sites.

Following a comparison of ordinances from the City of Tucson, City of Phoenix, City of Scottsdale, City of Santa Fe (New Mexico), Boulder County (Colorado), and Dade County (Florida), the report recommends that Pima County improve the effectiveness of its historic zone policy by:

- Creating a comprehensive preservation program within the Zoning Code; and

- establishing Pima County as a Certified Local Government by meeting the State of Arizona's requirements for acceptance into the national program.

Preliminary Workplan:

In order to gather the information necessary for Pima County to protect cultural and historic resources, staff will work with the Cultural and Historic Resources Technical Advisory Team and the Arizona State Museum. The Arizona State Museum has served as a storehouse for knowledge about the cultural resources of the state for over one hundred years. Since the 1930s, museum researchers have compiled information on thousands of sites in its Archaeological Site Files Office, which serves as the state's permanent record for researchers and cultural resource managers. To facilitate both research and management needs, the Arizona State Museum has spent the last three and a half years computerizing their records, and the records of other state and federal agencies, as part of a collaborative effort to convert data on cultural resources from paper records into an electronic geographic Information system (GIS) database. The AZSITE Cultural Resource Inventory consists of two spatially referenced databases: one for providing information on archaeological and historic sites and their locations, and the other on the locations of survey investigations. The data base currently contains information on approximately 58,000 sites and several thousand surveys state wide, including those in Pima County. The AZSITE project is the only comprehensive source of information on archaeological and historic sites in Pima County that is currently available in a GIS format.

Site Data: In establishing a site specific data layer for the Sonoran Desert Conservation Plan, the Arizona State Museum will provide Pima County with archaeological and historic site data for all of eastern Pima County in a GIS format that is compatible with the county's own GIS program. This will provide the county with critical management information on the extent and character of known archaeological and historic sites in eastern Pima County that can be integrated with data on other resources to be included in the Sonoran Desert Conservation Plan. Additional data entry is needed to complete the AZSITE data base for eastern Pima County. Estimates are that data entry will be required for approximately 2200 archaeological and historical sites, as well as approximately 1200 surveys. The site data will require data entry into the attribute files, as well as location data in the geographic information system. This latter task will be accomplished through digitizing the existing USGS paper maps containing site data. An estimated 650 hours will be needed to complete the site data portion of the file for eastern Pima County.

Survey Data: The survey data will require digitizing information on the 1200 surveys in the survey data base along with the accompanying attribute data. The Pima County Department of Transportation has digitized some portions of the county's cultural resource survey data and has made that information available to AZSITE; this may shorten the time needed to do the work. Estimates are that 770 hours will be needed to complete the survey data portion of the file for eastern Pima County. A total of 1420 hours will be required for this project, which may be reduced by up to 200 hours if existing information from Pima County proves useful.

Cost: It is estimated that the total cost for the data entry project for eastern Pima County will be $24,775.94. A contract with cost ceiling of $25,000 is currently being developed to cover the entire cost to Pima County (labor and equipment).

Summary:

In June of 1999, the Cultural and Historic Resources Technical Advisory Team to the Sonoran Desert Conservation Plan will meet for the first time to begin discussions about the resource underpinnings for our regional conservation plan. This team, and the County's partnership with the Tohono O'odham Nation in developing the Cultural Historic Preservation element of the Sonoran Desert Conservation Plan, will be described in a conservation plan update forwarded to the Board under separate cover. The attached report provides an initial frame of reference for the Team. It will likely undergo numerous changes before recommendations are made to the Steering Committee about what resources should be covered by the Sonoran Desert Conservation Plan and how they should be protected. I will forward all reports to the Board as they are produced by staff.

Attachment

MEMORANDUM

Date: April 26, 2000

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

From: C.H. Huckelberry
County Administrator

Re: **History of Archaeological, Historical, and Ethnographic Research**

Attached is a copy of a report on the history of archaeological, historical, and ethnographic research in southern Arizona. This is the first in a series of installments in a regional synthesis of cultural and historical resources that will be produced to develop the Sonoran Desert Conservation Plan.

In the next few weeks, reports will be issued on these topics: (1) Prehistoric, Historic, and Ethnographic Peoples of Southern Arizona; (2) The Cultural Landscapes Approach in Archaeology and History; (3) Overview of Traditional Cultural Places in Pima County; (4) Overview of Cultural Landscapes in Southern Arizona Prehistory; and (5) Overview of Cultural Landscapes in Southern Arizona History.

The purpose of this research is to document the nature and extent of cultural and historical resource assets in Pima County to assist in the planning process. These assets include archaeological sites, historic buildings and structures, cultural and historical landscapes, and places of traditional cultural value that collectively represent 12,000 years of human history in southern Arizona.

History of Archaeological, Historical, and Ethnographic Research condenses the history of archaeological, historical, and ethnographic research from the 1880s to the present day. The material covers each discipline within three general time periods, 1880-1937, 1937-1965, 1965-1990, and includes an update on research conducted since 1990. Within these broad time periods, the influence of regional and national developments in the fields of archaeology, history, ethnography, and the natural sciences are traced to explain how research in these areas has evolved over time here in southern Arizona, and Pima County in particular.

The result is a comprehensive overview of the contributions made by dozens of individuals who committed themselves to unlocking the secrets of the sonoran desert and the people who have lived here for thousands of years. The report follows the influence of ideas, institutions, and changes in law that together have laid the foundation for the modern studies of anthropological archaeology, historic archaeology, the history of the borderlands, and the ethnology of indigenous peoples in southern Arizona. This work sets the stage for subsequent discussions of Pima County's rich cultural and historical resources that ultimately will contribute to the cultural and historical resources element of the Sonoran Desert Conservation Plan.

MEMORANDUM

Date: May 10, 2000

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

From: C.H. Huckelberry
County Administrator

Re: ***The People of Southern Arizona, Past and Present***

Background

The attached report entitled *The People of Southern Arizona, Past and Present*, is one of several deliverables from Statistical Research Inc., written to develop the Cultural and Historic Resources Element of the Sonoran Desert Conservation Plan. Divided into four parts, the report summarizes available information that reflects the experience of (1) ancient peoples of Southern Arizona; (2) indigenous peoples; (3) non-indigenous peoples of the historical period; and (4) Pima County today.

Ancient Peoples of Southern Arizona

Pages 2 through 35 of the report provide a chronology of various cultures and a description of the residents of the land base that is now Southern Arizona, covering the years 9,500 B.C. to about 1,500 A.D.

Paleoindians: The oldest archaeological records describe a group of people who were in Arizona as long as 11,500 years ago. Referred to as Paleoindians in the scholarly literature, these residents were highly mobile hunters, who pursued animals that have since gone extinct, such as the dire wolf, huge bison, and mammoth. Sites have been found in the San Pedro River valley, including "kill" sites with mammoth remains. Sites do not include evidence that would indicate the Paleoindian peoples built homes or made ceramic containers.

Archaic Ancestors: Recent excavations have added to a body of knowledge that describes cultures and lifeways of people living in Southern Arizona during a time span of about 6500 years, beginning in 6,500 B.C. One of the late stages of this period, called the Archaic Period, was studied through a site excavated at the Santa Cruz Bend. Residents are thought to have occupied a site of over 8 hectares from 760 to 200 B.C.: 183 pit structures were identified and it is predicted that as many as 500 pit structures may have originally been present on the landscape. The mobile residents of this area are thought to have foraged, and survived on a diet of wild plant crops and game. Grinding stones called metates, and hand held tools called manos probably helped with seed and bean grinding. Maize is thought to have been introduced some 3000 years ago in the Southwest. Santa Cruz Bend houses lacked inside hearths and only one outside hearth was found in the excavation. Clay beads, figurines and crude clay containers have been found from this time period.

Formative Period: Early residents of Southern Arizona became more sedentary and dependent on agriculture at the same time ceramic pots and containers become evident in the cultural resource record. The authors of the attached report state that: "Ceramic containers began to appear in southern Arizona by around A.D. 1, and by A.D. 200, a well-developed ceramic-container technology was in place. Technologically sophisticated pottery appeared at settlements such as the Houghton Road site, El Arbolito, the Square Hearth site, the Valencia site, and several others." (P. 9)

Painted pottery in the Southern Arizona cultural resource record dates back to around A.D. 650. Increasing attention to detail, fine lines and designs soon became the mark of Hohokam pottery -- and a proxy for settled village life.

The Hohokam: Pages 12 through 24 of the attached report describe the ancient people of the Santa Cruz, Salt and Gila River Valleys. These "masters of the desert" developed irrigation canals to support extensive farming endeavors, created an elaborate art style, and grew by adjusting to the demands of desert life and maximizing water uses.

Pages 24 through 35 describe other cultures that lack a written record, but are evidenced through archaeological work, including the Salado culture, the Trincheras culture, the Patayan culture, and a time referred to as "protohistoric," which marks the passage to written documentation of events -- which in Southern Arizona occurred in the 1500s and 1600s, with the arrival of Spanish explorers to the Southwest.

Indigenous Peoples

Pages 35 through 64 of the attached report provide an outline of the experiences of the O'odham, Apache and Yaqui peoples in Southern Arizona.

The O'odham

Traditional lands for the O'odham people extended well beyond the current boundaries of the Nation, from the San Pedro River to the Colorado River and Gulf of California; and from Magdalena and the Sonora River of Mexico to the Gila River. Proximity to water might explain the adjective "Akimel" in relation to the O'odham who reside near the river, just as the "Tohono" O'odham reside in the desert. A more detailed description of the experience of the Tohono O'odham is found on pages 43 to 47.

The Apache

Relative newcomers to the region, the Athapaskan speaking Apache residents of Southern Arizona arrived around 1500 A.D. Pages 55 through 59 detail the years of conflict that Southern Arizona residents experienced with Apache lifeways.

The Yaqui

The dramatic story of the Yaqui people is outlined on pages 60 through 64 of the report. Campaigns against the Yaqui in the seventeenth century were staved off, but led to the introduction of the Jesuits to Yaqui culture, and subsequent conversions to Christianity. The Spanish colonial world found Yaqui people in mining and ranching endeavors. Jesuits departed from the Yaqui lands in 1767, and were replaced by Franciscans, who are said to have less successful relations with the Yaqui people. Escalating disputes in Mexico led to the displacement of some Yaqui people to Arizona in the early 1900s. More than 9000 Pascua Yaqui people live in Southern Arizona today. In 1982 they received federal recognition and in 1988 the first constitution was ratified.

Non-indigenous Peoples of Southern Arizona

Pages 64 through 87 of the report describe the path taken by four groups to Southern Arizona: the Hispanic people of the region; the Mormon residents; Chinese members of the community; and African Americans in Southern Arizona.

The Hispanic Presence in Southern Arizona

Pages 66 through 76 divides the description of Hispanic presence in Southern Arizona into three parts based on the nation exerting most influence at the time: 1539 to 1821 is designated as the Spanish Colonial period; 1821 to 1854 is called the Mexican period; and 1854 to the present is referred to as the U.S. period. Some highlights from the report include these points:

- "Although Fray Marcos de Niza, Fransisco Vasquez de Coronado, and perhaps other Spanish explorers passed through southern Arizona in the sixteenth and early seventeenth centuries, no physical trace of their presence here has ever been found. ... The next wave of Spaniards to enter the region -- Jesuit missionaries and their military escorts in the late seventeenth century -- were the first Europeans to ... establish a way of life in the region that lasted, in different versions, until the Gadsden Purchase." (P. 68)

- "In 1732, priests were once again assigned to the Santa Cruz village of Bac ... Among the visitas under San Xavier del Bac was a small village on the west bank of the Santa Cruz River, at the foot of Sentinel Peak ("A" Mountain). This was San Cosme de Tucson, the antecedent of modern Tucson, which Father Kino first noted by that name in 1698. [P]riests were installed in their respective missions and guaranteed protection by Captain Juan Bautista de Anza." (P. 69)

- "The mission settlements at Tumacacori and San Xavier del Bac remained predominantly Native American, but Hispanic people were now a presence at Tumacacori, the Tucson presidio, and Tubac, which in 1787 had once again become a presidio. The total Hispanic population was nonetheless very low: an official census taken of the Tucson presidio and surrounding area in 1804 counted 1,015 gente de razon. At Tubac that

year, the same census listed 88 soldiers and their families, plus 8 civilian households. At Tumacacori, 88 gente de razon were listed. With the gradual increase in the Hispanic population ..., the occasional family attempted farming, ranching, or mining in outlying areas such as Arivaca and the San Pedro Valley, but most Spaniards continued to congregate in or near the three Santa Cruz Valley settlements." (P. 73)

- "The latter half of the nineteenth century saw the emergence in Tucson of 'an oasis of middle-class Mexican society.' (Sheridan 1986), including merchants and entrepreneurs, artists and intellectuals, and politicians of statewide and national influence. Even in the late 1800s, as Anglo-Americans increasingly excluded Mexican Americans from everyday life, Mexican Americans retained prominent roles in Tucson's economic and political life, and the Mexican-American community continued into the twentieth century as a vital, culturally distinctive entity." (P. 67)

Mormons, Chinese, and African American Residents of Southern Arizona

Pages 76 through 87 offer insights into the experiences of the first Mormon settlers in Binghampton; the Chinese emigration and experience in the early economy of Tucson; and the unheralded achievements of African-Americans, which include the work of Esteban as the first guide for the Spanish friar Marcos do Niza in 1539, and the discovery made by George McJunkin, an African American cowboy who found the first Paleoindian site in 1927.

Conclusion

Cultural and historic resources are preserved under a regulatory scheme that, by itself, does not explain the richness of the resource it seeks to protect. The attached report is one in a series of such reports that will be issued in the next few weeks that attempt to lead members of the Steering Committee for the Sonoran Desert Conservation Plan to a better understanding of the field itself, and more importantly, toward a greater appreciation of the importance of these resources in light of their relation to Tucson's past and present community members.

MEMORANDUM

Date: May 11 2000

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

From: C.H. Huckelberry
County Administrator

Re: ***Cultural Resource Sites Depicted on Early Maps***

<u>The First Official Map of Pima County</u>

The letterhead of George Roskruge's stationary in the 1880s carried a seal with the promise: "I will be pleased to furnish all available information for intending settlers on the public lands of this County." In 1893 the Pima County Surveyor made good on his promise for the "intending settlers" of his day, and, more than one century later, for Pima County residents today, by creating the first and most detailed "Official Map of Pima County, Authorized by the Board of Supervisors." Roskruge's map, reproduced as the cover of this report, features township and range lines, along with section lines for all surveyed areas. Natural resources are sketched out, from mountains to valleys to watercourses. Ranches, mines, towns, trails, roads and many sites that we would now consider cultural or historic resources are also recorded on the map. Map making in the 1880s was labor intensive and aspects of it were relatively expensive. The Demand on the County Treasury from 1883, found on the next page, outlines how a $10 map for the District Attorney required Roskruge to:

- Spend eight days in the field "viewing out road from Tucson to Gunsight" -- at a cost to Pima County of $80;
- Hire a team at the rate of $6 per day ($1.50 per person per day);
- Hire a guide at the rate of $2.50 per day;
- Take along $20 worth of "provisions feed etc:"
- Place the names of streets in the Sheriff's Block Book -- an expense of $7.50;
- Make the map -- an expense of $10; and
- Copy the map -- an expense of $5.

This particular task took two months to complete and accumulated charges of $190.50. Other County documents from the 1880s provide insight into just how labor intensive the work of surveyors, road overseers, and map makers was.

DEMAND ON THE COUNTY TREASURY.

TUCSON, ARIZONA, 19th June 1883

G. J. Rosbrugh Presents this demand on the COUNTY OF PIMA for the sum of $190 50 for Services as County Surveyor

the items of which are hereunto annexed.

TERRITORY OF ARIZONA, } ss.
COUNTY OF PIMA.

I do solemnly swear that the above is a just and true account against the County of Pima; that the service therein has been done and performed by me; that the items hereunto annexed are true and correct in every point and particular, and that no part thereof has been paid; and that I am not indebted in any manner to the County of Pima.

Sworn to and subscribed before me, this 19th day of June 1883 } George J. Rosbrugh
W. F. Leahy
Dep. Co. Bd. Supervisors

"An Act to Provide Manner of Presenting Claims against Counties, Passed 11th Session, 1881, Revised Statutes, Territory of Arizona."

SECTION 1. Every person having a claim against any county in this Territory, excepting those referred to in the proviso to this section shall within six (6) months after it accrues, present a demand therefor in writing to the Board of Supervisors of the county against which such claim or demand is held, verified by the affidavit of himself or agent, stating minutely what the claim is for and specifying each several item and the date, and amount thereof; PROVIDED, that nothing herein shall be held to apply to the claims for compensation due to jurors and witnesses, and for official salary, which by some express provision of law is made a demand against the county.

P. S.—Any charge against the county must be certified to by the officer for whose service was performed, or articles furnished. Constables' bills must be certified to by the Justice of the Peace for whose service was rendered.

ITEMS OF THE FOREGOING DEMAND.

1883			
April 11th	Placing names of Streets on Sheriffs Block Book.	7	50
May —	Eight days viewing out Road from Tucson to Gunsight	80	—
	Team @ $6.00	48	—
	Guide @ 2½	20	—
	Provisions Feed &c	20	—
June 14	making map of Section of County Gaol for Dist. attorney.	10	—
18	Copy do do	5	—
		$190	50

One historical report reflects that in 1887, from October through December, six different employees rotated through the county system for Road District No. One, working for periods lasting from 11 ½ days on the low end, to 23 ½ days for those who had staying power. The property owned by the County that year for the outings of field teams included:

> "2 horses, 1 wagon and harnes (sic), 1 wagon sheet, 2 water kegs, 1 jack screw, 1 monkey rench (sic), 2 horse blankets, 2 picket ropes, 1 grind stone, tent and poles, 5 shovels, 2 picks, 2 pick axes, 2 axes, 3 drills, 1 hammer, 1 large iron rench (sic), 2 crow bars, 2 hammer handles, 2 water buckets, 2 camp kettles, 1 coffee pot, 1 oven, 1 stew pan, 1 bread pan, 1 coffee mill, 2 frying pans, knives and forks, 4 cups, 5 tin plates, 3 picks, 6 drills, 1 miners spoon, 1 sledge hammer, 1 striking hammer."

The County documents that reflect the administration of survey and map making work, particularly as it facilitated the County Road Districts, indicate that it was an endeavor that ranked with the highest and most interesting county business.

Report

The attached report entitled *Cultural Resource Sites Depicted on Early Maps,* is a review of a number of early regional maps, including Roskruge's 1893 classic. Statistical Research Inc., a group that is working with County staff to develop the Cultural Preservation Element of the Sonoran Desert Conservation Plan, undertook a systematic examination of early maps. The resulting data bases and GIS cover will provide a new and useful view of our past. In addition to the 1893 County map, USGS maps from the period of 1904 to 1915, and 1942 to 1963 were examined. Ten tables resulted from the analysis. A summary table is included on the next page. When the number and names of sites with similar typology are compared, based on maps at the beginning and middle of the 1990s, these details become apparent:

- The number of settlements reflected on the maps grows dramatically from the early to the middle part of the century.
- "Camps" evolve from military purposes to youth and federal works purposes.
- Records for mines experience an increase over time.
- Parks and recreation areas gain prominence as map-worthy sites over time.
- The number of ranches recorded on maps more than doubled over time. Some of the most important ranches today are mapped on the documents from 50 and 100 years ago.
- Schools and education centers receive increased attention from map makers over time.
- Records for tanks and water related structures experience the highest increase.

Summary of Tables

CULTURAL RESOURCE SITES FROM USGS MAPS 1904-1915 and 1942-1963			
SITE TYPOLOGY	TUCSON -- 1905	EASTERN PIMA COUNTY -- 1904-1915	EASTERN PIMA COUNTY -- 1942-1963
Town, city, railroad stop	6 sites	11 sites	49 sites
Camp (e.g., CCC, boy scout, prison)	9 sites	9 sites	8 sites
Cemetery, grave			19 sites
House, cabin	4 sites	5 sites	6 sites
Church			2 sites
Farm, agricultural operation			6 sites
Medical facility			8 sites
Landing field			17 sites
Mines	1 site	5 sites	68 sites
Fire, ranger station	1 site	1 site	7 sites
Park, picnic, recreational area	1 site	1 site	27 sites
Ranch, land grant	19 sites	44 sites	115 sites
Schools			35 sites
Tank (excavated or natural)			75 sites
Water tank (aboveground)			12 sites
Dam, reservoir, water feature	2 sites	2 sites	15 sites
Well, windmill			128 sites
Windmills			15 sites
Military instillation or feature	1 site	1 site	11 sites
Transportation related feature	6 sites		2 sites

Conclusion

In Pima County, the existence of these records becomes more meaningful when the realization sets in that Roskruge's 1893 map or the USGS maps from the first half of the century include sites that have both historic and present value.

Not only do sites such as the Agua Blanco Ranch, Andrada Ranch, Anvil Ranch, Bellota Ranch, Empire Ranch, and McGee Ranch, show up on the first maps commissioned by the Board or the United States Geological Survey, the current owners and stewards of these ranches are major participants in the Sonoran Desert Conservation Planning process.

By successfully furnishing "all available information for intending settlers on the public lands of this County," George Roskruge provided a way for us to assess our losses, appreciate the valuable resources that remain, and go forward in a more thoughtful manner, with maps serving not only as a record of who we are but also a blueprint for what we aspire to become: a community that is balancing its population expansion with an ethic of resource conservation and protection.

Attachments

MEMORANDUM

Date: May 23, 2000

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

From: C.H. Huckelberry
County Administrator

Re: ***Cultural Landscapes -- Relationships Between Land and People***

The attached report from Statistical Research Inc. (SRI), written to develop the Cultural and Historic Resources Element of the Sonoran Desert Conservation Plan, provides an introduction to a method used by anthropologists and archaeologists called the *cultural landscape approach*. SRI will publish two reports in the next weeks that utilize this approach by reviewing the cultural landscapes of the historic and prehistoric periods of Southern Arizona. To introduce the topic and provide some background on how archaeologists reconstruct the stories of past cultures from the hints left on the land, the attached report explains the theory of the cultural landscape approach.

The different residents of Southern Arizona over time have held different, and sometimes conflicting, conceptions of land use. These views of land use have been tied to the moral and ethical belief systems -- to the cultures -- of the various occupants through time. The authors of the attached report describe how the archaeologist tasked with making sense of a landscape from Archaic to modern time will find "a jumble of prehistoric and historical-period peoples who perceived the environment in extremely different ways, creating an archaeological record replete with competing sets of land-use practices." Viewing this same scene through the cultural landscape approach however can "sort out these different perceptions and their concrete results in the archaeological record."

The components of a cultural landscape are described in four ways, moving from most to least tangible. The first dimension that might be apparent to the archaeologist is reflected in physical modifications to the environment such as landmarks and landscape signatures. There is also a historical domain that reflects the activities carried out by the residents of the landscape being analyzed. A third view is one that explains how the residents of the landscape interacted with their environment, and the fourth layer of analysis explains how residents of the landscape understood their environment.

Future reports will utilize the cultural landscape method to relate the experiences of the Hohokam, Tohono O'odham, and non-Indian residents of Southern Arizona, describing and comparing land use practices associated with dwelling, governing, securing food, and carrying out belief systems. Introduced here, the method provides a useful tool for understanding the fact that different Southern Arizona residents over time have held vastly different views of land use. More importantly, as we begin to see <u>why</u> these differences have existed in the past, we might find that it is not only possible but necessary to honor diverse and deeply held land ethics within our land use plans of the future.

MEMORANDUM

Date: May 30, 2000

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

From: C.H. Huckelberry
County Administrator

Re: ***Overview of Traditional Cultural Places in Pima County***

Background

The attached document entitled *Overview of Traditional Cultural Places in Pima County,* contains two reports that help to develop the Cultural Resources Element of the Sonoran Desert Conservation Plan. The first is by authors from Statistical Research Incorporated (SRI). It provides background information on the definition and application of the traditional cultural places designation under the National Historic Preservation Act. The second report is from the National Forest Service, and it expands on the first with examples of how traditional cultural places can be considered as part of land management planning.

Definitions

Culture is defined in the National Register to mean:

- "Traditions, beliefs, practices, lifeways, arts, crafts, and social institutions of any community, be it an Indian tribe, a local ethnic group, or the people of the nation as a whole." (SRI report at page 2.)

Traditional Cultural Places (TCPs) were defined in the 1993 National Register Bulletin 38 as those places that are:

- "eligible for inclusion in the National Register because of their association with cultural practices or beliefs of a living community that (a) are rooted in the community's history, and (b) are important in maintaining the continuing cultural identity of the community." (SRI report at page 1.)

Examples of traditional cultural places can include places or properties that are valued by urban, rural, or Native peoples. The authors of the attached report cite these examples:

- "a location associated with the traditional beliefs of a Native American group about its origins, its cultural history, or the nature of the world;"

- "a rural community whose organization, buildings and structures, or patterns of land use reflect the cultural traditions valued by its long-term residents;"

- "an urban neighborhood that is the traditional home of a particular cultural group, and that reflects its beliefs and practices;"
- "a location where Native American religious practitioners have historically gone, and are known to go today, to perform ceremonial activities in accordance with traditional cultural rules of practice; and"
- "a location where a community has traditionally carried out economic, artistic, or other cultural practices important to maintaining its historical identity."

Evaluating traditional cultural places can be difficult since not all such places have a visible manifestation, yet eligibility to the National Register of Historic Places requires use of the property for at least 50 years, integrity of the property, and the area proposed for registration must meet one or more of the criteria below (from page 3 of the SRI report):

- "association with events that have made a significant contribution to the broad patterns of history [including oral history]:'
- "association with the lives of significant persons in the past;"
- "embodiment of the distinctive characteristics of a type, period, or method of construction, or representative of the work of a master, or possession of high artistic values, or representative of a significant and distinguishable entity whose components may lack individual distinction;"
- "a history of yielding, or potential of yielding, information important in history or prehistory."

Traditional Cultural Places in Pima County

Two traditional cultural places within Pima County are listed in the National Register of Historic places:

- the El Tiradito shrine in Tucson's Barrio Historico; and
- I'Itoi Mo'o, sometimes called Montezuma's Head, in Organ Pipe Cactus National Monument.

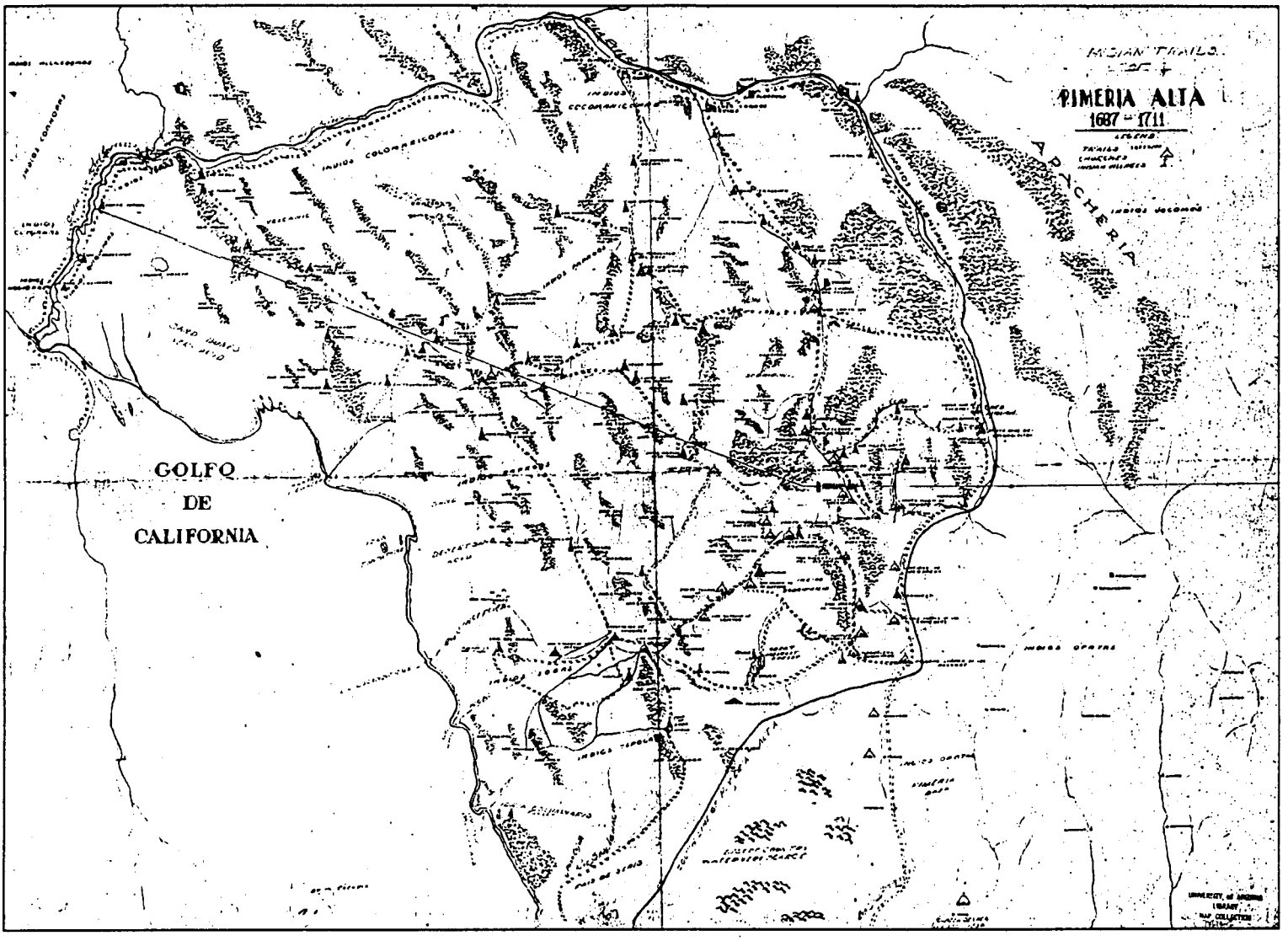
The United States Forest Service, to prepare for revisions of the Coronado Forest Plan, is conducting studies together with members of the Native American community in order to address issues of traditional cultural properties. A briefing paper on this effort is attached. Citing Forest Service assessments, SRI identifies these general categories that might be designated as traditional cultural properties upon further review (SRI report at page 6):

- Archaeological sites (Hohokam, Salado or Animas phase sites, and sites with associated burials)
- Traditional community sites (powwow or dance grounds)
- Ceremonial sites (Baboquivari Mountains)
- Historic event sites (battlegrounds)
- Traditional use areas (agave roasting pits)
- Agricultural fields (terraces, boundary markers)
- Shrines (rock rings, rock piles or cairns)
- Petroglyphs, pictographs, and geoglyph sites
- Caves and peaks (Sentinel Peak, Rincon Peak, Baboquivari Peak)
- Mineral sources (especially minerals used in paints)
- Waterways and healing waters (streams, springs)
- Plant communities (multiple-use plants for food, tools, medicine and rituals)
- Animal habitats
- Bird-nesting and roosting areas.

Trails are also identified as important to the earliest residents of Arizona and Sonora. A map of trails used from 1687 to 1711 by Native Americans is found on the next page. The Forest Service report expands the discussion of traditional cultural places by providing a summary of southeast Arizona history, and summaries of existing information on uses of Forest lands in the past by groups including the Chiricahua Apache, Western Apache, Tohono O'odham, Akimel O'odham, Hopi, Zuni, Yaqui, Mexicano, and Anglo-American residents.

Conclusion

The potential existence of traditional cultural properties in Pima County, and the small number listed in the National Register of Historic Places, suggests that a more extensive survey effort is called for by government land managers, including local governments. Partnerships with Native American resource experts, and a respect for what the authors describe as the privileged character of traditional knowledge, are necessary components of cultural property research. The next stages of developing the Cultural Resource Element will involve conducting a traditional cultural properties assessment for consideration as part of the Sonoran Desert Conservation Plan.



Indian Trails of Pimería Alta 1687-1711.

MEMORANDUM

Date: May 30, 2000

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

From: C.H. Huckelberry
County Administrator

Re: ***Cultural Landscapes of History in Southern Arizona***

Overview

Recently, as part of the series of research documents that is contributing to the development of the Cultural Resources Element of the Sonoran Desert Conservation Plan, a report was forwarded to the Board that introduced the topic of how archaeologists and historians reconstruct the stories of past cultures from the hints left on the land through the cultural landscape approach. Summarized in this memorandum, the attached report entitled *Cultural Landscapes of History in Southern Arizona* is written by authors from Statistical Research Inc. to describe the different, and sometimes conflicting, conceptions of land use that have been held by residents of Southern Arizona during the past 500 years. Briefly outlining major events in the Native American, Hispanic and Anglo experience, the report provides a chronology of events that tends to support one scholar's view that "western history has been an ongoing competition ...for the right to claim for oneself and sometimes for one's group the status of legitimate beneficiary of Western resources. This intersection of ethnic diversity with property allocation unifies Western history." (Page 3) The report covers the following topics:

Landscapes of Conquest

A. Discovering the Landscape: Early Spanish Exploration of Southern Arizona

In 1539 the first European passed through southern Arizona and began the written record of events that allows us today to separate the past into the categories of "pre-history" (the domain of the archaeologists) and "history" (the domain of the historians). Some might imagine that the historical period has an advantage over prehistory, in relative literary or technological sophistication. But the first recorded story in southern Arizona "history" was an exaggeration of sorts, told by Friar Marcos de Niza, when he returned from his 1539 entrada and related to the Viceroy of New Spain that legends of the Seven Cities -- where fabulous wealth and high culture abounded -- were partially confirmed. At least there was one place worthy of glowing descriptions, which he called Cibola.

Viceroy Antonio de Mendoza very much wanted to hear this and so commissioned the 1540 entrada led by Francisco Vasquez de Coronado that involved 1300 people (including Niza) and 1500 horses and cattle. But upon retracing Niza's steps -- at least in Coronado's view -- there was nothing as fabulous as Niza described, and so the experience was recorded differently, and entradas, for the most part, were directed elsewhere for the next one hundred and fifty years. As a result, when Father Kino arrived in 1691 to what is now southern Arizona, he had little competition from secular Spanish enterprises, and the Jesuit version of European culture had a chance to gain something of a stronghold before other Spanish influences became a regional presence.

B. New Plants, New Animals, New Diseases

Pages 5 through 8 of the attached study describe the impact on Native Americans of introductions of new plants and animals. Father Kino is reported to have introduced the Pima residents of the Santa Cruz Valley to wheat -- a frost tolerant crop that allowed year round farming and a more stable and sedentary life. Domestic livestock animals were introduced as well, providing a substitute for the food source that formerly required hunting. However, as the authors state on page 7:

- "Whatever the benefits enjoyed by the native peoples of southern Arizona as a result of Spanish plant and animal introductions, those benefits were greatly overshadowed by the effects of another, largely one-sided biological exchange that spread deadly Old World diseases throughout the Americas beginning with the first landing of Columbus in 1492. Prior to that first landing, the native peoples of the Americas had developed for at least 12,000 years in isolation from such European diseases as measles, influenza, and smallpox. Consequently, resistance ... was extremely low ... and the effects of the many epidemics that soon raced through ... were devastating. Native American populations throughout the hemisphere declined by 66 to 95 percent during the Spanish Colonial period, and entire societies simply disintegrated under the pressures of depopulation."

C. Expansion of the Missionary Landscape into Southern Arizona

Pages 8 through 11 summarize the role of missionaries. While Pima County is now considered a part of the southwestern corner of the United States, it was within the northern reach of land visited by Jesuit missionaries who worked their way up from Sinaloa and southern Sonora (Pimeria Baja) to the Pimeria Alta -- the northern territory of Piman-speaking peoples -- with the goal of converting those they met to Catholicism along the way. In addition, the relationship of Native residents to the landscape changed. Later, in 1767, the Jesuit order was expelled from all Spanish colonies and the Franciscan order followed. The authors report that Pimans in the Santa Cruz Valley were so reduced in population that the Franciscans began to seek out the Tohono O'odham to the west of the Valley. By the late eighteenth century, the Tohono people were the largest part of the San Xavier del Bac and Guevavi mission communities.

D. The Hispanic Landscape of Isolation

Pages 11 through 13 of the report describe the landscape that Spaniards crossing the northern frontier of New Spain experienced, including the 1775 exploration by Juan Bautista de Anza to open the overland route to provide service to the Franciscan missions. The isolation of the Pimeria Alta from Mexico City, the challenges of rugged topography and climate, and ongoing hostilities for travelers probably all contributed to the view that Pimeria Alta was a far-flung outpost. Isolation from the economic community to the south during the Mexican era did not prevent residents of southern Arizona from becoming familiar with the growing Anglo-economy to the north. Detailed in the next section, the transition from Native to European land values led to a series of encroachments by Spanish and Anglo-Americans on Native American lands.

E. Dividing Up the Landscape: Land Grants and Homesteads

An overview of the land grant policies of the Spanish Colonial and Mexican eras is found on pages 13 through 16, followed by a comparison of the United States version of this practice codified in the 1862 Homestead Act. The authors make these points:

- "The source of conflict in all three periods [Spanish Colonial, Mexican and U.S.] lay in the fundamentally different conceptions held by Europeans and Native American of the human relationship to the physical landscape. For both Hispanics and Anglo-Americans, that relationship was defined by the principle of private property, the exclusive right of an individual to occupy and use land for persona benefit. ... For the Native Americans of southern Arizona, by contrast, the relationship of people to land had no formal definition, did not involve individual rights, and centered instead on the traditional association of a group of people with a loosely defined territory."

- "Gradually, the Spanish occupation of lands near the missions and in outlying areas was regularized, often with legal sanctions adapted to local circumstances, or official rewards for the continued efforts of Spaniards to colonize the region. For example, when the presidio at Tubac was reestablished in 1787, the new commander hoped to encourage Spanish settlement at the presidio by invoking a provision of the Royal Regulations of 1772, 'whereby those who wished to engage in agriculture could receive title to presidio lands in return for keeping arms and horses available for defense of the country."

- "Such grants were made within the bounds of the four square leagues designated for each presidio. Along the Santa Cruz River, these grants frequently conflicted with earlier assignments of mission lands to Native Americans."

- "The largest of land grants to Hispanic settlers, and the ones that became significant as the bases of major Anglo-American cattle raising operations in the late nineteenth and early twentieth centuries, came at the start of the Mexican period. The grants were made, much like the grants of the Spanish Colonial era, with an eye to encouraging permanent settlement in an area that the central government knew was only tenuously a part of its territory. Almost all of the petitions for large grants were submitted in the 1820s, since by the 1830s most of southern Arizona outside the immediate area of the presidios was too plagued by Apache raids to allow further settlement."

- "The Spanish Colonial policy of granting land to settlers, a policy that continued basically unchanged in the Mexican era, had a practical successor in the land-granting policies of the U.S. government, which instituted a more egalitarian (theoretically, at least) and systematic land-distribution program throughout the American West. ... Following passage of the Homestead Act of 1862, parcels, subdivided into four 160-acre quarter sections, were provided at a nominal cost to anyone who would live on the land and farm it for five years."

- "The concept of a 160-acre self-sufficient farm, originating in the temperate East, failed in much of the arid West. ... The Desert Land Act of 1876 expanded the amount of land an individual could claim to 640 acres (a full section), provided that the land was brought into irrigation within three years."

- "Although the rate of failure of homesteads greatly exceeded the rate of success, successful and abandoned homesteads are found scattered throughout the state, including in Pima County."

- "Two other important land-distribution laws were passed by Congress [in 1862]. Both had a profound effect on Arizona, including the southernmost portion of the state. The first was the Pacific Railroad Grant. ... The second law was the Morrill Act, which provided large grants of federal land to state governments, to be used to support pubic systems of education. Today, state trust lands (as they are called in Arizona) represent a large portion of the public lands in Pima County. They also constitute one of the largest potential sources of urban sprawl in the county, since the lands must, by the provisions of the Morrill Act and its derivative legislation, be sold to the highest bidder. In the metropolitan portions of Pima County, the highest bidder is typically a private development company."

Living on the Land: Mining, Farming, and Ranching in the Historical Period

Pages 16 through 29 outline the history of mining, ranching and farming in Pima County. A description of the transition from gold and silver mining to copper mining, and the decline in the copper mining industry, is found on pages 17 through 20. Farming, and its various practices by Native American, Spanish and Anglo residents, is described on pages 21 through 23. Ranching and its impact on the landscape in southern Arizona is summarized on pages 24 through 29, including an explanation for the economic and environmental crisis that was caused by overgrazing and drought conditions at the end of the 1800s.

In general, all three enterprises were transformed by the arrival of the railroad in 1880 from small scale operations to large, heavily capitalized businesses that created conflicts with the natural resource base that we still have not reconciled today.

Landscapes of Mobility

The relation of transportation to the local economy and the various residents of Pima County is described. In brief succession, pages 29 through 33 explain how:

- Native American trails gave rise to trails used by Spanish and then Mexican presidio soldiers.
- Wagons with four wheels were introduced by Anglo-Americans, replacing pack horses and mules and creating the need for road maintenance in the 1800s.
- Wagon trains moved through southern Arizona during the California Gold Rush (late 1840s). After the Gadsden Purchase, heavy wagon freighting connected Arizona to the United States, by way of 20 mule teams pulling loads up to 18,000 pounds.
- Starting in 1858 transcontinental stage lines were available, particularly through the Butterfield Overland Mail operation. The railroad replaced cross-country wagon travel in the 1880s.
- Finally, railroads persisted as the dominant mode of transportation until after World War II, when automobiles and airplanes replaced trains as the dominant modes of transportation.

A 1927 cartoon from the *Arizona Daily Star* captures the plight of southern Arizona residents caught in the transition periods. Bemoaning the loss of "silent deserts with their ever changing moods" a rancher on a horse is run off a "high mountain ledge" by the impatient driver of a "lizzie" and the blast of its horn, which is a sound the cartoon translates to words as "hank, hank!" The cartoon concludes that there are no such places of vast solitude anymore since the invention of the car.

The Social Landscape

Pages 33 through 35 describe the shift in the majority population of southern Arizona from Native American to Hispanic to Anglo-American. An increase in Anglo-American population after 1880 led to a sharp decline in the overall percent of marriages between Mexican and Anglo-Americans, falling from approximately 23 percent in the 1870s to less than 10 percent by 1910. Distance between ethnic groups was soon reflected on the landscape as Native Americans, Mexican Americans and Anglo-Americans became concentrated as populations in certain areas of the urban setting.

The Sacred Landscape

Finally, there is a discussion on pages 37 through 49 of the way religious and ethical values of various cultures in southern Arizona are reflected on the landscape.

Recommendations

The report concludes by offering two recommendations to improve future research in the area of cultural resources.

- According to the authors, a useful tool for planners, cultural resource managers and social-historical researchers would result from digitizing homesteading records of the General Land Office and the population census schedules from territorial times up through the 1920s. A GIS layer of homesteading patterns, and census information on household composition, ethnicity, and occupation would allow detailed, broad studies to occur that currently can not be undertaken.

- Oral histories of migrants to southern Arizona after World War II have not been collected, although the post-war residents who came here seeking jobs and housing were the first in the steady population growth trend that has occurred since mid-century.

Conclusion

This brief history of southern Arizona, viewed in terms of the experiences of the Native American, Hispanic, Mexican and Anglo-American residents does support the view that our history is the story of conflicting views of land use and competition for the resource base. What is different now, in the year 2000, is our shared acknowledgement that this resource base is limited and in need of conservation and restoration. By quantifying the resource base through the study process of the Sonoran Desert Conservation Plan, and respecting the underlying land ethic of our diverse residents, our current land use decision making process holds the promise that we can go forward in a different and more thoughtful way.

MEMORANDUM

Date: July 3, 2000

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

From: C.H. Huckelberry
County Administrator

Re: **Cultural Landscapes of Prehistory in Southern Arizona**

Background

During the past months a number of reports have been produced to contribute to the Cultural and Historic Resources Element of the Sonoran Desert Conservation Plan, including:

- *History of Archaeological, Historical, and Ethnographic Research*
- *The People of Southern Arizona, Past and Present*
- *Relationships Between Land and People*
- *Cultural Resource Sites as Depicted on Early Maps in Pima County*
- *Overview of Traditional Cultural Places in Pima County*
- *Cultural Landscapes of History in Southern Arizona*

At the same time these broadly descriptive reports have been drafted by Statistical Research Incorporated (SRI), members of County staff working with the Cultural and Historic Resources Advisory Team have analyzed resources at the watershed subarea level, and presented this information in the form of nine reports to the Steering Committee for the Sonoran Desert Conservation Plan. Later this summer, a document that brings together all of the cultural resources research developed for the Sonoran Desert Conservation Plan will be issued to define this element in a more comprehensive manner.

Ancient Cultural Landscapes -- The Preclassic Hohokam

The attached document entitled *Cultural Landscapes of Prehistory in Southern Arizona* completes the series of reports by Statistical Research Incorporated. A discussion of the period of Hohokam culture between 800 and 1200 A.D. is divided into four sections that review the domestic landscape, the agricultural landscape, the religious landscape, and the social landscape of the people who have a name that translates to "finished ones" in Piman.

Dwelling Space: The Built Environment of Home

Pages 2 through 6 of the attached report describe findings and theories about Hohokam dwellings. A few highlights are reproduced below:

- "The typical Hohokam pit house was a mud-covered structure of poles, brush, and thatch, built within a shallow pit -- hence the name." [Page 3; Figure 1]

- "The placement of the hearth -- the heart of the home -- was invariably in front of the entry. The typical Hohokam hearth was a shallow, circular basin that was well plastered. It was set into the house floor with its rim level with the floor surface. There was little standardization in other aspects of floor features. The floor, the floor of the entry, and the sides of the pit walls were plastered." [Page 3]

- "Field houses -- temporary structures built near the agricultural fields, in which people lived during the farming season -- were usually built less substantially than more permanent habitations." [Page 3]

- "Ramadas, or open-sided pole and brush shelters, were probably used for a variety of domestic activities." [Page 3]

- "The arrangement of houses on the land surface was not random or unplanned, but apparently highly structured. The basic unit of organization was a group of houses that archaeologists label a 'courtyard group.'" [Page 4]

- "Houses were arranged around an open central area with their entries facing into this courtyard or yard. Communal features such as large roasting pits or ovens, trash mounds, and cemeteries may be associated with courtyard groups. Estimates of 16-20 residents have been made for each." [Page 4]

- "Most important, the location of the courtyard remained stable through time." [Page 4]

- "Larger groupings of houses within villages have been termed precincts or village segments." [Page 4]

- "The villages were composed of repeated clusters of village segments that were spatially separated from other units. An open, central plaza area may be the village focus at the largest settlements." [Page 4]

- "The smaller courtyard groups were no doubt based on immediate kinship; the larger groupings (village segments or precincts) indicate the presence of a larger, corporate descent group such as a lineage or clan." [Page 4]

The Agricultural Landscape

Pages 6 through 14 describe agricultural and resource gathering activities for the Hohokam residents of Southern Arizona from 800 to 1200 A.D. Highlights include:

- "Few other prehistoric peoples of the Southwest were as skilled as the Hohokam in building water-control features, and the diversity of their water-control techniques and farming practices was remarkable." [Pages 6-7]

- "Their water-control technology included runoff or floodwater farming by capturing rainfall and diverting it to their fields; irrigation farming by means of canal systems taking water from the rivers; and dry farming, using only natural precipitation." [Page 7]

- "Hohokam canal systems exceeded in scale all other prehistoric systems in North America. For example, Canal System 2, located on the north side of the Salt River, ... consisted of 50 main canals constructed over a period of about 900 years. Canal systems consisted of main and secondary canals and networks of feeder ditches. Headgates controlled the flow of water." [Page 7]

- "Simple ditches and weirs were also used to divert water from cienegas, springs, and artificially impounded reservoirs. The Tohono O'odham practiced a technique called ak-chin farming. Ak-chin is a Piman word for the alluvial fan at the mouth of an arroyo. Agricultural fields were located on these aprons of fertile soil and were watered by rainfall runoff, sometimes directed by brush or stone dams and simple ditches. The Hohokam probably used similar methods."

- "Conservation techniques for dry farming included rock-pile fields and terraces. Many portions of the bajada slopes of the Tucson Basin and adjacent areas were too distant from water ... and were dry farmed. Hundreds of acres in these areas were devoted to cultivation through building simple rock piles that trapped and conserved direct moisture and also protected the growing plants. Huge rock-pile fields occur throughout the Tucson Basin, in the Marana area on the bajada of the Tortolita Mountains, in the southern Tucson Basin, and in the Picacho Mountains area." [Page 8]

- "Crops that were grown include domesticated plants (corn, beans, squash of several varieties, tobacco, and cotton)."

- "The Hohokam relied less intensively on hunting than other prehistoric peoples of the Southwest. Nonetheless, large animals, such as deer, pronghorn, and bighorn sheep, and small animals, particularly rabbits and other rodents, were regularly hunted. Fish, birds, reptiles, amphibian, and even insects were consumed." [Page 11]

The Social and Political Landscapes

Pages 21 through 37 of the attached report describe the social and political dynamics of the Hohokam as they can be inferred from hints left on the landscape. A few highlights are:

- "Archaeologists have not very clear understanding of where and when Hohokam culture originated. There are two general hypotheses: the Hohokam culture grew up locally from Late Archaic peoples who were living in southern Arizona, and that the Hohokam were immigrant people who originated from somewhere in what is today Mexico. The weight of the evidence today supports the second hypothesis." [Page 22]

- "Whereas conflict among social groups may be inevitable, there is little or no evidence of warfare ... among the pre-Classic period Hohokam." [Page 28]

- Researchers have asserted that "while violent conflict cannot be dismissed for the Hohokam, it existed at a minimal level compared with other Southwestern societies and was not elevated to a dominant preoccupation... . They also suggested that, as sedentary village farmers, the Hohokam would have had a greater stake in minimizing conflict than more mobile southwestern peoples." [Page 28]

- "The northern Tucson Basin offers good examples of community relationships and the landscape whole. Research has defined two ... communities of equivalent scale in this area. One was on the flank of the Tortolita Mountains and the second along the Santa Cruz River at the northern end of the Tucson Mountains. Both incorporated permanent sources of water, diverse locations for productive activities, a range of site types reflecting these activities, and focal sites with ball courts. Each community was surrounded by areas lacking substantial habitation sites and with sparse distributions of other types of sites." [Page 32]

- "The Hohokam evidently emphasized the family and larger descent groups, such as lineages and clans. This is mirrored in their dwellings, the organizations of their villages, and in their ritual performances." [Page 35]

- "Social organization seems to have been nonhierarchical, or at least horizontally arranged. That is, instead of hierarchical ordering of levels or tiers, there was a repetitive patterning of equivalent units. This is seen in house clusters, the organization of villages, in community patterning, and in the regional landscape as a whole. House clusters were accretions of similar houses, villages were accretions of house clusters, communities were similar-sized and equally spaced settlements, and the regional landscape was patterned with dispersed, equivalent communities." [Page 35]

Conclusion

The report on *Cultural Landscapes of Prehistory in Southern Arizona* conveys a sense of the Hohokam's attempts to make the best of resources found on the Southern Arizona landscape. County staff members have added a number of figures to the report that will be recognizable as the lasting symbols and art forms that have characterized our area. Uncertainties about the origins and fate of the Hohokam people, coupled with the other aspects of their cultural story, will keep the current residents of Southern Arizona interested in this past people. The protection of cultural resources under the Sonoran Desert Conservation Plan will allow us to continue to gain information and add to our own wisdom about how people in Southern Arizona have failed and succeeded in attempts to balance and integrate land use and natural resource utilization.

LAND USE, LEGAL, AND FISCAL CONSIDERATIONS

MEMORANDUM

Date: October 21, 1998

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

From: C.H. Huckelberry
County Administrator

Re: **Sonoran Desert Conservation Plan**

Introduction

The Board has instructed staff, over a number of meetings, to develop and improve strategies to deal with rapid urban growth in Eastern Pima County. These activities have varied from a general Study Session discussion of growth on February 24, 1998 to specific Board initiatives on May 19, 1998, leading to the adoption of various alterations to the County Zoning and Land Use Codes. To date the Board has been very active in addressing matters of growth, quality of life, and the environment.

The attached draft report, entitled Sonoran Desert Conservation Plan, results from Board direction to develop a comprehensive environmental based response to urban growth pressures. The draft plan itself is the merger of active citizen discussion regarding growth with the Coalition for the Sonoran Desert Protection Plan and others, along with integration of a number of past and present County activities that are natural resource protection oriented.

Development of this plan has been in response to the policies and visions stated by the Board in discussing urban growth issues in Pima County and the need to balance economic, environmental, and human interest.

The report is being transmitted for your initial review and comment before being finalized. In this memorandum I will have a number of recommendations regarding further actions requiring Board direction.

Indicators of Need to Act

As identified in the attached report, Pima County's population has increased dramatically and is expected to reach 1.2 million by the year 2020, as compared to the 800,000 people who live in Pima County today. Distributing this population by jurisdiction, the unincorporated area is expected to increase 65 percent over its present population. Given present housing trends and to accommodate increased regional population, the urbanized area will increase by approximately 160 square miles, which is roughly equal to the present size of the City of Tucson.

Given that today only 18 percent of the land in the State of Arizona is private, one could think that we will soon run out of land to urbanize in Arizona. However, if you look at where rapid urban growth is occurring, such as Eastern Pima County, 31 percent of the land is now privately held and 33 percent is State Trust land. Therefore, 64 percent of the land area in Eastern Pima County is or can be developed. The large availability of land that can be developed, as well as rapid population growth, make action on natural resource protection, preservation, and conservation essential now.

Merging Past, Present and Future Actions

The draft Sonoran Desert Conservation Plan identifies six elements, all integrated to comprise one single natural resource protection plan for Pima County. While this is the first time that we have articulated how these elements combine to form one plan, past Pima County actions have pursued independently and often at different paces, implementation of all plan elements. In fact, enumerated in the plan report is the fact that over $48 million of the May 1997 bond issue is dedicated to implementing various projects within one or more elements of the plan. In addition, successfully completing our Federal legislative agenda will secure almost $55 million in Federal funding. Also, the County's own land use regulatory action, through development of the Starr Pass Environmental Enhancement Fee, has provided an additional $18 million for Tucson Mountain Park expansion. In the near future we may have the opportunity to secure another $40 million to $60 million of funding if Proposition 303 is approved at the November general election.

Full implementation of the Sonoran Desert Conservation Plan as outlined in the attached report will take significantly more funding than is now available. It will also take time. However, it must be remembered that when some of the very first past accomplishments of this plan were undertaken in 1987 by helping conserve the Empire and Cienega ranches, none of the previously discussed funding was available.

Compatibility with Comprehensive Plan Update

The Comprehensive Plan adopted by Pima County in 1992 was scheduled for a major update in 1997. Due to issues primarily related to the incorporation of new cities and towns, this update was postponed. Given the ongoing litigation both in State and Federal courts, it is likely that the issue of incorporation may not be solved for another two years. Therefore, the Board may wish to consider advancing an update of the Comprehensive Plan for next fiscal year. In the meantime, the Sonoran Desert Conservation Plan as outlined herein forms the basis of a natural and cultural resources element of the Comprehensive Plan. With the simple addition of air and water elements, the Sonoran Desert Conservation Plan becomes the environmental element of the Comprehensive Plan. By advancing the environmental element of the Comprehensive Plan update, the long-term urban form of Pima County begins to solidify, something that has not been well-defined to date.

Endangered Species Act Compliance

One of the fundamental duties of government is to protect those who cannot protect themselves. This concept applies to our more vulnerable human population but also applies to enforcement of the Endangered Species Act.

In the 19 months that have passed since the United States Fish and Wildlife Service listed the Cactus Ferruginous Pygmy Owl as endangered, we have seen growing conflict related to land use decisions, but a shortage of community-defined solutions. Three realities must be acknowledged in order to move toward the formulation of meaningful solutions. First, the problems associated with the pygmy owl listing are enormous from an environmental perspective; second, the listing has serious economic implications; and third, the ethical decisions before the community as it balances environmental values with economic values and the health and safety needs of residents will be difficult and will require a new level of commitment to demonstrating respect for diverse interests.

Most elements of this draft plan involve preservation of natural habitat that is important for endangered species survival. However, the elements of biological corridors and sensitive and critical habitats directly relate to endangered species protection.

A preliminary work plan for interim and long-term endangered species and habitat protection has been created with the assistance of members of the environmental community, individuals who have voiced concerns over protection of private property rights, representatives of the business community, and other interested parties.

The work plan will open the door to the broad formal public process necessary to undertake regional endangered species planning and program implementation with Federal natural resource agency partners. Perhaps more importantly, it will enable the local community to accept responsibility for our endangered species compliance obligations and adopt a proactive role in defining balanced and rational solutions. To date, community options have been defined primarily by conflict and a winner-take-all approach. Now the Board can reverse this trend by establishing a process that will frame the choices available to the community in terms of consensus-building and an approach that honors multiple obligations. Through this process, we will have greater opportunity to protect the pygmy owl, achieve lasting conservation goals on an ecosystem and multi-species level, and foster acceptance of, and pride in, environmental values that can be upheld across the community.

Recommendations

Recommendations are broken down into three categories: first, recommendations that require general review and comment that could take place over a period of time; second, recommendations on actions the Board may wish to take in the near term providing policy direction; and third, actions that should be taken to demonstrate the County's commitment to compromise and to comply with the Endangered Species Act.

Review and Comment Recommendations

1. It is requested the Board review and comment on the six elements of the draft Sonoran Desert Conservation Plan. Appropriate direction would include Board priorities regarding the elements and specific present and future projects identified in each element within the plan.

2. Where the elements identify specific geographic boundaries, such as in riparian corridor protection or mountain parks, the Board should provide direction regarding the adequacy of the boundaries identified by staff.

3. The Board should provide direction regarding what type of jurisdictional and/or regional review and comment is desired on the draft plan.

Policy Recommendations

4. Given the significant amount of State Trust land identified for conservation and preservation (103,000 acres), the Board should direct staff to file Arizona Preserve Initiative applications on the State lands identified within riparian protection corridors and mountain parks. State lands within these same areas would also be priority acquisitions should Proposition 303 be successful in the November general election.

5. The Board should review the Land Use Policy modifications suggested on pages 31, 32 and 33 of the draft plan and provide direction to staff on implementation.

Action Recommendations

6. Direct staff to initiate an appropriate Truth in Bonding Ordinance amendment that would delete the Arthur Pack Regional Park location for the Northwest YMCA and Community Center as it has been determined that natural habitat preservation in Arthur Pack Regional Park may be essential for the Cactus Ferruginous Pygmy Owl.

7. Authorize the County Administrator to communicate with the Chancellor of Pima Community College to indicate that the alternative that would locate a northwest Pima Community College campus at Arthur Pack Regional Park should be withdrawn from further consideration.

8. In light of significant human safety issues, notify the United States Fish and Wildlife Service of the County's intent to proceed with transportation improvements on Thornydale Road from Ina to Linda Vista, and seek appropriate review and comment from the United States Fish and Wildlife Service and other interested parties regarding impacts and mitigation measures that can be taken to reduce potential disturbance and the loss of habitat that may be associated with roadway widening. Important human safety issues make this project unlike the decision related to the Northwest YMCA and Pima Community College use of Arthur Pack Regional Park.

9. Pursue a cooperative agreement to enter into a federally recognized planning process that will establish a public process open to stakeholders, expedite development of a scope of work, and allow work to begin on a biological assessment for the interim and long-term multi-species habitat conservation plan.

10. Advertise in a newspaper of general circulation within the County that Pima County is interested in receiving letters of interest from those who would like to participate in a steering committee related to development of a multi-species habitat conservation plan. All Federal and State land managers in the region will be invited to participate in the steering committee. The letters of interest received from the public, along with recommendations related to the structure and function of the steering committee, will be forwarded to the Board for review and approval.

11. Invite the Native American Tribes within Pima County and all cities and towns to join in the previously referenced cooperative agreement and provide support and funding for developing the interim, as well as long-term, conservation plan for threatened or endangered species.

12. Actively pursue a scientific study funding request that had previously been made to the Department of the Interior.

CHH/jj

Attachment

MEMORANDUM

Date: January 19, 1999

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

From: C.H. Huckelberry
County Administrator

Re: Correspondence Received in Response to the Draft *Sonoran Desert Conservation Plan*

The attached correspondence was received by my office in response to the draft *Sonoran Desert Conservation* concept document during the comment period which lasted nearly twelve weeks (October 27, 1998 to January 15, 1999).

A total of 170 letters or documents were received. An estimated 59 non-governmental organizations or individuals have expressed an interest in participating in developing the plan. The 59 parties reflect constituencies as diverse as the conservation community, neighborhood groups, ranchers, miners, landowners, private property advocates, developers, home builders, the real estate industry, and water interests.

Legislative action and other communication indicates that the Tohono O'Odham Legislative Council supports the County's effort. Likewise, eight federal entities,[1] four state departments,[2] and a number of local incorporated areas have expressed willingness (either informally or in writing) to work with Pima County. With the exception of letters from the McGee Ranch community, there is only one letter that wholly rejects the *Sonoran Desert Conservation* concept. Initial concerns from certain neighborhoods and some members of the ranch community have been addressed in meetings and will continue to be addressed through the planning process itself.

I am currently drafting a report for the Board's January 26, 1999 meeting which provides a summary and analysis of the detailed responses from the community, recommends the formation of a Steering Committee, and makes recommendations about measures that the Board might consider to protect the pygmy-owl while the long term conservation plan is being developed. The attached documents are presented in the order they were received.

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[1] (1) United States Department of Agriculture, Forest Service, Coronado National Forest; (2) Department of Defense, United States Air Force, Ranges and Airspace Division; (3) United States Department of the Interior, Bureau of Land Management; (4) United States Department of the Interior, Bureau of Reclamation; (5) United States Department of the Interior, Office of the Secretary; (6) United States Department of the Interior, National Parks Service; (7) United States Department of the Interior, U.S. Fish and Wildlife Service; and (8) United States Geological Survey.

[2] (1) Arizona Department of Environmental Quality; (2) Arizona Department of Water Resources; (3) Arizona Game and Fish Department; and (4) Arizona State Land Department.

Chronology of All Correspondence

October 29, 1998
1. Alan Lurie, Executive Vice President, Southern Arizona Home Builders Association

November 2, 1998
2. Mary Darling, Darling Environmental & Surveying

November 9, 1998
3. Jonathan DuHamel, President, Tucson Chapter of People for the USA!

November 10, 1998
4. Joe Parsons, President, Parsons Ranches

November 12, 1998
5. Town Council of Sahuarita
6. Ellen Barnes

November 14, 1998
7. Kenn Schultz

November 16, 1998
8. Michael Zimet, Founder, Pima County Private Property Rights Association

November 17, 1998
9. Luther Propst, Executive Director, Sonoran Institute
10. Ed and Margaret Bieber, Green Valley residents
11. Mark Miller

November 18, 1998
12. Chuck Sweet, Town Manager, Town of Oro Valley

November 19, 1998
13. Michael Winn, President, Ecological Restoration and Management Associates

November 20, 1998
14. David Nix, University Attorney, University of Arizona
15. Aurelia Acton
16. Jeanie Marion

November 22, 1998
17. Graham Barton

November 23, 1998

18. John Bordenave, Enchanted Hills Neighborhood Association
19. Brian and Karen Metcalf
20. Lan Lester, Town of Tortolita

November 24, 1998

21. John McGee, Forest Supervisor, Coronado National Forest
22. Patricia Richardson, Vice President, Tucson Association of Realtors
23. David Hogan, Southwest Center for Biological Diversity
24. Lawrence Aldrich, President, Southern Arizona Leadership Council

November 25, 1998

25. Jud Richardson, President, Green Valley Coordinating Council

November 27, 1998

26. John Menke, President, Saguaro Forest Associates

November 29, 1998

27. Jan Gingold, President, Pima Trails Association
28. Andra Ewton, Defenders of Wildlife
29. Rob Kulakofsky, Center for Wildlife Connections

November 30, 1998

30. Ren Lohoefner, Department of the Interior, United States Fish and Wildlife Service
31. David Walker, Habitat Branch Chief, Arizona Game and Fish Department
32. Christina McVie, Desert Watch
33. Doug McVie, Desert Watch
34. Barbara Rose, Northern Tucson Mountains Resource Conservation/Education Project
35. Glenda and Robert Zahner
36. John Pimental

December 1, 1998

37. David Mehl, President, Cottonwood Properties
38. Robert Smith

December 3, 1998

39. William Hallihan, Vice President, Cottonwood Properties
40. Tim Blowers

December 4, 1998

41. Neale Allen, Mountainview Homeowners Association

December 6, 1998

42. Jeanne Rosengren, Tucson Mountain Park area

December 7, 1998
43. Jim Shiner
44. Bill Arnold

December 8, 1998
45. City of Tucson Staff Review
46. Bob Deming, Mary Kidwell

December 9, 1998
47. Lora Awtrey, McGee Ranch, Sierrita Mountains
48. Janette Awtrey, McGee Ranch, Sierrita Mountains
49. Bruce Gungle, Tucson Mountains Association

December 10, 1998
50. Tim Terrill, Metropolitan Pima Alliance
51. Cassandra Martinez, McGee Ranch, Sierrita Mountains

December 12, 1998
52. Donald and Carolyn Honnas, Honnas Land and Cattle

December 14, 1998
53. Patricia Awtrey, McGee Ranch, Sierrita Mountains
54. Frances Werner
55. Robyn and Lois Benson, Lou Benson Construction Company
56. Laurence Marc Berlin

December 15, 1998
57. Rodger Schlickeisen, Defenders of Wildlife

December 16, 1998
58. Lynn Harris, Gary Fox, David Harris, Sierrita Mining and Ranching Company
59. Fred Depper, McGee Ranch, Sierrita Mountains

December 17, 1998
60. David Hogan, Southwest Center for Biological Diversity
61. Tim Terrill, Metropolitan Pima Alliance

December 18, 1998
62. Luther Propst, Sonoran Institute

December 21, 1998
63. Richard Rosen

December 22, 1998
64. Mike Hein, Town of Marana
65. Kate Hiller
66. Lynn Harris and Lucille Depper, McGee Ranch, Sierrita Mountains

December 23, 1998
67. Pima County Open Space Acquisition Review Committee

December 26, 1998
68. Buffers

December 27, 1998
69. Linda Griggs, Tucson Mountains Association
70. Marcy Tigerman, Tucson Mountains Association
71. Patricia DeWitt, Tucson Mountains Association
72. Gary Forbes, Tucson Mountains Association
73. Marcel and Olga Nuets, Tucson Mountains Association

December 28, 1998
74. Gary Fox, McGee Ranch, Sierrita Mountains
75. Dale Turner, Sky Island Alliance

December 29, 1998
76. L.G. and Barbara Wilson, Tucson Mountains Association
77. Village of Casas Adobes

December 30, 1998
78. Rincon Institute

January 3, 1999
79. Janette Awtrey, McGee Ranch, Sierrita Mountains

January 4, 1999
80. Tucson-Pima County Historical Commission
81. Arizona Department of Environmental Quality
82. Richard Daley, Executive Director, Desert Museum
83. John Martin, Tucson Mountains Association
84. Jill Rich, Tucson Mountains Association
85. Don Arkin and Sharon Emley, Tucson Mountains Association
86. Susan Zakin, Tucson Mountains Association
87. Thomas Wiewandt, Tucson Mountains Association
88. Mildred Kiteser, Tucson Mountains Association
89. Beverly Manfredonia, Tucson Mountains Association
90. Jill Littrell, Tucson Mountains Association

91. Jean Moore, Tucson Mountains Association
92. Ann Dursch, Tucson Mountains Association
93. Catherine Penny, Tucson Mountains Association

January 5, 1999

94. Erleen Martin, Tucson Mountains Association
95. Richard Genser
96. Richard D. Harris, McGee Ranch, Sierrita Mountain Coalition
97. Lynn Harris or Heather Fox, Sierrita Mining & Ranching
98. Lynn Harris, Sierrita Mining & Ranching
99. James Harris, McGee Ranch, Sierrita Mountains
100. Mary Ann Riley, c/o McGee Ranch, Sierrita Mountains
101. Betty Oryall, c/o McGee Ranch, Sierrita Mountains
102. Todd and Suzy Harris, McGee Ranch, Sierrita Mountains

January 6, 1999

103. Katharine Jacobs, Arizona Department of Water Resources
104. Dudley Fox, McGee Ranch, Sierrita Mountains
105. John Harris, McGee Ranch, Sierrita Mountains

January 7, 1999

106. Bruce Ellis, Diane Laush, United States Department of Interior, Bureau of Reclamation
107. Center for Wildlife Connections
108. Carl Davis, President, Silverbell Mountain Alliance

January 8, 1999

109. Tohono O'Odham Legislative Council, Resolution 99-011, Section 3.
110. Nancy Wall
111. Gay Lynn Goetzke

January 9, 1999

112. Neal and Karen Harris, McGee Ranch, Sierrita Mountains
113. Barbara McDewitt, c/o McGee Ranch, Sierrita Mountains
114. Patricia McGee Coughanour, McGee Ranch, Sierrita Mountains
115. Augusta Davis, Tucson Mountains Association

January 10, 1999

116. William Crosby, Director, Environmental & Cultural Conservation Organization
117. Bill Schnaufer, Navarro Ranch
118. Dan Beckel, President, Andrada Property Owners

January 11, 1999

119. City of Tucson, Mayor and City Council
120. Lois Kulakowski, Kathy Jacobs and Mark Myers, Tucson Regional Water Council

121. Natalie McGee, McGee Ranch, Sierrita Mountains
122. Mona Allen Wolters, McGee Ranch, Sierrita Mountains
123. Michael, Wolters, McGee Ranch, Sierrita Mountains
124. Larry Wolters, McGee Ranch, Sierrita Mountains
125. Carol Klamerus, President, Tucson Mountains Association
126. Holly Finstrom, Tucson Mountains Association
127. Jayne Kahle, Tucson Mountains Association

January 12, 1999

128. Jesse Juen, United States Department of the Interior, Bureau of Land Management
129. Dennis Wells, State Land Commissioner, Arizona State Land Department
130. Lisa Stage, Women for Sustainable Technologies
131. Lucy Vitale, Line by Line Editorial Services
132. Penelope Harris, McGee Ranch, Sierrita Mountains
133. Norman Harris, McGee Ranch, Sierrita Mountains
134. Donna McGee, McGee Ranch, Sierrita Mountains
135. Judy Ann Fox, McGee Ranch, Sierrita Mountains
136. Sheldon Fox, McGee Ranch, Sierrita Mountains
137. Les Harris, McGee Ranch, Sierrita Mountains
138. Jeremy Harris, McGee Ranch, Sierrita Mountains
139. Stephen Bacchus, McGee Ranch, Sierrita Mountains
140. Melissa Bacchus, McGee Ranch, Sierrita Mountains
141. Kathy McGee, McGee Ranch, Sierrita Mountains
142. Charles Bristow, McGee Ranch, Sierrita Mountains
143. Elizabeth Espinoza, c/o McGee Ranch, Sierrita Mountains
144. Sarah Baker, c/o McGee Ranch, Sierrita Mountains
145. Wendell Baker, c/o McGee Ranch, Sierrita Mountains
146. B. Vermeerech, c/o McGee Ranch, Sierrita Mountains
147. Judith Murphy, McGee Ranch, Sierrita Mountains
148. Carlene Peck, c/o McGee Ranch, Sierrita Mountains
149. Anne Davidson, c/o McGee Ranch, Sierrita Mountains
150. Eileen Bradford, c/o McGee Ranch, Sierrita Mountains
151. W.D. Matthews, c/o McGee Ranch, Sierrita Mountains
152. Southern Lago del Oro Community

January 13, 1999

153. Carolyn Campbell, Coalition for the Sonoran Desert Protection Plan
154. Carol Duffner and Joe Murray, Northwest Coalition for Responsible Development
155. Gene and Marvyl Wendt, Wrong Mountain Wildlife Preserve
156. Dee Kinsey and Carol Ehrlich
157. Sharon Conine (Medema-McGee), McGee Ranch, Sierrita Mountains
158. Ernest Burnham, McGee Ranch, Sierrita Mountains

January 14, 1999

159. Les Corey, The Nature Conservancy,
160. Vicki Cox Golder, Golder Ranch
161. Zephaniah Guy Kirkpatrick, Silverbell Mountain Alliance
162. Quinn Simpson, Center for Environmental Ethics

January 15, 1999

163. Franklin Walker, United States Department of the Interior, National Park Service
164. Alter Valley Conservation Alliance: P.King, M.Miller, M. King, A.McGibbon, S. Chilton
165. George Bender, Cyprus Sierita Mining Company
166. Gerald Juliani, Pure Water Coalition
167. Arizona Game & Fish Department
168. Charles Award, Southern Lago del Oro Community
169. Southwest Network for Environmental and Economic Justice (Nogales)
170. Defenders of Wildlife

Chronology of Non-Governmental Applicants for the Steering Committee

1.	Alan Lurie	Southern Arizona Home Builders Association
2.	Mary Darling	Darling Environmental & Surveying
3.	Jonathan DuHamel	Tucson Chapter of People for the USA!
4.	Joe Parsons	Parsons Ranches
5.	Ellen Barnes	Landowner
6.	Michael Zimet	Pima County Private Property Rights Association
7.	Michael Winn	Ecological Restoration and Management Associates
8.	John Bordenave	Enchanted Hills Neighborhood Association
9.	Patricia Richardson	Tucson Association of Realtors
10.	David Hogan	Southwest Center for Biological Diversity
11.	[To be determined]	Southern Arizona Leadership Council
12.	Jud Richardson	Green Valley Coordinating Council
13.	John Menke	Saguaro Forest Associates
14.	Jan Johnson	Pima Trails Association
15.	Andra Ewton	Defenders of Wildlife
16.	Rob Kulakofsky	Center for Wildlife Connections
17.	Christina McVie	Desert Watch
18.	Doug McVie	Landowner
19.	Barbara Rose	N.Tucson Mnts Resource Conservation Project
20.	William Hallihan	Cottonwood Properties
21.	Tim Blowers	Developer / Landowner
22.	Neale Allen	Mountainview Homeowners Association
23.	Jim Shiner	Developer / Landowner
24.	Bill Arnold	Real Estate
25.	Bruce Gungle	Tucson Mountains Association
26.	Tim Terrill	Metropolitan Pima Alliance

27.	Donald/Carolyn Honnas	Honnas Land and Cattle
28.	Frances Werner	Landowner
29.	Robyn/Louis Benson	Lou Benson Construction Company
30.	Laurence Marc Berlin	Attorney / Private Property
31.	Luther Propst	Sonoran Institute
32.	Kate Hiller	Citizen's Alliance for Responsible Growth
33.	G. Hartmann/N.Young Wright	Buffers
34.	Dale Turner	Sky Island Alliance
35.	Richard Daley	Desert Museum
36.	John Martin	Landowner
37.	Richard Genser	Real Estate
38.	Richard D. Harris	McGee Ranch, Sierrita Mountain Coalition
39.	Lynn Harris or Heather Fox	Sierrita Mining & Ranching
40.	Carl Davis/ ZG Kirkpatrick	Silverbell Mountain Alliance
41.	Gay Lynn Goetzke	Property Rights
42.	William Crosby	Environmental & Cultural Conservation Organization
43.	Dan Beckel	Andrada Property Owners Association
44.	Mark Myers	Tucson Regional Water Council
45.	Lisa Stage	Women for Sustainable Technologies
46.	Lucy Vitale	Line by Line Editorial Services
47.	Carolyn Campbell	Coalition for the Sonoran Desert Protection Plan
48.	Carol Duffner/Joe Murray	Northwest Coalition for Responsible Development
49.	Les Corey	The Nature Conservancy
50.	Vicki Cox Golder	Real Estate / Golder Ranch
51.	Quinn Simpson	Center for Environmental Ethics
52.	Pat/ Macaela King	Anvil Ranch
53.	Mary Miller	Elkhorn Ranch
54.	Andrew McGibbon	Alter Valley Alliance
55.	Sue Chilton	Chilton Ranch
56.	George Bender	Cyprus Sierita Mining Company
57.	Gerald Juliani	Pure Water Coalition
58.	Charles Award	Southern Lago del Oro Community
59.	Teresa Leal	SW Network Environ / Economic Justice (Nogales)

Attachments

Board of Supervisors Memorandum

MARCH 2, 1999

REPORT ON PUBLIC COMMENT, UPDATE AND RECOMMENDATIONS ON THE DRAFT SONORAN DESERT CONSERVATION CONCEPT PLAN

I. Background

On October 27, 1998, the Board launched a major conservation planning effort -- the Sonoran Desert Conservation Plan -- that will: (1) define urban form and prevent urban sprawl through the protection of natural and cultural resources; (2) provide the basis of a natural resource protection and environmental element of the Comprehensive Plan; (3) lead to the recovery of the endangered cactus ferruginous pygmy-owl and stabilize the ecosystem and plant communities which support multiple species and thereby prevent future listings; and (4) lead to issuance of a Section 10 permit under the Endangered Species Act for a regional multi-species conservation plan that is one of the largest, if not the largest in the United States.

From October 1998 through mid-January of 1999, comments were submitted from the public about the draft Sonoran Desert Conservation document. This memorandum outlines and suggests amendments to the draft document based on public comments, and recommends adoption of a Concept Plan. After completion of a biological evaluation and economic analysis, a final Sonoran Desert Conservation Plan will be forwarded to the Board for consideration and final adoption

The Sonoran Desert Conservation effort will create a model of how the Endangered Species Act can realize its potential for the protection of multiple species, and at the same time avoid the potential economic crisis and community disruption that a listing can cause. The Plan also is unique in that it honors the living in harmony with nature culture of Native American tribes, preserves the role of ranching families and protects historic landscapes. During the next eighteen months to two years, Pima County will focus on identifying and preserving six major categories of land areas which will form the natural resource component of Pima County's Comprehensive Plan:

- Ranch Conservation
- Historic and Cultural Preservation
- Riparian Restoration
- Mountain Park Expansion
- Establishment of Biological Corridors
- Critical and Sensitive Habitat Protection

One year ago the Board of Supervisors held its first study session on the topic of growth management. Since that time a number of important growth planning activities have occurred, not the least of which is our necessary compliance with the federal Endangered Species Act. Now Pima County is embarking on a conservation planning effort that potentially includes a land base that is ten times the size of the San Diego Multi-Species Conservation Program, which is considered to be the most complex permitted conservation plan in the United States. Though it will take time to develop and finalize, the Sonoran Desert Conservation Plan initiated by the Board holds a great deal of promise for the long term stability of the cultural, economic and natural resources of our region.

II. Summary of Public Responses

General Response: Over the course of a three month comment period, 183 letters were submitted on the draft Sonoran Desert Conservation concept document. With the exception of letters from the McGee Ranch community, there was only one letter that wholly rejected the Sonoran Desert Conservation concept. A compilation of responses was transmitted to the Board in a memorandum dated January 19, 1999 and additional letters are attached.

Governmental Response: Legislative action and other communication indicates that the Tohono O'Odham Legislative Council supports the County's conservation effort. Nine federal entities, four state entities, and seven local governments have communicated a willingness to participate in developing a regional conservation plan. (See attached Report at page 4.)

Non-Governmental Response: Seventy-seven non-governmental organizations or individuals have specifically asked to have a role in developing the plan. (See attached Report at pages 23-24.) As I stated in the January 19, 1999 transmittal of letters, parties interested in working on the Sonoran Desert Conservation Plan reflect constituencies as diverse as the conservation community, neighborhood groups, ranchers, miners, landowners, private property advocates, developers, home builders, the real estate industry, and water interests. A rough approximation of interest group participation is that 28 (36%) of the candidates represent neighborhood and environmental groups; 24 (31%) represent the business, real estate, and development community; 10 (13%) represent landowners and private property advocates; 9 (12%) represent ranching and mining interests; and 6 (8%) represent consulting, water or other interests. (See attached Report at page 25.)

III. Summary of Comments which Suggest Amendments to Boundaries by Element

Pages 6-22 and 55-60 of the attached Report include a review of the comments submitted.

Ranch Conservation: The Ranch Conservation Element has developed into one of the most important aspects of the process in light of its direct link to the issues of (1) protecting endangered species and preserving critical habitat, (2) weighing the importance of long term use of State, Forest, and Bureau of Land Management lands from a regional and landscape perspective, and (3) realizing the role that ranch lands play in preventing wildcat subdividing. The major boundary issue forwarded by ranch interests and the State Land Department is that the fate of private holdings by ranch families depends on the future of lease lands owned by state and federal entities. Decisions about private land are tied to the public use.

Cultural and Historic Preservation: State, federal and non-governmental entities suggested the addition of projects, including Esmond Station, Kentucky Camp, Robles Ranch, Romero Ruin and an archeological site on the northwest side of the Sierrita Mountains.

Riparian Restoration: Riparian projects that were emphasized in the text of comment letters include protection of Brawley Wash, the Canada Del Oro recharge project, Rincon Creek, the Santa Cruz River corridor, and Tanque Verde Creek.

Mountain Park Element: The mountain park designation generated concern from two communities: Southern Lago Del Oro and the Sierrita Mountain / McGee Ranch community. In contrast, there were requests to include a new mountain park for the Ragged Top and Silverbell Mountains, expand the Colossal Cave and Empire areas, and protect the Waterman-Roskruge area. The Tortolita Mountain Park proposal generated both letters which requested its expansion and letters requesting removal of lands from the proposed park.

Biological Corridor and Critical Habitat Elements: Corridors extending from Saguaro National Park, the Tortolita Mountains, the Tucson Mountains, and other areas were identified for inclusion, along with critical habitat which serves as the nest site or dispersal routes for pygmy-owls. One comment suggested that : "The draft Plan does a relatively good job of proposing land conservation around the County's perimeter, but completely ignores areas closer to the City limits. ... We think key parcels should be targeted for purchase and the regulatory mechanisms should be carefully considered." (Buffers)

The Buffers comment raises an important point. A number of properties in the urban area have been bypassed from development. To the extent possible, these areas should be considered for preservation, particularly when the properties can be interconnected to form linkage from the larger open areas within eastern Pima County into urbanized Tucson. An appropriate cost-benefit analysis should be performed to evaluate the benefits of converting these urban desert spaces into infill development.

IV. Adoption of Concept Document

While the final Plan is being developed, I will recommend adoption of the Sonoran Desert Conservation Plan in concept to establish a framework for more detailed planning by:

1) Incorporating 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;

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

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

4) Changing the name of the proposed Sierrita Mountain Park to the Sierrita Ranch Conservation Area and removing the proposal of "mountain park" as applied to Southern Lago Del Oro, but working with the Southern Lago Del Oro community to achieve conservation goals;

5) Adding Silverbell Mountain Park which includes Ragged Top and Silverbell Mountains;

6) Considering urban desert corridors.

V. Steering Committee

On December 1, 1998, the Board accepted a structure for the planning process which created a Steering Committee, Technical Advisory Teams, and a Project Management Team. The Project Management Team (made up 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 (made up 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 Board previously directed staff to return at the close of the comment period with letters of interest and recommendations for seating the Steering Committee. Seventy-seven non-governmental entities and over 20 government entities have expressed interest in developing the Sonoran Desert Conservation Plan. (See attached Report at pages 4 and 23.)

Several factors arise in considering the formation of a Steering Committee, including that the success of the process depends on its inclusiveness. Each of the parties feels strongly that he or she has an interest to protect and promote in the conservation planning process and would probably view exclusion at this stage as an attempt to limit public participation. At the same time, there is a great deal of knowledge that should be acquired by any advisory panel member who will ultimately make a recommendation on a preferred preserve alternative based on its conservation value and in light of the community's fiscal capacity. While the process of obtaining sufficient planning funds is taking place, Steering Committee members should use this time period to begin meeting at least two times each month over the next three months to acquire knowledge in a variety of subject areas, including:

1) The requirements of both the Endangered Species Act and private property law;

2) The status and baseline requirements of the cactus ferruginous pygmy-owl;

3) The trends in conservation practices, the policy direction of multi-species planning processes, and the actual nuts-and-bolts of how such a plan is drafted;

4) Knowledge of population and community demographic trends;

5) The requirements of other relevant laws, including the National Environmental Policy Act (NEPA), National Historic Preservation Act, Taylor Grazing Act, State and School Lands law, Growing Smarter legislation; mining, multiple use, and water laws;

6) An understanding of the role of ranching within the region and its integration with conservation and open space;

7) An understanding of land ownership, land use practices, and comprehensive plans now in place across the region;

8) An understanding of the location and significance of cultural and historic sites;

9) Knowledge of trends in natural resource consumption which might create population growth constraints;

10) The vegetation communities and habitat associations within Pima County;

11) The status and baseline requirements of species included within the Plan;

12) Familiarity with the cost of land, the costs associated with growth and development, and the costs of conservation program implementation.

A working knowledge of all these areas will be essential if the Committee members are to make a credible recommendation on a regional conservation program that will impact land use planning and development for decades into the future. These sessions will bring the entire group up to the same place in their knowledge of various aspects of multi-species conservation planning as described above, and prepare the Steering Committee for their most important role in recommending a preserve design to the Board in the future. The business of the Steering Committee, including updates on the work of the Technical Advisory Teams, will be presented during public meetings that precede workshops and seminars.

Recommendation to Begin Steering Committee Work: I will recommend that the Board direct staff to invite interested government entities and each of the non-governmental organizations and individuals who have submitted letters to become members of the Steering Committee contingent upon their willingness to begin attending a twice per month series of educational seminars and workshops. Everyone expressing an interest will be invited to participate. Within six months, I will 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.

VI. Issues of Potential Liability under the Endangered Species Act

Two important federal decisions are pending which might provide assistance to Pima County in assessing and taking action to avoid liability under the Endangered Species Act. This section summarizes pages 27-37 of the attached Report, which provides a brief update on federal proposed pygmy-owl landowner guidance and survey protocol and the proposed critical habitat designation. It also provides an assessment of Pima County's capital improvement projects in light of these issues.

Survey Guidance: In August of 1998 the United States Fish and Wildlife Service and the Arizona Game and Fish Department jointly announced new guidance for determining if "take" of a cactus ferruginous pygmy-owl has occurred and new survey protocol for the pygmy-owl.

The comment period for this proposed guidance closes in mid-March of 1999. If a new survey standard is adopted, implementation would likely occur in January of 2000. The proposed survey protocol essentially changes the number of surveys from one to six, and the newly proposed surveys would have to be conducted in two different breeding seasons.

Critical Habitat: In December of 1998, the Service published proposed rules for designating critical habitat for the pygmy-owl. In June of 1999, the Service will determine whether to designate critical habitat. Under the proposed rules, federal projects within the critical habitat area are evaluated by the Service.

Application to Pima County: As long as Pima County lacks a Section 10 permit, it is subject to potential liability for "take" (harm, harass, significantly alter habitat etc) under Section 9 of the Endangered Species Act. That is the most important rule to keep in mind, and when properly understood, Section 9 creates a great desire on the part of the landowner for reliable advice. The survey guidance is intended to provide such advice.

Policy Proposal: As Pima County awaits the outcome of these processes, we not only lack protection from Section 9 liability (for our own projects, and potentially for projects permitted by the County), we lack unified agency advice. In the absence of a settled opinion, we have proceeded in a manner which has resulted in rational decision making and raised our confidence level about the impact of projects. This method might be improved and standardized to create a policy for County projects which includes:

1) Requiring projects that will significantly alter pygmy-owl habitat currently planned in areas identified as critical habitat to be included in and designed as part of the larger Sonoran Desert Conservation Plan, with exceptions for issues such as human safety forwarded to the Board for discussion and action;

2) Creating a check and balance method for other projects by:
(a) seeking professional surveys and assessments from an independent biologists;
(b) subjecting the results to peer review; and
(c) consulting with agency biologists;

3) Undertaking additional surveys for County projects in areas that are identified as sensitive but not critical; and

4) Forwarding survey data to the Arizona Game and Fish Department for research purposes and to inform the Sonoran Desert Conservation planning process.

The layers of expertise involved in this process ensure the best advice available is generated, the search effort is rigorous and calibrated to the sensitivity of the habitat, and the information benefits the community. We must set a positive example for the balance of the community by incorporating the best advice available into effective species protection policy. Our projects must comply in all respects to existing and proposed federal policy on Endangered Species protection.

VII. Reducing Liability and Facilitating Inter-governmental Cooperation with Incentive Provisions

Incentives for progressive interim actions will also be incorporated into the intergovernmental cooperative agreement that can now be finalized upon the close of the comment period. At least 20 jurisdictions or government entities have expressed interest in the planning process. The entities that have land use authority are subject to potential liability for "take" until permits are issued at the end of the study process.

To create incentives for land use decisions that facilitate protection of pygmy-owls and other species during the interim period, the cooperative agreement, which we can now pursue with the close of the comment period, will include a provision which will allow lands acquired or conserved by other means during the interim period to be credited toward meeting obligations to the regional multi-species conservation plan, if such conservation measures actually contribute to achieving the final Sonoran Desert Conservation Plan goals, particularly the recovery of the pygmy-owl. This provision will encourage creative solutions and alliances.

VIII. Reducing Liability and Facilitating Private Sector Cooperation with Incentive Provisions

Need for Incentives - One complaint about the Endangered Species Act is that it seeks to protect animals by placing burdens on landowners with valuable habitat, which creates ill will toward either the government entity carrying out the law, or the protected animal itself. There are mechanisms which can provide incentives, including programs which allow landowners to capture economic value for sensitive habitat, and agreements which can accelerate the resolution of compliance issues for governments. Mitigation banks, transfer and purchase of development rights, and conservation easements are examples of programs or methods within programs that can be used to return economic value for the conservation of land.

Mitigation banking, described in greater detail in the attached Report (pages 43-44), is defined as "privately or publicly owned land managed for its natural resource values. The bank owner sells habitat credits to parties who are required to compensate for environmental impacts of their activities or who wish to fund land conservation efforts. Developing a conservation bank establishes legal links between the owner of the bank and resource agencies." The value of credits is a factor of the market, and can be quite high.

Purchase or transfer of development rights programs are gaining popularity with ranch and agriculture land owners. The attached Report provides greater detail at page 45. In general, a landowner can sell or transfer land uses such as development rights to another party (such as a local government). This keeps the land affordable, the ranch use protected, and the open space or ecological value preserved. Ranch owners who rely on public land for grazing leases will also need a use commitment from the public entity so that foregoing development rights on the private land makes long term economic sense.

Pima County's Role: Pima County has an interest as part of the Sonoran Desert Conservation Plan to encourage small scale preserves that result from mitigation banking and sale of development rights which then fit into the larger ecologically viable preserve design.

IX. Summary of Public Comments on Land Use Policy

The attached Report includes a more detailed compilation of comments submitted for a number of proposed land use policies. These are found in the Appendix at pages 61-63, and include:

No Upzoning in Environmentally Sensitive or Historic Areas - Five comment letters supported the notion of limiting upzoning in environmentally sensitive lands.

Create an Environmentally Compatible Standard for Rezoning Time Extensions - One local government and one non-governmental entity supported this concept.

Comprehensive Plan Amendments to Resource Conservation - Three comment letters described the need to undertake comprehensive planning along with conservation planning.

Transferable Development Rights - Three letters discussed the need for a transferable development rights program.

Infrastructure Investment Guidance - The Town of Marana expressed the need to recognize that in order to encourage appropriate growth, infrastructure must be made available in terms of sewer if we are to be successful and truly provide an integrated approach.

Environmental Enhancement Fee - One local government and two private citizens wrote in support of environmental enhancement fees.

Environmental Banking Authority - Land banking alternatives received support from the State Land Department.

X. Formation of Interim Environmental Land Use Policy

Based on the comments submitted and the need to deal effectively with endangered species issues in the interim planning period, I will recommend that the Board direct staff to draft policies for Board consideration which will apply during the planning period, including:

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;

4) An environmentally compatible standard for rezoning time extensions;

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

6) Revise and integrate grading and landscape standards into a unified policy proposal for Board consideration which encompasses recent changes to the Native Plant Preservation Ordinance, the hillside development and buffer overlay zones, and riparian habitat regulations, 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;

7) Adoption of 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;

8) Develop and propose transfer and purchase of development rights programs;

9) Develop and propose ranch, cultural and historic preservation zoning classifications; and

10) Develop and propose environmental land banking and mitigation banking programs.

XI. Funding

Intergovernmental Funding: In addition to facilitating interim actions, the cooperative agreement among governments will establish the goal of recovery, commit agencies to data and information sharing, and move toward a cost sharing agreement next fiscal year. The federal agency that could make contributions to the planning process this year is the U.S. Fish and Wildlife Service, through potential funding for pygmy-owl studies and staffing. Also, in its letter submitted during the comment period, Arizona Game and Fish has suggested that potential financial resources are available. Both the State and the United States Forest Service offered scientific data and information to support the County's efforts.

Federal Appropriation and Other Strategies - On October 27, 1998, the Board directed staff to actively pursue a scientific study funding request that had previously been made to the Department of the Interior. Progress has occurred in this regard through lobbying efforts which might result in a $3 to $5 million federal planning appropriation to Pima County. At the time such money becomes available, the County can request proposals for the larger regional conservation planning effort. We simply lack sufficient funds to undertake long term regional planning now. The original allocation of $300,000 will be useful in advancing the science of the pygmy-owl, and staff members have made steady progress in working with other agencies to establish the groundwork for the biological evaluation as envisioned by the Sonoran Desert Protection Plan. A much larger amount of money is required for the regional plan process, however.

In addition to the science studies, funding will cover the cost of assessing environmental impacts and drafting an environmental impact statement, carrying out the public notice and public participation requirements of the National Environmental Policy Act (NEPA), and conducting an economic analysis of the cost associated with conservation alternatives to evaluate the community's fiscal capacity to adopt a conservation plan and to understand the cost associated with various conservation alternatives.

If the effort to obtain federal planning funds does not succeed, Pima County will have to seek other sources of funding. Local governments in California and Nevada have implemented fee generated funding schemes, as described on page 54 of the attached report.

XII. Research

Progress on Multi-Species Planning - In the work plan accepted by the Board of Supervisors on October 27, 1998, there was discussion of the elements of a long term ecosystem based conservation planning process. The work plan expanded the original Sonoran Desert Protection Plan to include both a biological assessment and an economic impact assessment. The expanded plan now has (1) a larger planning area, (2) more partners, (3) expanded public process, (4) a more comprehensive approach, and (5) greater scientific oversight and peer review. Progress in each of these areas has been achieved during the three month comment period, and is described in the attached Report, pages 48-50.

Progress on Pygmy-Owl Research Efforts - In the work plan accepted by the Board of Supervisors on October 27, 1998, there was discussion of the interim research needs for the pygmy-owl. A number of specific pygmy-owl studies were identified, including (1) more extensive survey efforts, (2) habitat and telemetry studies, and (3) genetics studies. Progress in each of these areas has been achieved during the three month comment period, as described in pages 51-53 of the attached Report and summarized below.

(1) Regarding more extensive survey efforts:

The work plan accepted by the Board states that interim action is needed to initiate more comprehensive surveys which will further our knowledge of how many pygmy-owls there are and where they are located. Based on discussions with agency scientists and members of the pygmy-owl recovery team, there is a recommendation to pursue a comprehensive survey effort during the remainder of the breeding season (March - June), and have contracts in place so that surveys can begin in January of the next breeding season in order to compile the data necessary for both the Sonoran Desert Conservation Plan and the recovery team effort.

The recommendation for this survey season is to increase the survey effort by considering contracts with a cumulative expenditure ceiling of $100,000, or $140,000 through a cost-sharing agreement with U.S. Fish and Wildlife. Individual members of the science pygmy-owl recovery team have volunteered to make recommendations to the County Administrator on contracts after reviewing proposals. The survey effort would be closely coordinated with telemetry, habitat assessment, and genetics work described below.

(2) Regarding habitat and telemetry studies:

The work plan accepted by the Board states that interim action is needed to undertake telemetry studies and habitat assessments which will provide information necessary to tailoring recovery and conservation plans to protect the owl and the economy.

Based on discussions with agency scientists and members of the pygmy-owl recovery team, there is a recommendation to pursue a contract with the Tucson Office of the Arizona Game and Fish Department to conduct habitat assessments and telemetry work. Mr. Scott Richardson has conducted this work to date and as the leading expert on the Arizona population of pygmy-owls, he is uniquely able to carry out such an assignment in the short term. The telemetry and habitat assessment effort would be closely coordinated with survey and genetics work. Results would be available to the science teams of both the Sonoran Desert Conservation Plan and the Recovery Team.

A contract ceiling of $60,000 is recommended to cover the entire cost (travel, labor and equipment) of at least 10 telemetry studies, cooperative efforts with the genetics and survey work, and a habitat assessment which builds on the results of the 1998 study.

(3) Regarding genetics studies:

The work plan accepted by the Board states that interim action is needed to undertake genetic research. Based on discussions with agency scientists and members of the pygmy-owl recovery team, there is a recommendation to pursue a contract with Mr. Glenn Proudfoot from the University of Texas A&M. Mr. Proudfoot has submitted a proposal for genetics work, and as the foremost pygmy-owl genetics expert in the United States, he is uniquely qualified to conduct pygmy-owl genetics studies.

These studies of DNA sequence data 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:

- Are Arizona pygmy-owls lacking genetic variation relative to healthy populations?
- Are populations genetically differentiated from each other?

Results would be peer reviewed, submitted for publication in scientific literature, deposited in the national GenBank, and available to the science teams of both the Sonoran Desert Conservation Plan and the Recovery Team. The estimated time of completion is March 2000.

A contract ceiling of $37,000 is recommended 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.

XIII. Recommendations

I recommend that the Board approve the following actions:

1) Adopt Concept Document: While the final Plan is being developed, I recommend adoption of the Sonoran Desert Conservation Plan in concept to establish a framework for more detailed planning by:

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

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

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

e) Adding Silverbell Mountain Park which includes Ragged Top and Silverbell Mountains;

f) Considering urban desert corridors.

2) Begin Steering Committee Work: I recommend that the Board direct staff to invite interested government entities and each of the non-governmental organizations and individuals who have submitted letters to become members of the Steering Committee contingent upon their willingness to begin attending a twice per month series of educational seminars and workshops. Within six months, I will 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 at that time.

3) Draft Survey Policy Proposal for County Projects: I recommend that the Board direct staff to draft a survey protocol policy for County projects which includes:

a) Requiring projects that will significantly alter pygmy-owl habitat currently planned in areas identified as critical habitat to be included in and designed as part of the larger Sonoran Desert Conservation Plan, with exceptions for issues such as human safety forwarded to the Board for discussion and action;

b) Creating a check and balance method for other projects by: (1) seeking professional surveys and assessments from an independent biologists; (2) subjecting the results to peer review; and (3) consulting with agency biologists;

c) Undertaking additional surveys for County projects in areas that are identified as sensitive but not critical, and

d) Forwarding survey data to the Arizona Game and Fish Department for research purposes and to inform the Sonoran Desert Conservation planning process.

4) Draft Interim Environmental Land Use Policy: Based on the comments submitted and the need to deal effectively with endangered species issues in the interim planning period, I recommend that the Board direct staff to draft policies for Board consideration which will apply during the planning period, including:

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;

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) Adoption of 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;

h) Develop and propose transfer and purchase of development rights programs;

I) Develop and propose ranch, cultural and historic preservation zoning classifications; and

j) Develop and propose environmental land banking and mitigation banking programs.

5) Initiate Comprehensive Planning Process: Direct staff to return to the Board within 60 days with a strategy to integrate the actions of the Sonoran Desert Conservation Concept Plan with the Pima County Comprehensive Plan so that such a plan includes elements that accommodate conservation, equity and fairness considerations, and population growth.

6) Initiate a Pygmy-Owl Study Series: In the work plan accepted by the Board of Supervisors on October 27, 1998, there was discussion of the interim research needs for the pygmy-owl. I recommend that in the remaining months of this pygmy-owl survey season, Pima County should use a portion of the $300,000 budgeted for conservation planning to pursue three types of studies:

a) Contract for Pygmy-owl Surveys: The recommendation for this survey season is to undertake a survey effort by considering more than one contract with a cumulative expenditure ceiling not to exceed $100,000, or $140,000 through a cost-sharing agreement with U.S. Fish and Wildlife (with $40,000 from the Service).

b) Contract for Telemetry and Habitat Assessments: Based on discussions with agency scientists and members of the pygmy-owl recovery team, there is a recommendation to pursue a contract with the Tucson Office of the Arizona Game and Fish Department to conduct habitat assessments and telemetry work. A contract ceiling of $60,000 is recommended to cover the entire cost (travel, labor and equipment) of telemetry studies, cooperative efforts with the genetics and survey work, and a habitat assessment.

c) Contract for Genetics Studies: Based on discussions with agency scientists and members of the pygmy-owl recovery team, there is a recommendation to pursue a contract with Mr. Glenn Proudfoot from 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 is recommended 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.

Respectfully submitted,

C. Huckelberry

C.H. Huckelberry
County Administrator

(February 18, 1999)

Attachment

MEMORANDUM

Date: June 29, 1999

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

From: C.H. Huckelberry
County Administrator

Re: **Comparison of Pima County Expenditures per Capita to Other County and City Governments**

Each year as the budget is discussed, the inevitable question is asked as to whether or not the County could reduce expenditures and hence reduce tax revenues needed to support governmental services. These questions are often asked in conjunction with phrases like "cut the fat out of government," or "we need to economize and become more efficient." No one will disagree that we need to maximize efficiency and provide as much service as possible at the least cost. The difficulty is always finding a comparative standard. I recently transmitted to the Board two such measures of comparative standards. With this memorandum I will transmit a third, more comprehensive review of over 100 city or county budgets. Many of these governmental entities have service populations in the general order of magnitude similar to ours, and some have experienced similar trends in population growth.

Exact comparisons are difficult because counties will provide different types and levels of service. For example, Pima County is the only county in Arizona that provides regional wastewater services. Also, only one other county (Maricopa County) in Arizona has a health care delivery system.

However, general per capita expenditures are a relative measure of county services provided, particularly when the data set is large. Therefore, if Pima County's per capita expenditures were significantly above the average of all other counties, one could conclude that perhaps there is room to economize, become more efficient, and reduce per capita expenditures. In Pima County the opposite is true. Of over 100 local governments reviewed, the Pima County per capita expenditure is on the low side. The average expenditure per capita for all counties in the study group was $1,157. The Pima County budgeted per capita expenditure in the study year, fiscal year 1997/98, was $856, or 35 percent lower than the average. Counties within the study that have populations ranging from 750,000 to 850,000 tend to have budgets ranging from $1.1 billion to $1.8 billion, approximately twice the Pima County budget in 1997/98.

Few large counties in the country have experienced a population growth similar to Pima County; however, counties in California and Florida, as well as Clark County, Nevada (Las Vegas), have experienced similar population growth and, hence, growth in governmental service demand. Of the similar size or larger California counties in the study group, they averaged 33 percent more ($1,141) in average per capita expenditures than Pima County. Florida counties, regardless of population size, averaged 63 percent more ($1,399) in average per capita expenditures, but large or similar size Florida counties spend over twice the rate of Pima County on a per capita basis, averaging $1,763 per capita. Clark County, Nevada spent $2,139 per capita, 2.5 times that of Pima County. Attachment A is a comparison of Pima County to 70 other counties of expenditure per capita for fiscal year 1997/98. Attachment B is a combined city/county expenditure per capita comparison of 100 other cities and counties ranked by per capita expenditure from lowest to highest.

In summary, while no analysis is foolproof, given the comparisons that have been made, Pima County's per capita expenditure is among the lowest of other high growth counties with a similar population base. The fact that the County's per capita expenditure is 35 percent below the average of counties studied would indicate that, in general, any expenditure reductions can only be made with a corresponding reduction in real services delivered.

CHH/jj

Attachments

MEMORANDUM

Date: January 31, 2000

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

From: C.H. Huckelberry
County Administrator

Re: *History of Land Use in Pima County*

I. Report

The attached draft entitled *History of Land Use in Pima County* is the sixteenth in the technical series of reports being prepared for the Sonoran Desert Conservation Plan, and one of several documents that will be prepared to describe land use, legal and fiscal considerations under the conservation plan. Divided into three parts, the report provides an overview of Pima County's (1) natural, constructed and administrative form makers, (2) the origins and implementation of planning and zoning legislation and regulations, and (3) a decade-by-decade review of some of the major land use decisions made within Pima County since the 1920s.

II. An Overview of Pima County's Form Makers

This section of the draft report discusses four form makers that have shaped Tucson and Pima County. Defining "form maker" to mean an influence on the settlement and growth patterns across the landscape, the text discusses the impact of natural, constructed and administrative form makers, including topography, watercourses, transportation routes and governmental lands. The discussion of transportation form makers shows the evolution of overland routes to railroads to highways. Descriptions of Territorial and State Trust Lands, the Tohono O'odham Nation, the Coronado National Forest, the Santa Rita Experimental Range, the Airport and the Air Force Base, and parks or other public land owned by the County, State and Federal entities are covered in the pages about governmental form makers. Also portrayed in this section are population growth rates and aerial photographic representations of the way housing has spilled across the landscape.

III. The Legislation of Planning and Zoning

The origins of Pima County's authority for planning and zoning is placed in the context of state legislation, which is described in relation to the early tenets of modern urban planning. San Francisco is identified as adopting the earliest American municipal land use ordinance in 1867, as the modern practice of planning brought together aesthetic and public health considerations to begin defining land and building standards that would uphold such values. Zoning was enabled for Arizona cities and towns in 1925, and about one quarter century later, in 1949, counties were allowed to initiate zoning ordinances. Amendments during the past 50 years to the County Planning and Zoning Act of 1949 are briefly described, including the changes that have allowed more land to be developed through unregulated lot splitting.

IV. The Practice of Land Use Planning In Eastern Pima County

The last section of the report, encompassing over fifty pages, provides a decade-by-decade review of land use decisions and attempts to plan for preservation and population growth. For example, City ordinances were established in the 1920s, with the ban on mortuaries in residential areas surviving a legal challenge and an appeal to the Arizona Supreme Court. In 1930 the City adopted a zoning ordinance.

During the 1940s, significant community discussion centered on planning issues as a team led by Ladislas Segoe published numerous reports on the physical and socio-economic characteristics of Tucson, covering topics as various as transit, schools, street cross sections, building codes, subdivision regulations, railroads, blighted areas, playgrounds, population and the economic base of Tucson.

A member of the Segoe team, Andre Faure, worked with local governments first through the City Planning and Zoning Commission created in 1941, to implement aspects of the Segoe reports. In 1943, he became the city-county planning director and worked with the County's Post-War Planning Committee, formed the same year. Passage of the 1949 County Planning and Zoning Act by the state legislature led to the creation of the Pima County Planning and Zoning Commission.

Further chronicled in sections of the attached report are the developments in Pima County's zoning regulations and land use decisions in the 1950s. These include the advent of master planning within the county, the rezoning of much of the Catalina Foothills from Suburban Ranch (SR) to one house per commercial acre (CR-1) and related master planning for community facilities in the late 1950s, and the introduction of subdivision plats and "bull's-eye zoning."

The report covers events during the 1960s such as the Rincon area planning process, the Vail-Posta Quemadea Area Master Plan, and regional planning initiatives. The 1960 City-County General Land Use Plan (GLUP) attempted to envision Tucson in the years 1975 and 2000. Among other conclusions about the region's future, the GLUP projected a population of 1.4 million at the turn of the century, with 300,000 people in Avra Valley, and suggested that Tucson could ultimately accommodate a population of more than 10 million people.

In the 1970s, amidst discussion of satellite communities and development of outlying ranch lands, the Eastern Pima County Comprehensive Plan was formulated. The report describes how an extensive empirical profile of the community was amassed, just as information had been collected during the Segoe planning process. Eight elements were developed, including population growth, environment, land use, human resources, housing, transportation, economic, and governmental. Projecting a population of 800,000 in the year 2000, the costs of "contained" development patterns were compared to costs for other development patterns. Policy recommendations made in 1975 for contained development patterns were not well received. The City revised the Comprehensive Plan and adopted it in 1979. A new regional plan was not adopted by the County until 1992.

V. Conclusion:

The attached report conveys the extent to which planning issues have occupied Tucson citizens during the last 75 years. Each decade sees an attempt to form a regional plan through either zoning, mapping, policy prescriptions, or combinations of these efforts.

While the early initiatives, and almost each effort since the 1920s, have demonstrated awareness of the natural and economic resource issues at stake, few plans have been implemented, and few implemented plans have been effective tools for guiding population growth in a rational manner that protects the resource base.

At times, we have grown faster than our ideas can be developed and implemented. At other times, we have been presented with recommendations that might have led to greater protection of fiscal and natural resources, but we have failed to fully grasp these opportunities.

The shortfall of infrastructure, the harm done to the tax base by poorly planned areas, and the natural resource dilemmas that are increasingly a part of our day-to-day lives, result from our 75 year track record of following population growth instead of guiding it.

Fortunately, the natural topographic and riparian form makers of the region still provide opportunities to mitigate and even reverse our resource losses. The Sonoran Desert Conservation Plan can serve as an exception to the planning efforts of the past century, but as the attached report makes clear, this will only happen if we are mindful of the difficult passage that plans must make to become a meaningful influence in defining urban form and protecting fiscal and natural resources.

Attachment

MEMORANDUM

Date: February 22, 2000

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

From: C.H. Huckelberry
County Administrator

Re: **Impact of Unregulated Development on the Pima County Tax Base, Service Demand and Future Infrastructure Liability**

Summary

Pima County has one of the highest property tax rates in the State. It is now apparent that a significant contributor to the high property tax rate is wildcat development. In fact, if wildcat development were eliminated, the tax rate could significantly decrease. This memorandum is intended to describe the fiscal tax base impact of the unregulated lot split issue. The *Fiscal Impact of Land Use* report, which will be forwarded to the Board in the near future, takes a more detailed look at wildcat development and other land use types, and further describes the cost of the unregulated land use to the tax base, and the price tag on bringing wildcat areas up to standard for the sake of health, safety, and long term fiscal viability.

Wildcat development creates a significant fiscal deficit for Pima County. Each section of land that accommodates population growth through the unregulated process fails to match regulated development by any measure of fiscal capacity, whether that is full cash value, revenue generated per acre for the tax base, or revenue paid on a per capita basis.

A single line of county service -- calls for the sheriff deputy -- is not covered by the taxes paid by residents of many sections of land developed through the wildcat method, and this service represents less than 20 percent of the property tax supported general fund expenditures of the County. Therefore, all other services required by the residents of wildcat development -- including expensive services such as healthcare and the justice system -- are further costs that simply are not covered by the contribution that unregulated land use makes to Pima County.

To compensate for this undervalued tax base, the tax rate is increased with regulated development subsidizing the cost of providing services to unregulated areas.

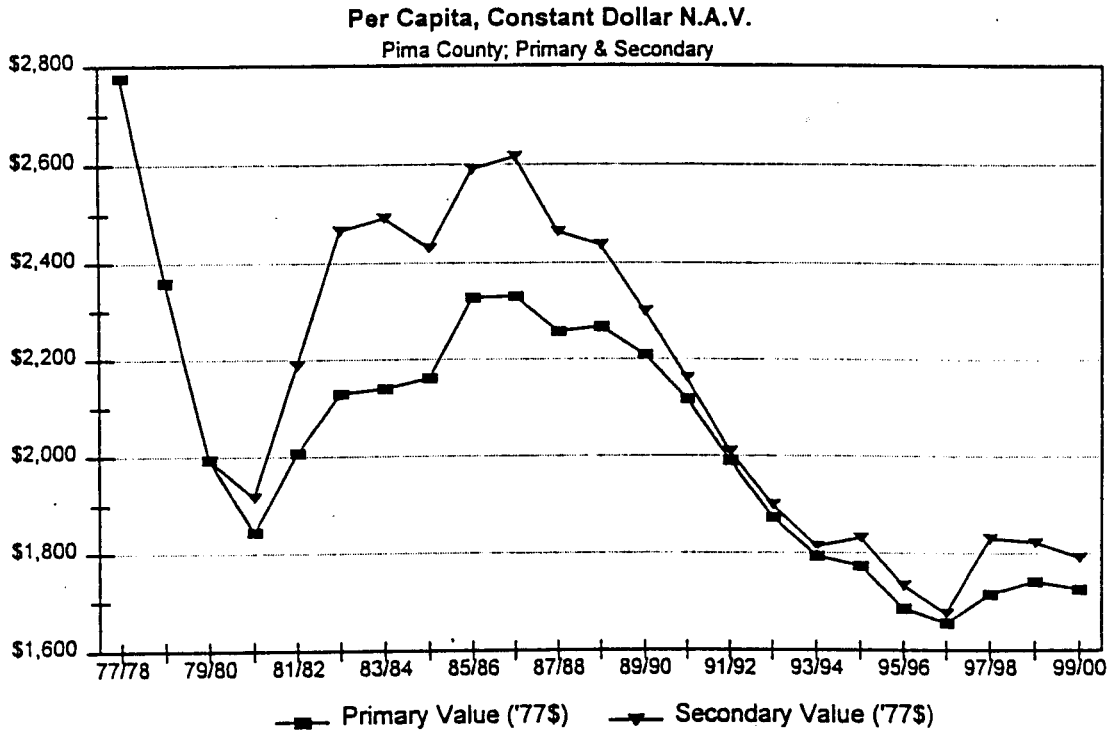
As the number of new lot split dwellings increases each year, and the constituent residents begin to request improved infrastructure and require it for health and safety purposes, the taxpayers will have to bear the cost to bring unregulated areas up to the minimum standards of regulated development. The problem of dealing with an accumulated infrastructure deficit of $35 to $55 million per year will be staggering.

I. Report

This memorandum provides a summary of one subject that is covered in a report that will be forwarded to the Board in the near future entitled *Fiscal Impact of Land Use in Pima County*.

The Pima County property tax base has declined substantially during the last quarter century when viewed on a per capita basis. The general fiscal trends show a decline in the revenue base.

For over ten years, there has been a fall in the per capita, constant dollar value of the tax base so that its ability to serve the current population with the same services has dropped. Since 1977-1978, there has been a 38 percent drop in the primary property tax value and a 36 percent drop in secondary value.



The question of whether this decline can be traced to types of land use development is one investigation in the *Fiscal Impact of Land Use* report. This memorandum briefly relates some of the disparities found between unregulated and regulated development types.

II. Regional Comparison of Value of Platted and Unplatted Land in Pima County

In 1998 a report entitled the *Wildcat Subdivision Study* found that an estimated 41 percent of development was occurring through the unregulated process. This trend is confirmed and continues, according to recent data. Mobile or manufactured homes in lot split areas rose from 756 in 1997 to 1728 in 1999. New single family homes rose from 303 in 1997 to 511 in 1999. Permit data since 1994 tends to confirm that a significant number of new dwellings are created each year in unregulated lot split areas: on the order of 1,525 to 2,300 per year in unincorporated Pima County. The map on the following page reflects the magnitude of the practice. Platted subdivisions are shown in red, but the parcel base surrounding land subdivided through the regulated process has been divided to a surprising degree through the unregulated process.

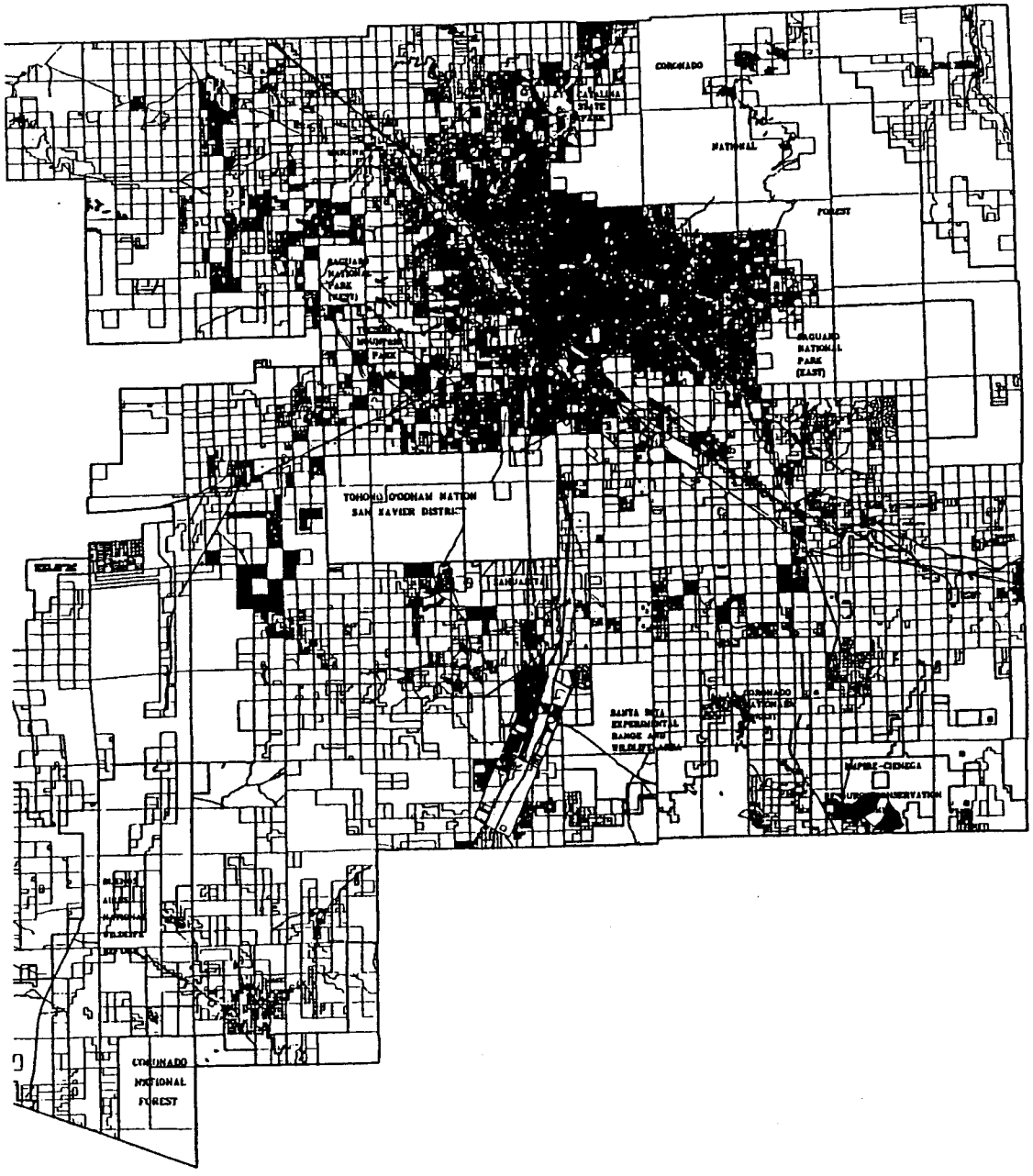
While the 1998 study reviewed twenty areas of the community, the current study looks at the entire parcel base which contains nearly 350,000 parcels. Within 16 areas that are urbanizing[1] and accommodating the population growth of the community, only 26 percent of the land has been platted. Whole communities, such as Arivaca, Catalina and Picture Rocks have accommodated all or most of their population growth through the unregulated process.

The 1998 study also measured and found disparities when comparing full cash value of unregulated land to the full cash value of land developed through the regulated process. These disparities were confirmed when analyzed at a broader scale in the current study. Within the urbanizing portions of Pima County, which contain the highest percentage of land that has been developed, the full cash value of an acre of land that has not gone through the regulated process is $14,839, while the full cash value of platted land in the urbanizing areas is $193,458, more than 13 times greater. Other comparisons of the value of platted and unplatted land from a regional perspective are found in the chart below.

REGIONAL COMPARISON OF VALUE OF PLATTED AND UNPLATTED LAND		
Land Unit within Pima County	**Unplatted -- Full Cash Value Per Acre**	**Platted -- Full Cash Value Per Acre**
All of Pima County (5,808,337 acres)	$1,515	$ 154,802
Eastern Pima County (2,443,144 acres)	$ 3,560	$ 159,011
Urbanizing Areas of Pima County (468,089 acres)	$14,839	$ 193,458

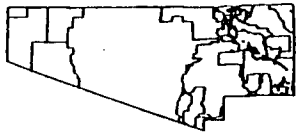
[1] Includes sixteen areas: Ajo, Arivaca, Casas Adobes, Catalina, Foothills, Green Valley, Marana, Oro Valley, Picture Rocks, Sahuarita, Santa Rita, South Tucson, South Valley, Tanque Verde, Tortolita, and Tucson. These areas comprise less than 10 percent of the land base of the County (468,089 acres) but pay almost 90% of the total property tax.

Platted Subdivisions in Eastern Pima County



- Platted Subdivisions
- Parcel Boundaries
- Administrative Boundaries

Pima County Index Map



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Scale 1: 150,000

TECHNICAL SERVICES

Pima County Technical Services
201 North Stone Avenue, 8th Floor
Tucson, Arizona 85701-1207
(520) 740-6318 • FAX (520) 740-3429
http://www.dot.co.pima.az.us

/Engineering/projects/county/archaeology/urban3.aml on Plotted 02/07/00

III. Full Cash Value, Revenue and County Expenditures -- Platted and Unplatted Land

At the community level, unregulated development has weakened the tax base contribution of vast tracts of land. Picture Rocks, for example, covers 44,775 acres, which is almost ten percent of the urbanizing areas of Pima County. However, residents of the Picture Rocks area paid just over $1 million dollars in total property taxes, which is less than one percent of the taxes paid by all residents in the urbanizing areas of the County. In general, when there is a higher percent of land that has been through the regulated process, there is a higher full cash value on an acre of land within the community. The chart below shows the relationship between land that has gone through the regulated process and the relative fiscal strength of that land on a (1) full cash value, (2) revenue per acre, and (3) revenue per capita basis. Additional columns are provided to show how unregulated land use tends to correlate to a lower than average contribution, and regulated land use to a higher contribution to the Pima County tax base, across these three measures.

SECTION LEVEL COMPARISON OF FULL CASH VALUE, REVENUE PER ACRE AND REVENUE PER CAPITA IN RELATION TO PLATTED AND UNPLATTED LAND (From highest to lowest full cash value per acre)					**AMOUNT ABOVE/ BELOW URBAN AVERAGE/ FULL C.V.**	**AMOUNT ABOVE/ BELOW URBAN AV REV/ ACRE**	**AMOUNT ABOVE/ BELOW COUNTY AVERAGE/ CAP EXP[1]**
Location of Study Site	**Reg / Unreg**	**Full Cash Value / acre**	**Revenue per acre**	**Estimated rev/ cap**	**+ / -- $61,250/a**	**+ / -- $410/ac**	**+ / -- $253/cap**
First Avenue	reg	$ 227,822	$ 1,313	$ 530	+$166572	+ $ 903	+ $ 277
River Road	reg	$ 111,789	$ 1,583	$ 765	+$50,539	+$1173	+ $ 512
La Canada	reg	$ 107,191	$ 612	$ 262	+$45,941	+ $ 202	+ $ 9
Catalina Hwy	reg	$ 102,260	$ 554	$ 246	+$41,010	+ $ 144	- $ 7
Tucson Mnts	reg	$ 91,574	$ 545	$ 370	+$30,324	+ $ 135	+ $ 117
Valencia/PW	r & ur	$ 43,191	$ 267	$ 367	- $18,059	- $ 143	+ $ 114
Picture Rocks	unreg	$ 32,882	$ 163	$ 95	- $ 28,368	- $ 247	- $ 158
Picture Rocks	unreg	$ 24,968	$ 164	$ 122	- $ 36,282	- $ 246	- $ 131
Taylor Lane	unreg	$ 18,155	$ 93	$ 82	- $ 43,095	- $ 317	- $ 171
Cam. Oeste	unreg	$ 16,474	$ 92	$ 46	- $ 44,776	- $ 318	- $ 207
Three Points	unreg	$ 10,151	$ 51	$ 106	- $ 51,099	- $ 359	- $ 147
Arivaca	unreg	$ 3,081	$ 20	$ 103	- $ 58,169	- $ 390	- $ 150

IV. Cost Factors Involved to Bring Wildcat Areas up to Standard

In considering the long term fiscal impact of unregulated development, cost factors include the demands that citizens will make on the public sector or government to bring substandard roads and infrastructure up to levels that protect the health and safety of residents and other community members. Pima County receives requests from lot split community members to build or improve their infrastructure, and as more population is accommodated in these areas, demands for service will continue, and increase. The price tag on bringing lot split land up to the standard of regulated development is staggering. In general, the cost of an improved lot or parcel is between 18 and 26 percent of total sale price of the home. A $100,000 home, then, has a unit cost of $18,000 to $26,000 for the land and infrastructure improvements (roads, utilities, sewer, etc.). Attempting to improve the land after lot split development has occurred would involve additional costs, such as (1) additional legal fees, as the easements asserted by multiple parties would be difficult to sort out; (2) the cost of putting in lines for sewer would be greater, since any current utilities are not likely to be placed correctly as the survey work is undone; (3) the cost of moving above ground utilities underground is greater than putting lines underground from the outset; and (4) the cost of revegetation and flood control is greater following typical wildcat development. The cost of bringing lot split areas up to standard would increase in proportion to its distance from existing infrastructure. The cost of the road without a curb is $32 to $33 per linear foot, and the cost of the utilities is $17 per linear foot plus the variable trenching cost, depending on size of lines. In summary, if the 1,525 to 2,300 new lot split dwellings created each year cost on average $23,000 per dwelling to bring infrastructure up to standard (this is a conservative estimate, which nets out the cost of land and does not include all additional costs as described above), the infrastructure deficit created by lot split land use is between $35 and $55 million each year. With no private sector contribution, the entire cost of this infrastructure investment could fall to public sector.

V. The Shortfall in Revenue Caused by Unregulated Development is Reflected in its Failure to Cover the Cost of a Single Public Service -- Deputy Sheriff Calls for Service

Data was gathered for lot split areas to compare the actual amount of taxes paid in lot split areas to the actual number of calls for deputy sheriff services. This was an easy unit of demand to measure since call data readily exists. Other service areas could be reviewed with additional effort. While it has been argued that areas developed through the unregulated process do not make a service demand on the County since substandard roads are not accepted or maintained by the County, and there is no sewer infrastructure, the data that follows indicates that many unregulated areas do not even generate enough in property taxes for Pima County to cover the cost of a single General Fund service -- calls by the Sheriff's Department. Sheriff's Department calls represent only 18 percent of the county budget funded by the primary tax levy. Therefore, all other services required by the residents of wildcat development -- including expensive services such as healthcare and the justice system -- are further costs that simply are not covered by the contribution that unregulated land use makes to Pima County. To compensate for this undervalued tax base, the tax rate is increased with regulated development subsidizing the cost of providing services to unregulated areas.

SHORTFALL IN REVENUE GENERATED FROM TAXES ON LAND DEVELOPED THROUGH UNREGULATED SUBDIVIDING IS REFLECTED IN THE INABILITY OF REVENUE GENERATED TO COVER COST OF EVEN ONE PUBLIC SERVICE BY PIMA COUNTY -- DEPUTY CALLS

LOCATION OF THE SECTION (ONE SQUARE MILE SITE)	REGULATED OR UNREGULATED	TOTAL AMOUNT PRIMARY TAXES PAID BY THE RESIDENTS OF THE SECTION (SQUARE MILE)	TOTAL COST OF CALLS TO SITE MADE BY THE SHERIFF'S DEPARTMENT[2] (Represents less than 20% Primary Tax General Fund Expenditures by County)	AMOUNT ABOVE OR BELOW THE ACTUAL S.D. EXPENDITURE
Cam. de Oeste	Unregulated	$43,669	$189,210 (901 calls)	-- $145,541
Picture Rocks	Unregulated	$74,250	$125,580 (598 calls)	-- $51,330
Picture Rocks	Unregulated	$76,449	$108,570 (517 calls)	-- $32,121
Taylor Lane	Unregulated	$43,108	$62,790 (299 calls)	-- $19,682
Arivaca	Unregulated	$9,706	$39,270 (187 calls)	-- $29,564
Three Points	Unregulated	$24,567	$37,800 (180 calls)	-- $13,233
La Canada	Regulated	$295,130	$140,910 (671 calls)	+ $154,220
Valencia/P Wash	Regulated	$128,346	$13,440 (64 calls)	+ $114,906
Catalina Hwy	Regulated	$272,449	$73,500 (350 calls)	+ $198,949
Tucson Mnts	Regulated	$258,716	$44,310 (211 calls)	+ $214,406
First Avenue	Regulated	$620,246	$116,130 (553 calls)	+ $504,116
River Road	Regulated	$802,338	$49,770 (237 calls)	+ $752,568
Average of Wildcat Sites	Unregulated	$45,291	$93,870 (447 calls)	-- $48,579
Average of Regulated Sites	Regulated	$396,204	$73,010 (348 calls)	+ $323,194

[2] Sheriff's Department and Budget Data (138,327 calls @ $210 per call). County expenditures for Sheriff's calls represents less than 15% of revenue from the primary and secondary, and less than 20% of revenue from the primary tax.

MEMORANDUM

Date: March 6, 2000

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

From: C.H. Huckelberry
County Administrator

Re: **Impact of Unregulated Development at the Community and Watershed Level**

I. Introduction

On February 22, 2000, I forwarded a memorandum that discussed the impact of unregulated development on the Pima County tax base. Some of the findings were:

1. Regarding Revenue: Wildcat development is accommodating more of Pima County's population growth as time goes on and it creates a significant fiscal deficit for Pima County. A section of land that accommodates population growth through the unregulated process typically fails to match regulated development by any measure of fiscal capacity, whether that is [a] full cash value, [b] revenue generated per acre for the tax base, or [c] revenue paid on a per capita basis. In fact, the Pima County property tax base has declined substantially when viewed on a per capita constant dollar basis. Since 1977-1978, there has been a 38 percent drop in the primary property tax value and a 36 percent drop in secondary value. To compensate for this declining tax base, the tax rate is increased with regulated development subsidizing the cost of providing services to unregulated areas.

2. Regarding Service Demand: A single line of county service -- calls for the sheriff deputy -- is not covered by the taxes paid by residents of many sections of land developed through the wildcat method, and this service represents less than 20 percent of the property tax supported general fund expenditures of the County. Therefore, all other services required by the residents of wildcat development -- including expensive services such as healthcare and the justice system – are further costs that simply are not covered by the contribution that unregulated land use makes to Pima County.

3. Regarding Additional Infrastructure Deficit: As residents of lot split areas begin to request improved infrastructure and require it for health and safety purposes, the taxpayers will have to bear the cost to bring unregulated areas up to the minimum standards of regulated development. An infrastructure deficit on the order of $35 to $55 million per year is accumulating given the current pace of wildcat development.

This memorandum is intended to provide an indication of why unregulated development offers so little benefit to the tax base by describing, briefly, the fiscal tax base impact of the unregulated lot split issue at the community and watershed level. A more detailed treatment of the topic will be presented in the upcoming *Fiscal Impact of Land Use* report.

II. The Relationship of Infrastructure to Fiscal Strength

As the previous issue paper suggested, vast disparities exist in the fiscal capacity of platted and unplatted land. This is true even within the urbanizing areas,[1] where, often, unplatted land is not rural landscape but is accommodating a large percent of Pima County's population. Within the urbanizing portions of Pima County, which contain the highest percentage of land that has been developed, the full cash value of an acre of land that has not gone through the regulated process is $14,839, while the full cash value of platted land in the urbanizing areas is $193,458, more than 13 times greater.

REGIONAL COMPARISON OF VALUE OF PLATTED AND UNPLATTED LAND		
Land Unit within Pima County	Unplatted -- Full Cash Value Per Acre	Platted -- Full Cash Value Per Acre
All of Pima County (5,808,337 acres)	$1,515	$ 154,802
Eastern Pima County (2,443,144 acres)	$ 3,560	$ 159,011
Urbanizing Areas of Pima County (468,089 acres)	$14,839	$ 193,458

The basic reason for this disparity is that unregulated development offers little in the way of sewers and roads, and the major housing type in unregulated areas has a valuation method which assumes depreciation over time, but improvements are the bulwark of the tax base. One measure of how structures relate to land that has gone through the regulated process is simply to compare the number of single family homes that were permitted on subdivided land as opposed to lot split land.

- During 1999, 5,171 new single family homes were permitted on land subdivided through the regulated process in unincorporated Pima County. These homes, subject to a valuation method that considers the market, can appreciate in value over time and thus contribute to the tax base.

- During that same time period, only 511 new single family homes were permitted on lot split land -- ten times less than occurs on subdivided land. Instead, mobile homes were placed on lot split land -- over 1,725 mobile homes in 1999. Mobile homes are subject to a valuation method that assumes depreciation over time. While service demand may remain constant or increase in lot split areas, the contribution to the tax base tends to decrease.

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[1] The sixteen areas included in this study as urbanizing communities include: Ajo, Arivaca, Casas Adobes, Catalina, Foothills, Green Valley, Marana, Oro Valley, Picture Rocks, Sahuarita, Santa Rita, South Tucson, South Valley, Tanque Verde, Tortolita, and Tucson.

Improvements as the Bulwark of the Tax Base: One measure that describes the relationship between improvements and tax value is a review of the component parts of the total full cash value of Pima County.

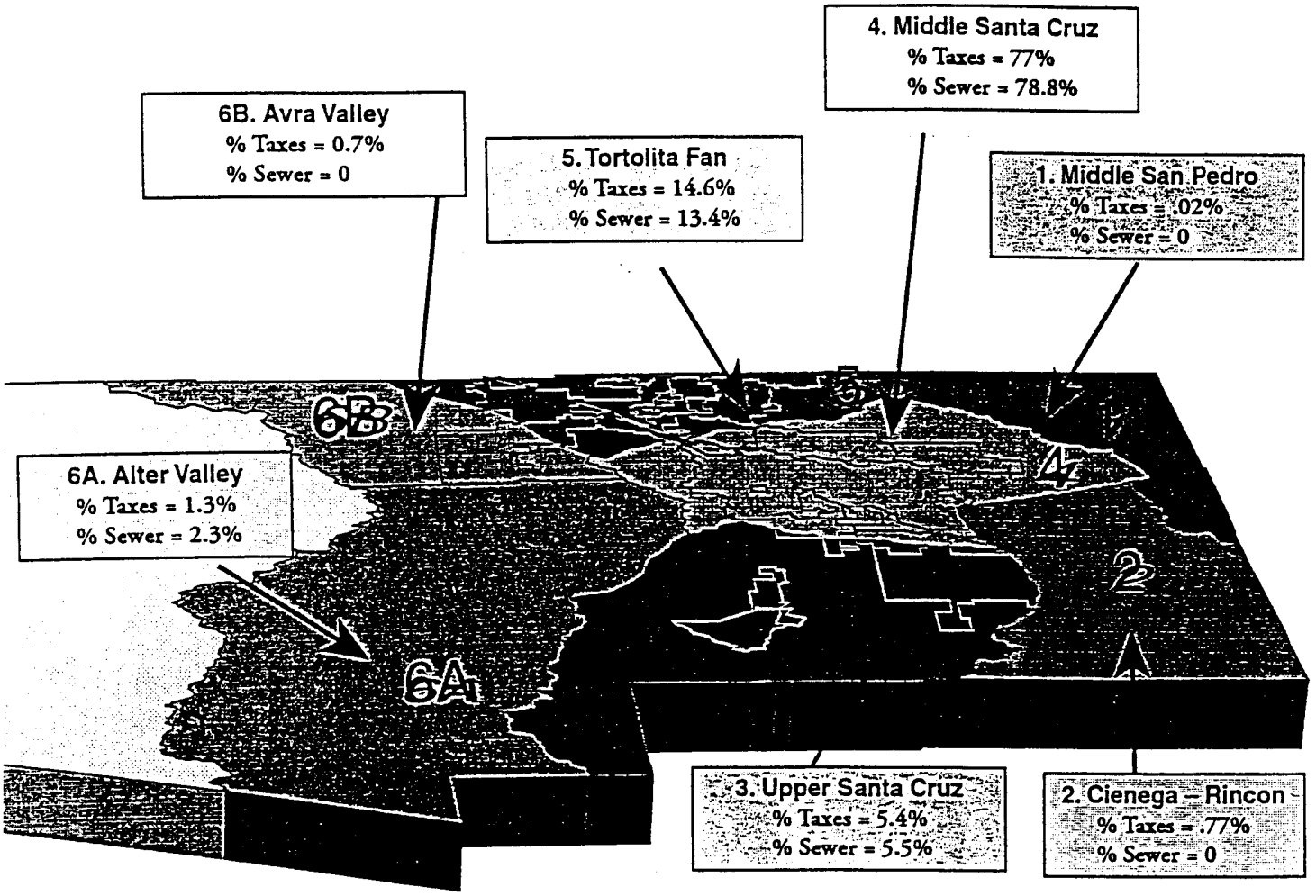
- As of November 18, 1999, the full cash value of Pima County was $34.2 billion.
- Approximately $22 billion, or 64% of the value of Pima County, was in the improved full cash value.
- Only $12.2 billion, or 36% of the full cash value of Pima County is the land value.

This is a surprising result, since the improvements found in the County make a relatively small footprint on the land base. Pima County covers almost 5.9 million acres, but most of its population (about 87%) is found in sixteen urbanizing areas that take less than one twelfth of that land base, or 468,089 acres. This population also accounts for most of the taxes paid to the Pima County Treasurer (about 90%). Still more surprising is this: within the most populated areas of Pima County, sixteen urbanizing areas, only 26% of that land has been through the regulated process. Accordingly, most of the property taxes of Pima County are picked up by residents who own homes that have gone through the regulated process and commercial taxpayers -- covering about 121,624 acres of land in the urbanizing areas (and 164,670 countywide), which is a sliver of the 5.9 million acres that comprise Pima County.

Another measure that shows how improvements to the land -- as opposed to the land itself -- will signal a benefit to the tax base is to compare the percent of the regional sewer system that runs through an area, and the percent contribution of that land area to the total amount of taxes paid. There is a close correspondence in the case of Pima County's watersheds. The Middle Santa Cruz watershed encircles the urbanizing areas that have the highest percent of land that has been platted: the City of South Tucson (87%), the foothills area (81%), Casas Adobes (69%), and the City of Tucson (42%). Combined, the Middle Santa Cruz watershed contributes 77% of the total primary and secondary taxes paid in all of Pima County (or $164.7 million of the approximate $214.5 million total). This same area has 78.8% of the regional sewer infrastructure within its land base. Similarly, the Tortolita Fan area pays 14.6% of the taxes and has 13.4% of the sewer infrastructure, while the Upper Santa Cruz area contributes 5.4% to taxes paid, and 5.5% ownership of the region's sewer infrastructure.

Watershed within Pima County	% PAID OF TOTAL PROPERTY TAX	% OF SEWER SYSTEM
Middle Santa Cruz	77 %	78.8 %
Tortolita Fan	14.6%	13.4 %
Upper Santa Cruz	5.4 %	5.5 %
Altar Valley	1.3 %	2.3%
Cienega-Rincon	0.77 %	0 %
Avra Valley	0.7 %	0 %
Middle San Pedro	0.02%	0 %

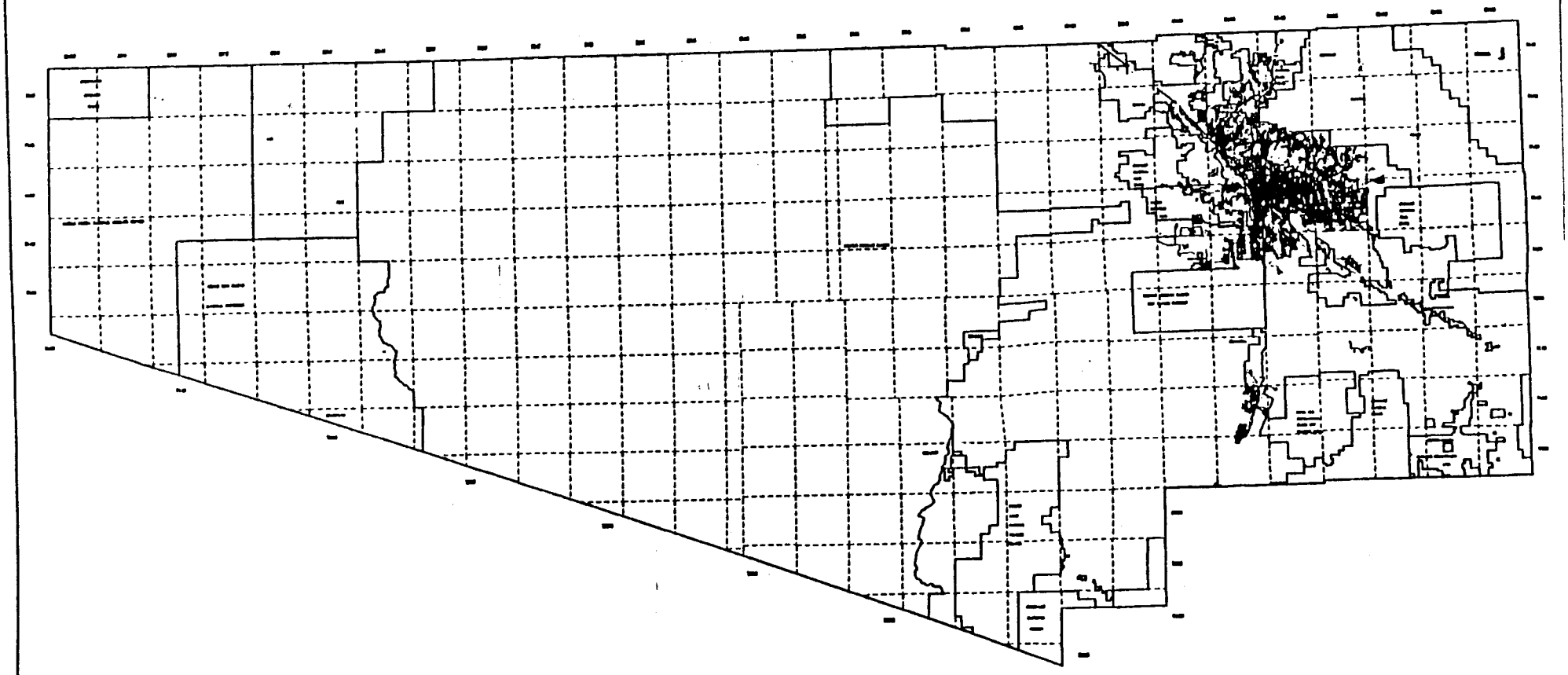
Eastern Pima County Watersheds
Revenue and Infrastructure Relationship



Percent of Total Taxes Paid,
Compared to Percent of Sewer System by Watershed

WATERSHED	% OF TOTAL PRIMARY & SECONDARY TAXES PAID	% OF SEWER SYSTEM
Middle San Pedro	0.02%	0
Cienega Rincon	0.77%	0
Upper Santa Cruz	5.4%	5.5%
Middle Santa Cruz	77%	78.3%
Tortolita Fan	14.6%	13.4%
Altar Valley	1.3%	2.3%
Avra Valley	0.8%	0

Pima County Maintained Sewers



County Maintained Sewers - All Sizes

Township And Range

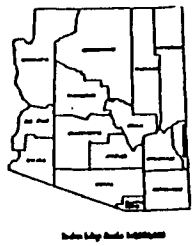
Administrative Boundaries

PIMA COUNTY DEPARTMENT OF TRANSPORTATION

TECHNICAL SERVICES

Pima County Technical Services
201 North Stone Avenue - 9th Floor
Tucson, Arizona 85701-1207
(520) 740-6670 - FAX: (520) 790-3429
http://www.dot.co.pima.az.us

State Of Arizona Index Map



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Plotted 1/4/2000

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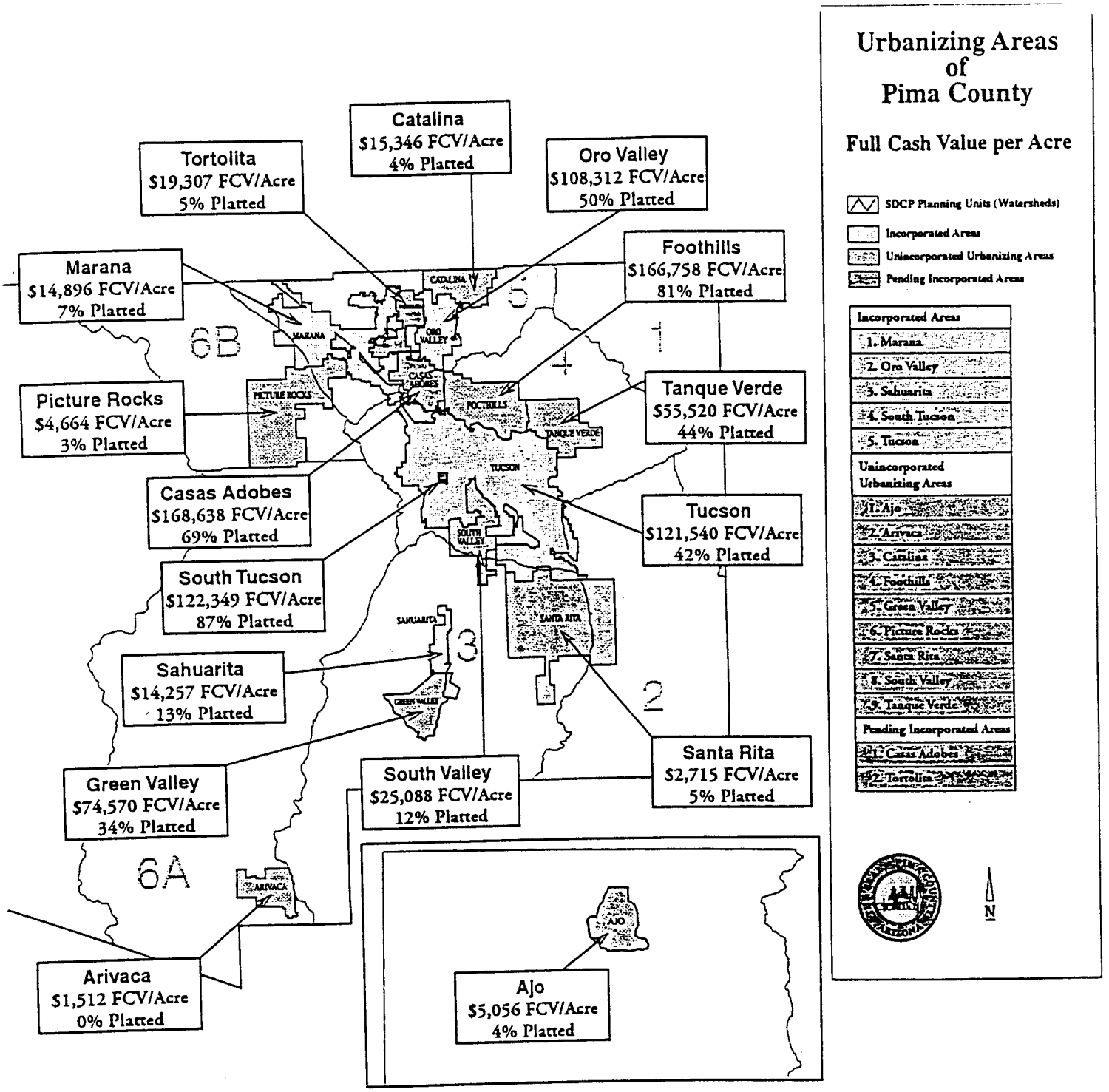
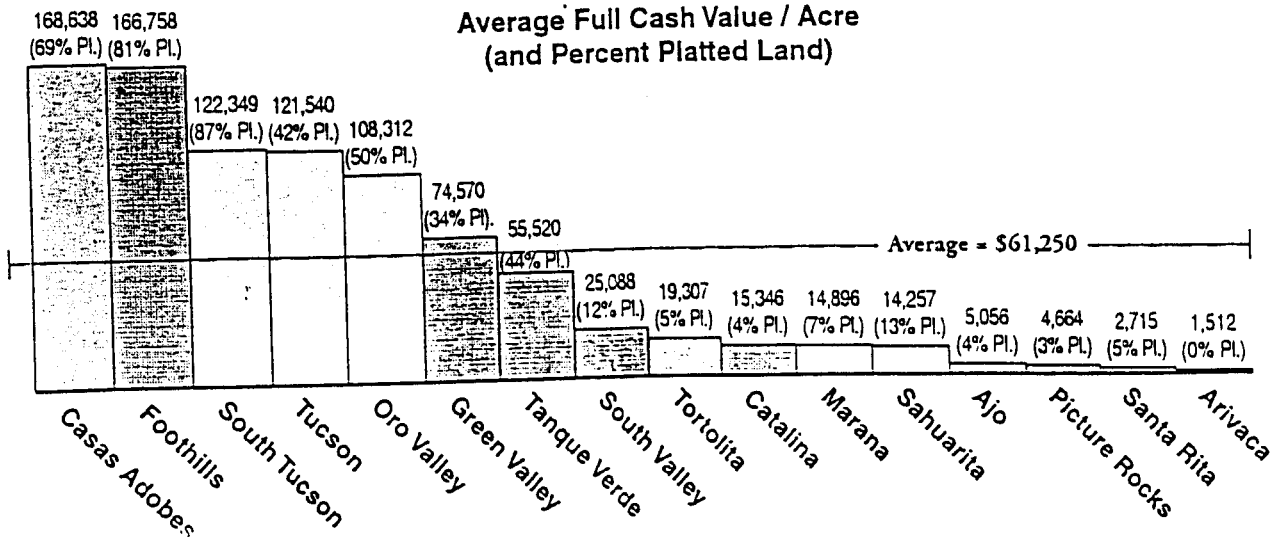
III. Community Level Comparison of Full Cash Value of Platted and Unplatted Land

At the community level, unregulated development has weakened the tax base contribution of vast tracts of land. Picture Rocks, for example, covers 44,775 acres, which is almost ten percent of the urbanizing areas of Pima County. However, residents of the Picture Rocks area paid just over $1 million dollars in total property taxes, which is less than one percent of the taxes paid by all residents in the urbanizing areas of the County. Comparisons of the full cash value of platted and unplatted land from an urbanizing community perspective are found in the chart below. The average full cash value of platted and unplatted land in the urbanizing areas is $61,250: only six of sixteen communities exceed this average.

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


Urbanizing Areas of Pima County
Full Cash Value per Acre
SDCP Planning Units (Watersheds)
Incorporated Areas
Unincorporated Urbanizing Areas
Pending Incorporated Areas
Incorporated Areas
1. Marana
2. Oro Valley
3. Sahuarita
4. South Tucson
5. Tucson
Unincorporated Urbanizing Areas
1. Ajo
2. Arivaca
3. Catalina
4. Foothills
5. Green Valley
6. Picture Rocks
7. Santa Rita
8. South Valley
9. Tanque Verde
Pending Incorporated Areas
1. Casas Adobes
2. Tortolita
N
Catalina
$15,346 FCV/Acre
4% Platted
Tortolita
$19,307 FCV/Acre
5% Platted
Oro Valley
$108,312 FCV/Acre
50% Platted
Marana
$14,896 FCV/Acre
7% Platted
Foothills
$166,758 FCV/Acre
81% Platted
Picture Rocks
$4,664 FCV/Acre
3% Platted
Tanque Verde
$55,520 FCV/Acre
44% Platted
Casas Adobes
$168,638 FCV/Acre
69% Platted
Tucson
$121,540 FCV/Acre
42% Platted
South Tucson
$122,349 FCV/Acre
87% Platted
Sahuarita
$14,257 FCV/Acre
13% Platted
Santa Rita
$2,715 FCV/Acre
5% Platted
Green Valley
$74,570 FCV/Acre
34% Platted
South Valley
$25,088 FCV/Acre
12% Platted
Arivaca
$1,512 FCV/Acre
0% Platted
Ajo
$5,056 FCV/Acre
4% Platted
6B
6A
5
1
4
3
2


Average Full Cash Value / Acre
(and Percent Platted Land)
168,638 (69% Pl.)
166,758 (81% Pl.)
122,349 (87% Pl.)
121,540 (42% Pl.)
108,312 (50% Pl.)
74,570 (34% Pl.)
55,520 (44% Pl.)
25,088 (12% Pl.)
19,307 (5% Pl.)
15,346 (4% Pl.)
14,896 (7% Pl.)
14,257 (13% Pl.)
5,056 (4% Pl.)
4,664 (3% Pl.)
2,715 (5% Pl.)
1,512 (0% Pl.)
Average = $61,250
Casas Adobes
Foothills
South Tucson
Tucson
Oro Valley
Green Valley
Tanque Verde
South Valley
Tortolita
Catalina
Marana
Sahuarita
Ajo
Picture Rocks
Santa Rita
Arivaca

IV. Community Level Comparison of Revenue on a Per Acre and Per Capita Basis

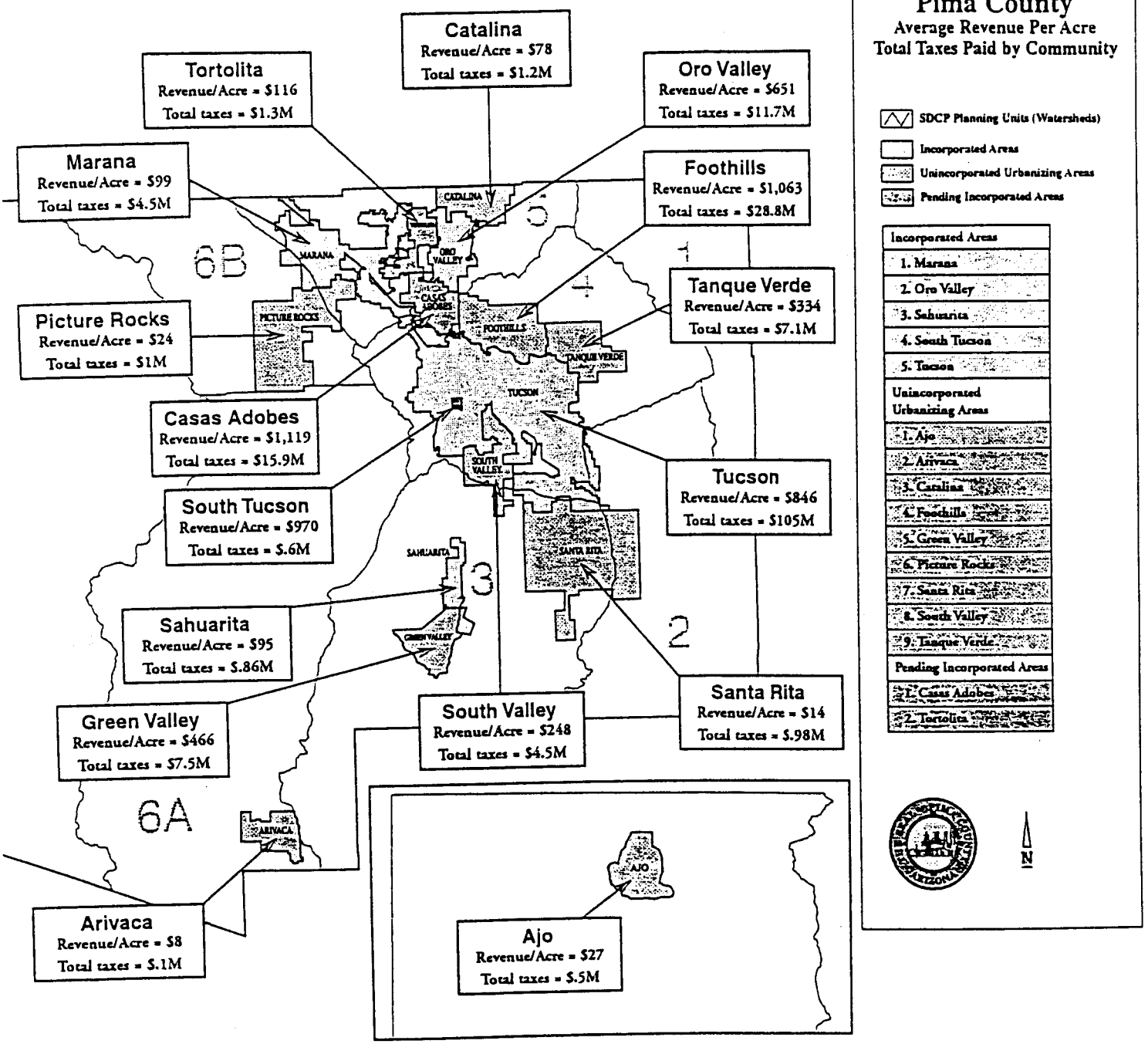
The chart below shows the relationship between land that has gone through the regulated process and the relative fiscal strength of that land on a revenue per acre basis, and a per capita basis. In general, regulated land use tends to correlate with a higher per acre contribution to the property tax levy of Pima County. Only six of sixteen communities exceed the average revenue per acre rate in urbanizing areas of $410. One half exceed the average per capita rate of $253,[2] but only 27% of the population within urbanizing areas is found in these eight communities. Maps of two planned and two wildcat communities follow.

COMMUNITY LEVEL COMPARISON OF REVENUE PER ACRE AND PER CAPITA IN RELATION TO PLATTED AND UNPLATTED LAND (From highest to lowest revenue per acre)			AMOUNT ABOVE (+)/ BELOW (--) AVERAGE/ ACRE REV.	AMOUNT ABOVE (+)/ BELOW (--) AVERAGE/ CAPITA EXP
The Urbanizing Areas (Percent platted)	Revenue per acre --	Revenue per capita --	+ / -- $410/rev	+ / -- $253/cap
Casas Adobes (69% platted.)	$1,119	$ 265	+ $ 709	+ $12
Foothills (81% platted.)	$1,063	$ 524	+ $ 653	+ $271
South Tucson (87% platted)	$ 970	$ 105	+ $ 560	- $ 148
Tucson (42% platted)	$ 846	$ 222	+ $ 436	- $ 31
Oro Valley (50% platted)	$ 651	$ 414	+ $ 241	+ $161
Green Valley (34% platted)	$ 466	$ 248	+ $ 56	- $ 5
Tanque Verde (44% platted)	$ 334	$ 286	- $ 76	+ $33
South Valley (12% platted)	$ 248	$ 332	- $ 162	+ $79
Tortolita (5% platted)	$ 116	$ 525	- $ 294	+ $272
Marana (7% platted)	$ 99	$ 309	- $ 311	+ $56
Sahuarita (13% platted)	$ 95	$ 292	- $ 315	+ $39
Catalina (4% platted)	$78	$ 194	- $ 332	- $59
Ajo (4% platted)	$ 27	$ 137	- $ 383	- $116
Picture Rocks (3% platted)	$ 24	$ 123	- $ 386	- $130
Santa Rita (5% platted)	$14	$ 192	- $ 396	- $61
Arivaca (0% platted)	$ 8	$ 90	- $ 402	- $163

[2] For this fiscal year, Pima County's property tax levy is approximately $214.5 million. When divided across the population of 845,745, $253 is available to spend on each Pima County resident for services provided by primary and secondary tax funds.

Urbanizing Areas of Pima County

Average Revenue Per Acre
Total Taxes Paid by Community



SDCP Planning Units (Watersheds)
Incorporated Areas
Unincorporated Urbanizing Areas
Pending Incorporated Areas

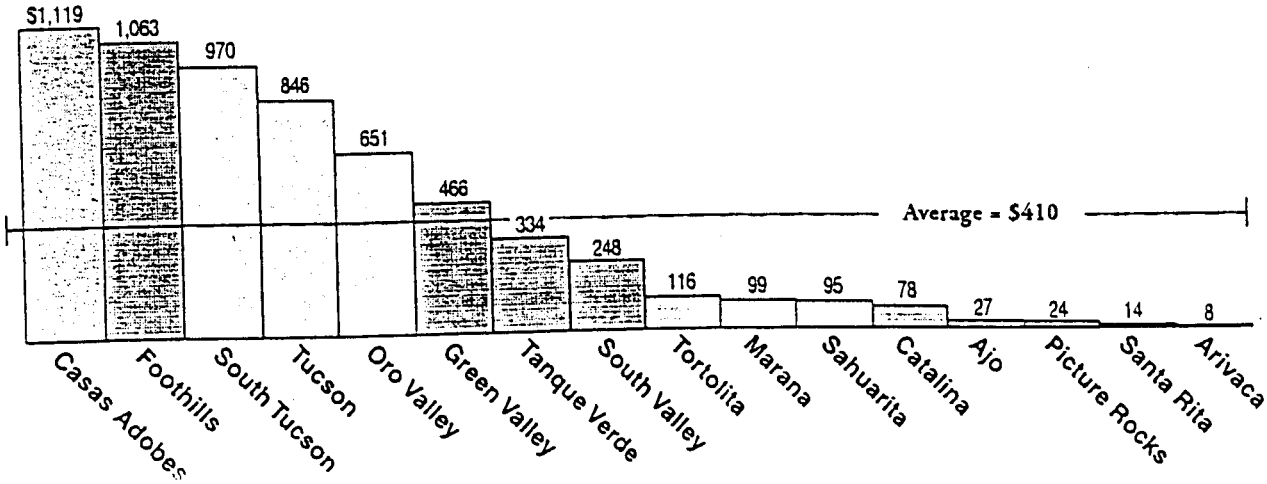
Incorporated Areas
1. Marana
2. Oro Valley
3. Sahuarita
4. South Tucson
5. Tucson

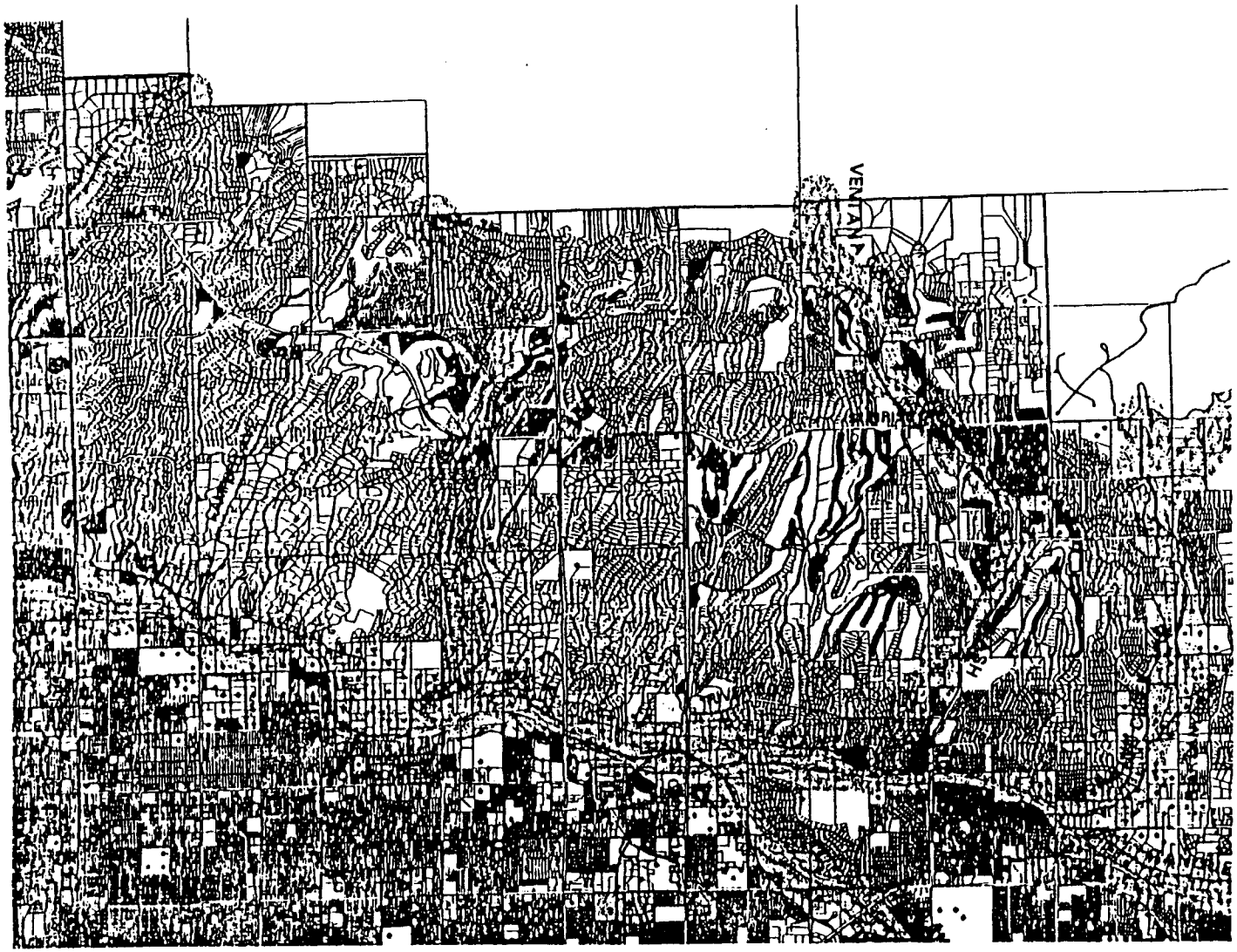
Unincorporated Urbanizing Areas
1. Ajo
2. Arivaca
3. Catalina
4. Foothills
5. Green Valley
6. Picture Rocks
7. Santa Rita
8. South Valley
9. Tanque Verde

Pending Incorporated Areas
1. Casas Adobes
2. Tortolita

N

Average Revenue per Acre



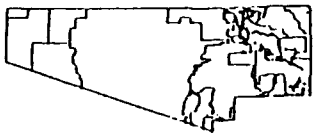


Unincorporated Area
Foothills
Maintenance Considerations

- Study Area
- Proposed Park
- Platted Subdivisions: 548
- Non Stress Area
- Low Stress Area
- Medium Stress Area
- Medium High Stress Area
- High Stress Area
- Highest Stress Area

- Biological Corridors /Links
- Parcel Base
- Washes
- Stress Area
- Sewer Lines > 10" Diameter: 27.06 Linear miles
- Community Boundary
- Wells: 393

Pima County Index Map



Scale 1 : 12,000

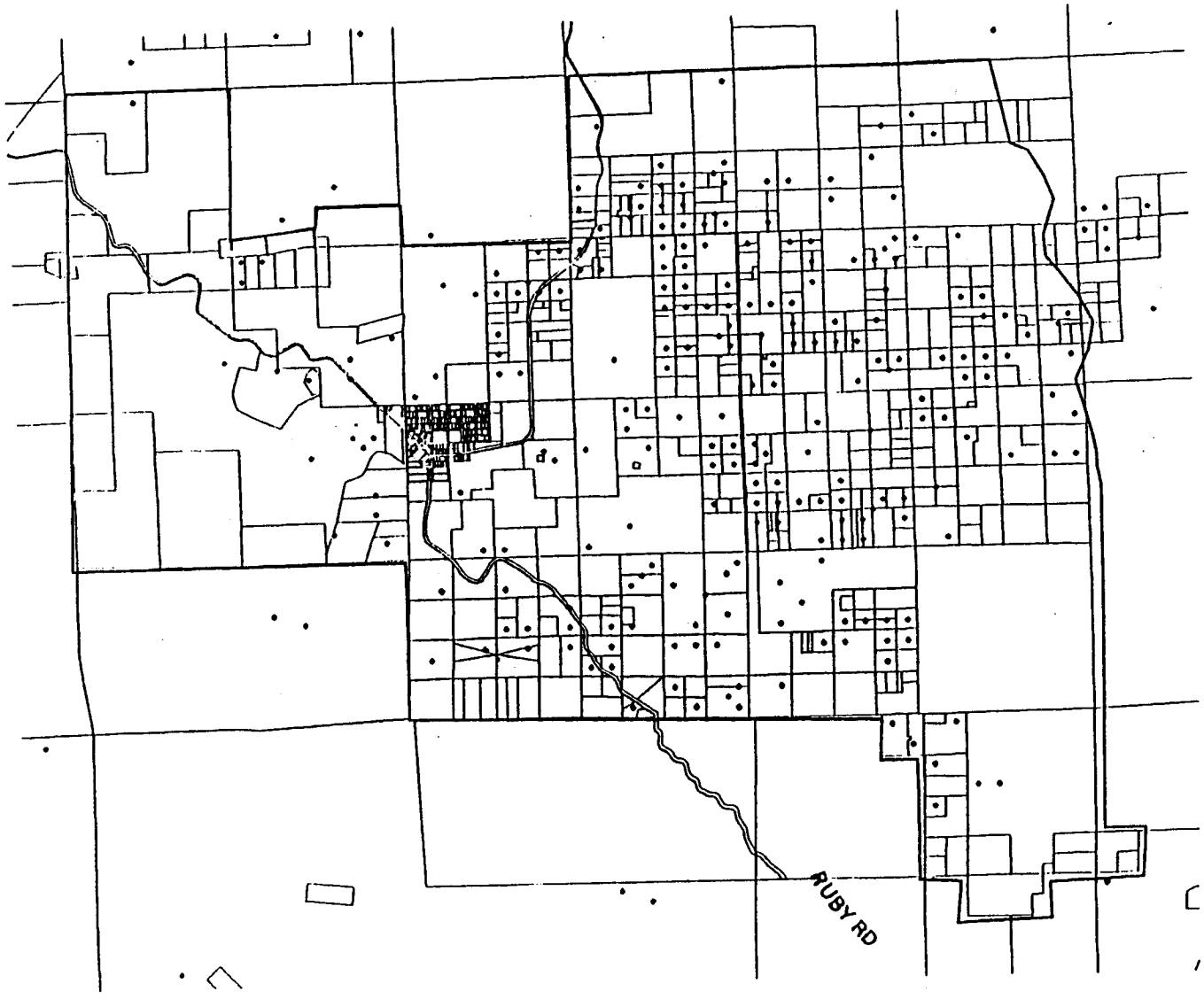
TECHNICAL SERVICES

Pima County Technical Services
201 North Stone Avenue, 8th Floor
Tucson, Arizona 85701-1207
(520) 740-6450 FAX: (520) 740-6420
http://www.dot.co.pima.az.us

/projects10/projects/development/maps/foothills.mxd

Plotted 12/01/00

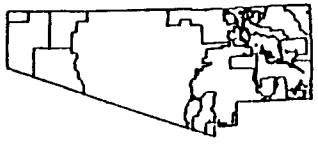
Unincorporated Area
Arivaca
Maintenance Considerations



- Study Area
- Proposed Park
- Platted Subdivisions: 0
- Non Stress Area
- Low Stress Area
- Medium Stress Area
- Medium High Stress Area
- High Stress Area
- Highest Stress Area

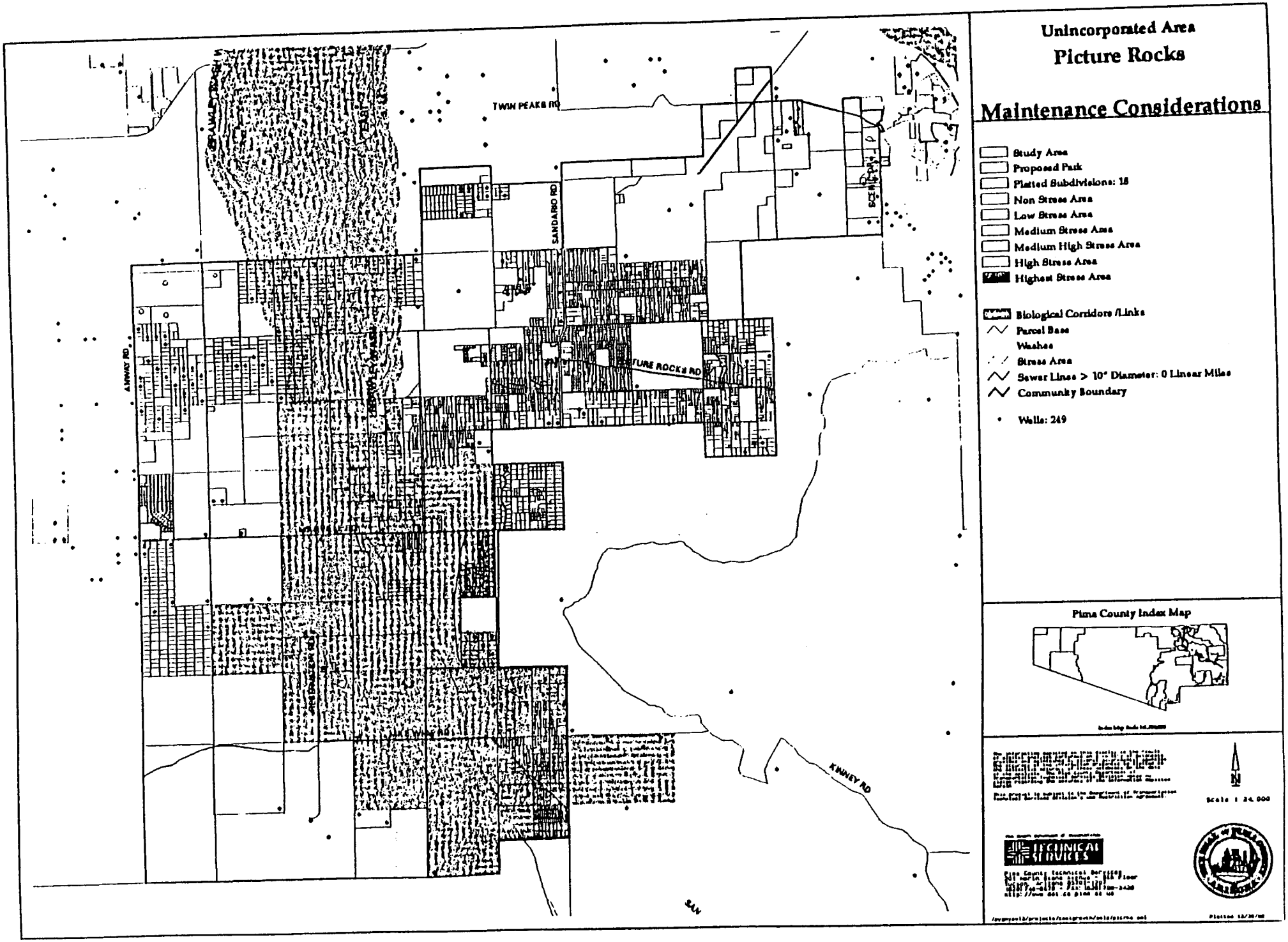
- Biological Corridors /Links
- Parcel Base
- Washes
- Stress Area
- Sewer Lines > 10" Diameter: 0 Linear miles
- Community Boundary
- Wells: 298

Pima County Index Map



Scale 1: 14,000

TECHNICAL SERVICES



Unincorporated Area
Picture Rocks

Maintenance Considerations

- Study Area
- Proposed Park
- Platted Subdivisions: 18
- Non Stress Area
- Low Stress Area
- Medium Stress Area
- Medium High Stress Area
- High Stress Area
- Highest Stress Area

- Biological Corridors /Links
- Parcel Base
- Washes
- Stress Area
- Sewer Lines > 10" Diameter: 0 Linear Miles
- Community Boundary

- Wells: 249

Pima County Index Map

Scale 1:24,000

TECHNICAL SERVICES

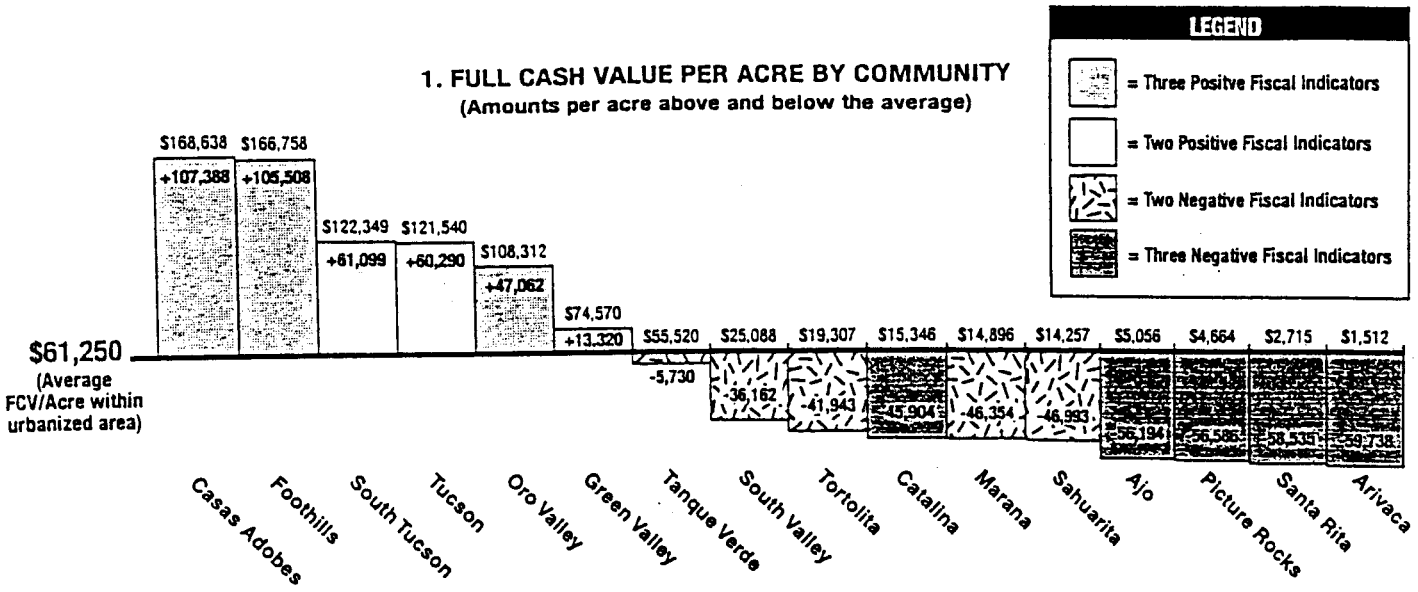
VI. Conclusion

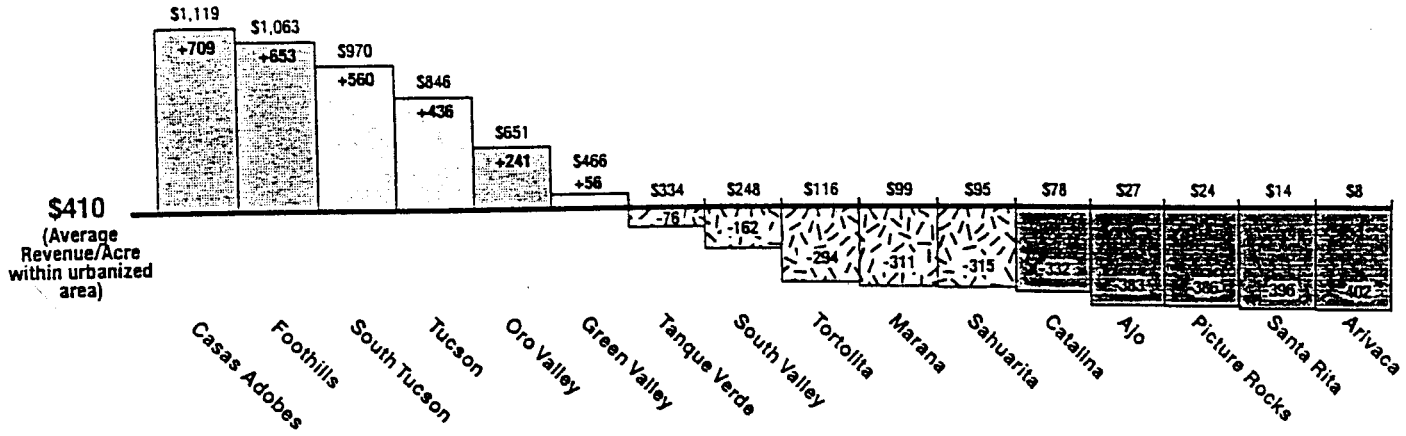
Infrastructure and improvements, not land, are the primary determining factors in the value of the tax base. In general, unregulated development provides neither the infrastructure nor the improvements which sustain the tax base. Despite the relative lack of contribution to the tax base, the population within lot split areas requires services, and this public sector expenditure is not matched or offset by taxes paid from the same population. As Pima County accommodates more population through unregulated development, we will see an increasing gap between revenue generated from the tax base, and services demanded in these areas of the County.

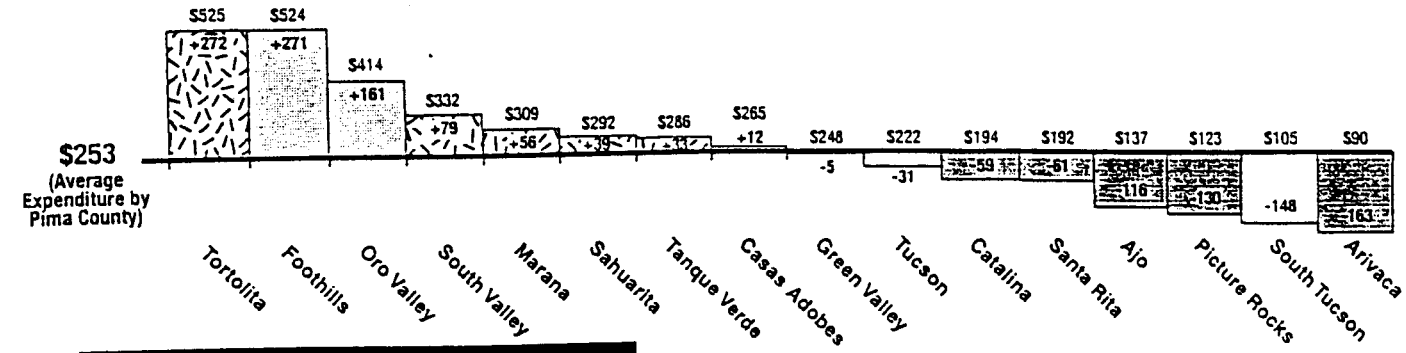
COMMUNITY LEVEL COMPARISON OF VARIOUS FISCAL INDICATORS IN RELATION TO PLATTED AND UNPLATTED LAND
(From highest to lowest revenue per acre)

Urbanizing Areas	Percent Platted	Full Cash Value / acre ($ 61,250 = urbanizing area av.)	Revenue / acre ($ 410 per acre = urbanizing area average)	Revenue /capita ($253 = ideal, ie, rev/cap would = average exp/cap)
Casas Adobes	69 %	$ 168,638	$1,119	$ 265
Foothills	81 %	$ 166,758	$1,063	$ 524
South Tucson	87 %	$ 122,349	$ 970	$ 105
Tucson	42 %	$ 121,540	$ 846	$ 222
Oro Valley	50 %	$ 108,312	$ 651	$ 414
Green Valley	34 %	$ 74,570	$ 466	$ 248
Tanque Verde	44%	$ 55,520	$ 334	$ 286
South Valley	12 %	$ 25,088	$ 248	$ 332
Tortolita	5 %	$ 19,307	$ 116	$ 525
Marana	7 %	$ 14,896	$ 99	$ 309
Sahuarita	13 %	$ 14,257	$ 95	$ 292
Catalina	4 %	$ 15,346	$78	$ 194
Ajo	4 %	$ 5,056	$ 27	$ 137
Picture Rocks	3 %	$ 4,664	$ 24	$ 123
Santa Rita	5 %	$ 2,715	$14	$ 192
Arivaca	0 %	$ 1,512	$ 8	$ 90

THREE INDICATORS 0F FISCAL CAPACITY





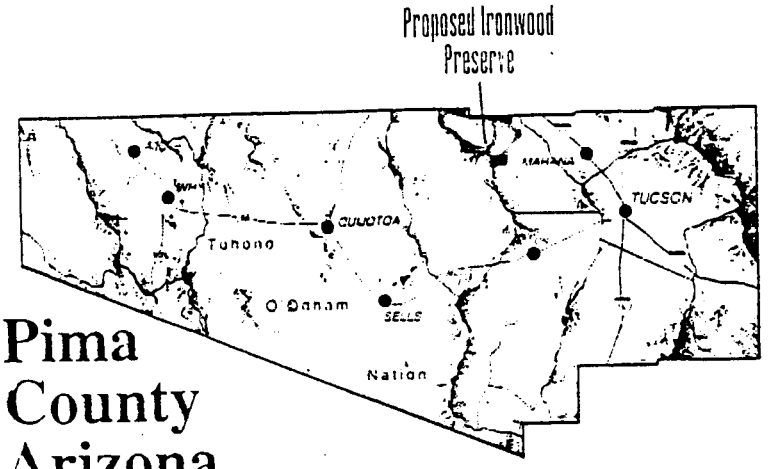


RESULTS

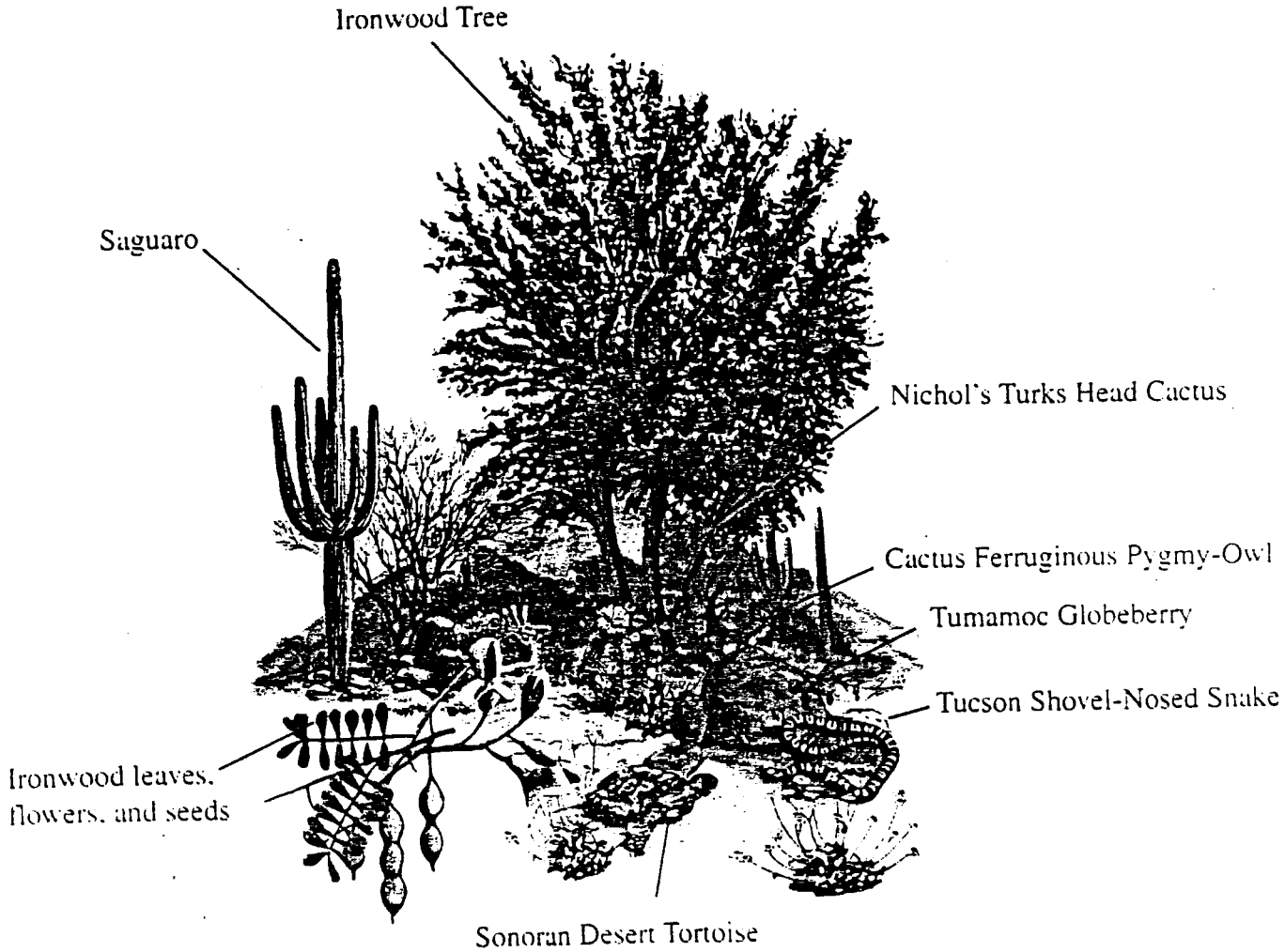
- Casas Adobes, Foothills, Oro Valley
- South Tucson, Tucson, Green Valley
- Marana, Sahuarita,South Valley,Tanque Verde, Tortolita
- Catalina, Ajo, Picture Rocks, Santa Rita, Arivaca

Proposal in Support of the Ironwood Preserve

Sonoran Desert Conservation Plan — Pima County, Arizona — March 2000



Pima County Arizona



Some of the Species of Concern found in the proposed
Ironwood Preserve,
Pima County Arizona

Board of Supervisors Memorandum

March 21, 2000

Proposed Ragged Top and
Silverbell Mountains Ironwood Preserve

I. Introduction

This document provides a brief discussion of the need for the federal government to afford special protection for the Ironwood forest found in the Ragged Top and Silverbell Mountains.

Pima County has invited the Secretary of the Department of the Interior to discuss options for preserving the Ironwood habitat of the Silverbell Mountains, up to and including the creation of an Ironwood National Monument in Pima County, Arizona.

The proposed Ironwood Preserve would conserve one of the most valuable stands of the ancient Ironwood forest within the Sonoran Desert ecoregion.

II. Background

The Ironwood species, which can live to be over 800 years old, has served as a quiet but enormously important protector of species diversity within the Sonoran Desert. An Ironwood Preserve, in an area already primarily owned by the Bureau of Land Management, would honor this species for its role in upholding the ecosystem, and the Preserve would achieve practical conservation goals that are necessary to promote the recovery of the endangered pygmy-owl.

Prior studies have established the importance of cultural resources within the area. Bedrock outcrops and volcanic hills in the Ragged Top, Pan Quemado, and Silverbell mountains are unusual for the number of petroglyph or rock art sites that have been recorded. There is wide variation in the number and complexity of petroglyph sites, ranging from a handful of simple elements to hundreds of individual petroglyph elements, some of which are very complex.

At the south end of this region of prehistoric settlement lies Cocoraque Butte, which is listed on the National Register. This butte and its surrounding desert floor exhibits an extensive Hohokam village and numerous rock art panels that are exceptional for their complexity of design and the number of elements. Like many rock art sites, Cocoraque Butte is considered to be a traditional cultural place by the Tohono O'odham and Hopi Indian tribes.

More recently, a study led by Dr. Gary Nabhan of the Arizona-Sonora Desert Museum entitled *Desert Ironwood Primer* established that within the Sonoran Desert "the Ragged Top site [in the Silverbell Mountains] ... contributed the highest levels of species richness [of the study], with six of the ten plots having the highest levels within the entire region."

The Ragged Top and Cocoraque Rock areas, discussed in this paper, are identified by Dr. Nabhan as priorities for new protection and for strengthened conservation management, since "within the region as a whole, the [Ragged Top and Cocoraque sites] contribute the highest values of significance to biodiversity conservation."

The *Desert Ironwood Primer,* a binational research effort, is the first study that takes a comprehensive view of Ironwood habitats in both the United States and Mexico, evaluating the ecological and cultural resources supported by the ancient ironwood tree. Compared to Mexico, the United States offers limited protection to this important species.

A number of recommendations are offered by the authors, which Pima County supports as part of the Sonoran Desert Conservation Plan and as interim measures to offer protection to areas identified by the authors as having extraordinary ecological significance.

Excerpts from Dr. Nabhan's prestigious study are included, along with maps and photos of areas most in need of immediate protection as part of a proposed Ironwood Preserve.

Proposal One:

One proposal would protect both the Ragged Top and Cocoraque areas, and bring over 71,000 acres of land owned by the Bureau of Land Management into protective status.

A checkerboard of approximately 24,000 acres of State Land could contribute to the contiguity of the preserve land and bring important slope and xeroriparian areas into protection.

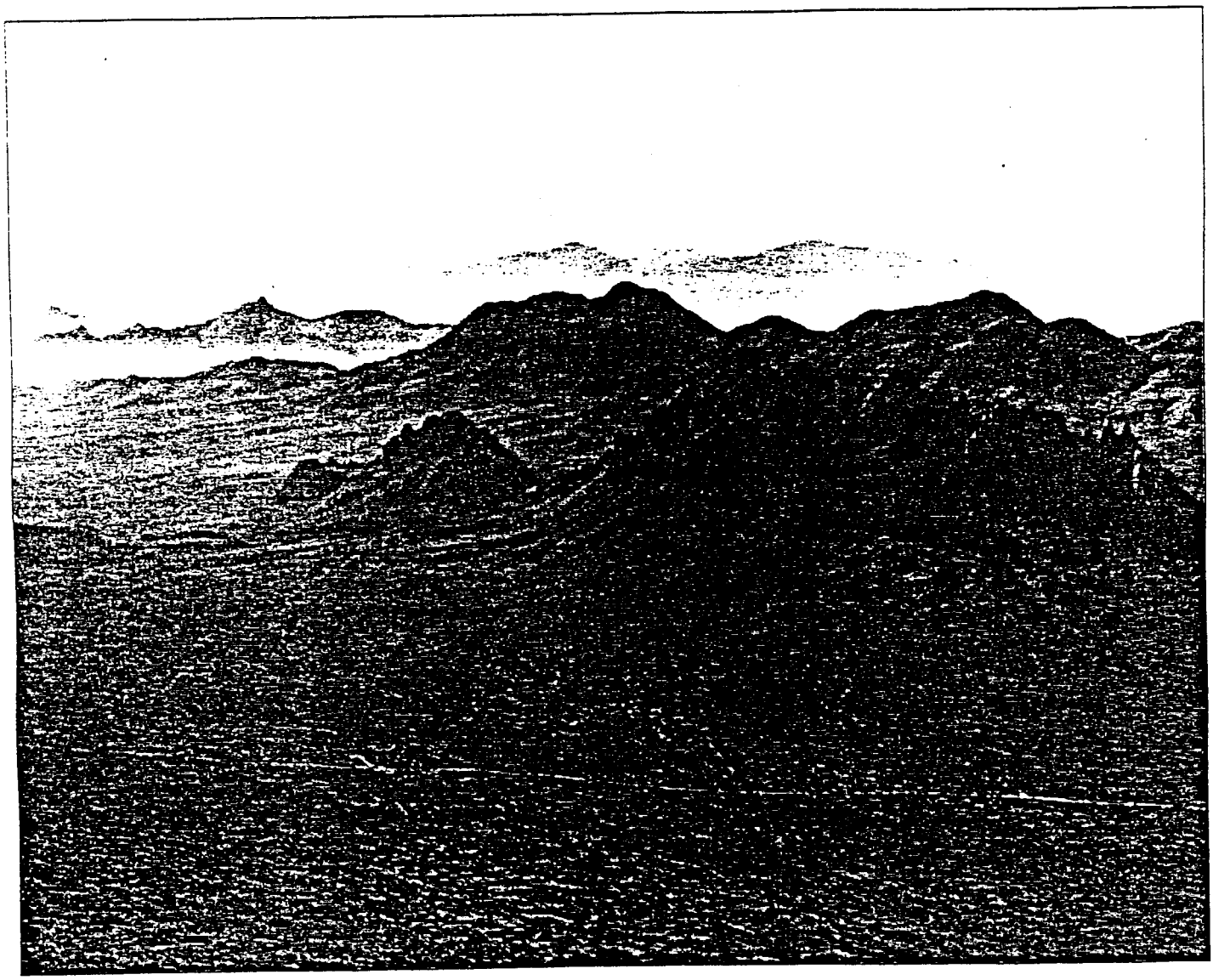
This proposal includes a buffer along the Tohono O'odham Nation which would protect important cultural resources and include the Cocoraque area that is so rich in biological and cultural resources.

Proposal Two:

A second proposal protects Ragged Top and brings approximately 57,000 acres of BLM land into protection.

Another 16,640 acres of State Land could add to an even more biologically sound preserve design.

The Ragged Top area, shown on the next page, is considered to offer the highest value in terms of species diversity and richness and in terms of the density of the Ironwood forest itself.



Ragged Top and Silverbell Mountain

Pima County, Arizona

III. Ecological Significance

The *Desert Ironwood Primer* establishes the importance of ironwood as a habitat modifying keystone species and nurse plant that has a role in supporting the biodiversity of over 500 Sonoran Desert species, including the endangered cactus ferruginous pygmy-owl.

At the site specific level, biodiversity associated with ironwood can be even higher. The ironwood-bursage habitat in the Silverbell Mountains of Pima County is associated with 674 species, including 64 mammals and 57 bird species.

Some of the highlights from the report include:

- Ironwood "ranks among the most ecologically and economically important plant species in the region. ... It's influence stands out in two biotic communities:

  1) ancient cactus and legume forests of desertscrub on rocky bajadas and alluvium in adjacent valleys; and

  2) xeroriparian habitats, which occur as narrow curving corridors along ephemeral and intermittent watercourses in the driest portions of the Sonoran Desert."

- "Ironwood generates a chain of influences on associated understory plants, affecting their dispersal, germination, establishment, and rates of growth. ... Ironwood is the dominant nurse plant in some subregions of the Sonoran Desert."

- "The mere presence of ironwood and other legume trees can increase the number of bird species in desertscrub habitat by 63%."

- "Recent studies show that without the protective cover of the desert legumes, the distributional ranges of saguaro, organ pipe, and senita cactus would retreat many miles, to more southern, frost-free areas."

- "Protecting ironwood habitat in Pima County, Arizona, will benefit a different mix of native species than would be conserved in ironwood habitats currently being protected on the islands or coasts of the Gulf of California."

- "North of the U.S. - Mexico border, the highest ironwood densities we recorded per hectare came from Arizona Uplands sites in Pima County (Ragged Top, 35 trees/ha; Cocoraque and Saguaro National Park West 22 trees/ha)."

Ironwood Densities in Pima County	
Location	**Ironwood/Hectare**
Ragged Top (Silverbells)	35 ironwoods / hectare
Cocoraque (Brawley Wash)	21.25 ironwoods / hectare
Saguaro National Park West	21.25 ironwoods / hectare
Tortolitas	11.25 ironwoods / hectare
Mason Audubon Center, NW Tucson	11.25 ironwoods / hectare
Cabaza Prieta National Wildlife Refuge	11.25 ironwoods / hectare
Organ Pipe National Monument (cut areas)	2.5 ironwoods / hectare

- In general, densities in Mexico range from 1.25 to 30 trees per hectare. The report points out that "it appears ironwood densities ... are greater near the species' northernmost limits in the Arizona Uplands and Lower Colorado River Valley."

- "Lush riparian habitats, such as closed-canopy mesquite bosques, are often assumed to be the most threatened habitat type in this region."

- "However, mounting evidence indicates that the biodiversity associated with xeroriparian habitats has become just as imperiled."

- "At least 31 breeding bird species declined locally in riparian mesquite bosques within the last half-century. Thirty of these birds also spend part of the year in ironwood habitats."

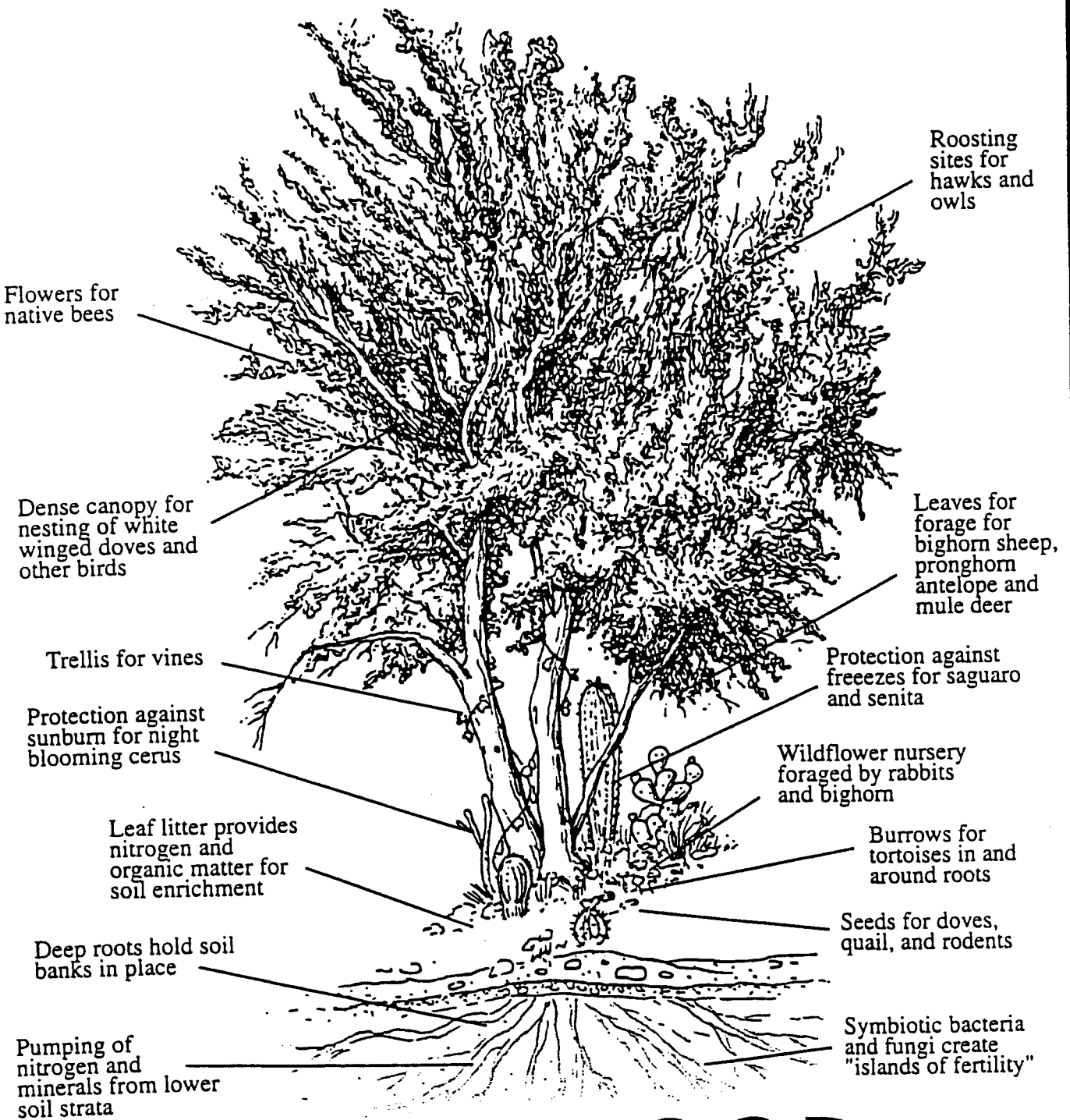
- "The Ragged Top site ... contributed the highest levels of species richness [of the study], with six of the ten plots having the highest levels within the entire region."

IV. Need for Greater Protection

The report points out that the United States offers limited protection for ironwood, compared to Mexico, despite the importance of the ironwood stands to the species itself, and to the larger Sonoran Desert system.

The Ragged Top and Cocoraque Rock areas are identified in the report as priorities for new protection and for strengthened conservation management, since "within the region as a whole, the [Ragged Top, Ironwood Picnic Area, and Cocoraque sites] contribute the highest values of significance to biodiversity conservation."

ECOLOGICAL VALUE OF IRONWOOD



IRONWOOD

Olneya tesota

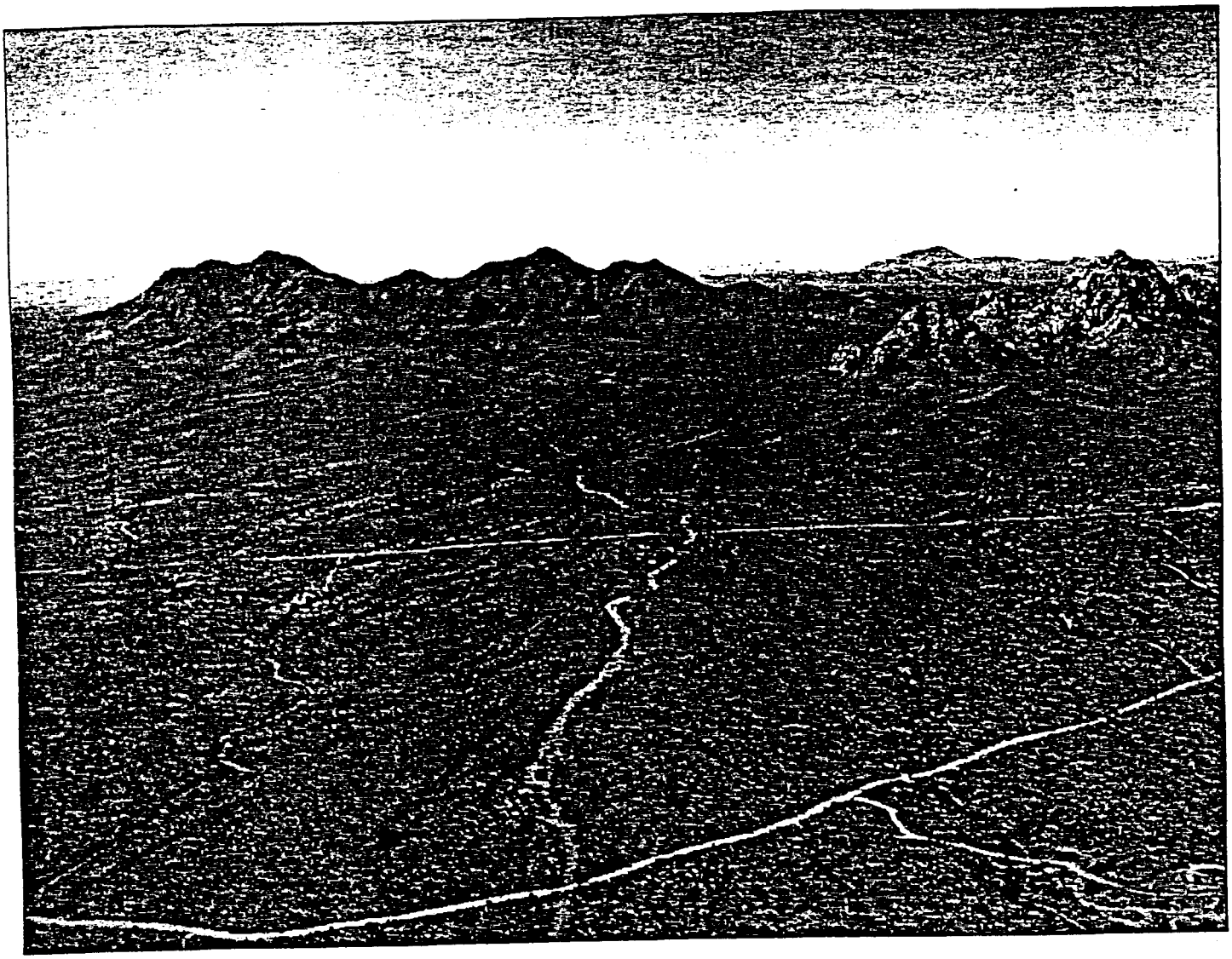
V. Cultural Resource Value of the Area

Portions of this area of the Avra Valley located to the west of the Los Robles and Brawley washes in the upper bajada and foothills of the Roskruge and Silverbell mountains have been surveyed for cultural resources. The region exhibits extensive systems of prehistoric settlement consisting of villages with public architecture, hamlets, farmsteads, agricultural fields, and a variety of specialized activity areas including rock art sites, reservoirs, quarry sites, resource processing sites, and hillside "trincheras" sites. More than 200 sites from the predominant prehistoric Hohokam period of A.D. 600-1450 have been recorded in the region, and two archaeological site districts have been listed on the National Register of Historic Places — Los Robles Archaeological District and the Cocoraque Butte Archaeological District.

At the north end of this prehistoric system is the Cerro Prieto Site, located in Pinal County just north of the Pima County line. Cerro Prieto dominates the landscape in this region rising some 700 feet from the valley floor and was clearly an important focal location for habitation and perhaps as a defensive refuge. This is a large and complex hillside "trincheras" village with more than 250 masonry rooms and numerous stone compounds, terraces, walls, and other features. Overall, the features at Cerro Prieto suggest a large, thriving early Classic period hillside settlement. Important questions remain to be addressed about its function in the Los Robles community as well as its role in regional cultural dynamics that extend from central Arizona to Sonora, Mexico.

South from Cerro Prieto in Pima County, is another significant but very different village site known as the Robles Platform Mound Community. This site appears to have been contemporaneous with the Cerro Prieto trincheras, occupied roughly from A.D. 1100-1300. Also a focal occupation site, the site is dominated by a rectangular, constructed earthen mound some 6-8 feet higher than the natural desert floor. Although no walls are visible, it is likely that there are buried adobe walls and pithouses present that define a substantial occupation during the Hohokam Classic period. Bedrock outcrops and volcanic hills in the Ragged Top, Pan Quemado, and Silverbell mountains are unusual for the number of petroglyph or rock art sites that have been recorded. There is a wide range of variation in the number and complexity of petroglyph site ranging from a handful of simple elements to hundreds of individual petroglyph elements, some of which are very complex. At the south end of this region of prehistoric settlement lies Cocoraque Butte, which is listed on the National Register. This butte and its surrounding desert floor exhibits and extensive Hohokam village and numerous rock art panels that are exceptional for their complexity of design and the number of elements. Like many rock art sites, Cocoraque Butte is considered to be a traditional cultural place by the Tohono O'odham and Hopi Indian tribes.

The western Avra Valley exhibits various elements of an extensive and complex prehistoric Hohokam community considered to be within the ancestral territory of the Tohono O'odham and certain Hopi clans. This region from the west bank of Los Robles Wash to the foothills of the Silverbell and Roskruge mountains retains significant cultural resource values and defines an intact cultural landscape created and used by the Hohokam during a time of apparent social, organizational and ideological changes that resulted in profound changes to this culture in southern Arizona.



Silverbell Mountain and Ragged Top

Pima County, Arizona

VI. Local Action in Response to Recommendations

Desert Ironwood Primer contains recommendations from the authors based on a decade of study by the science community.

The conservation related recommendations have been forwarded to the Science Technical Advisory Team for consideration as part of the Sonoran Desert Conservation Plan. County staff members have been directed to formulate a proposal for the Board's consideration which incorporates recommendations.

These include:

- Requiring assessments to determine the extent of ironwood destruction during the permitting process;
- Salvaging and relocating ironwood;
- Protecting the areas of highest density ironwood;
- Protecting and devising a corridor of stepping stone reserves within ironwood habitats for the benefit of species, including the pygmy-owl; and
- Planning and implementing protection strategies for ironwood as needed in wash, rocky slope and valley/plains ironwood habitats.

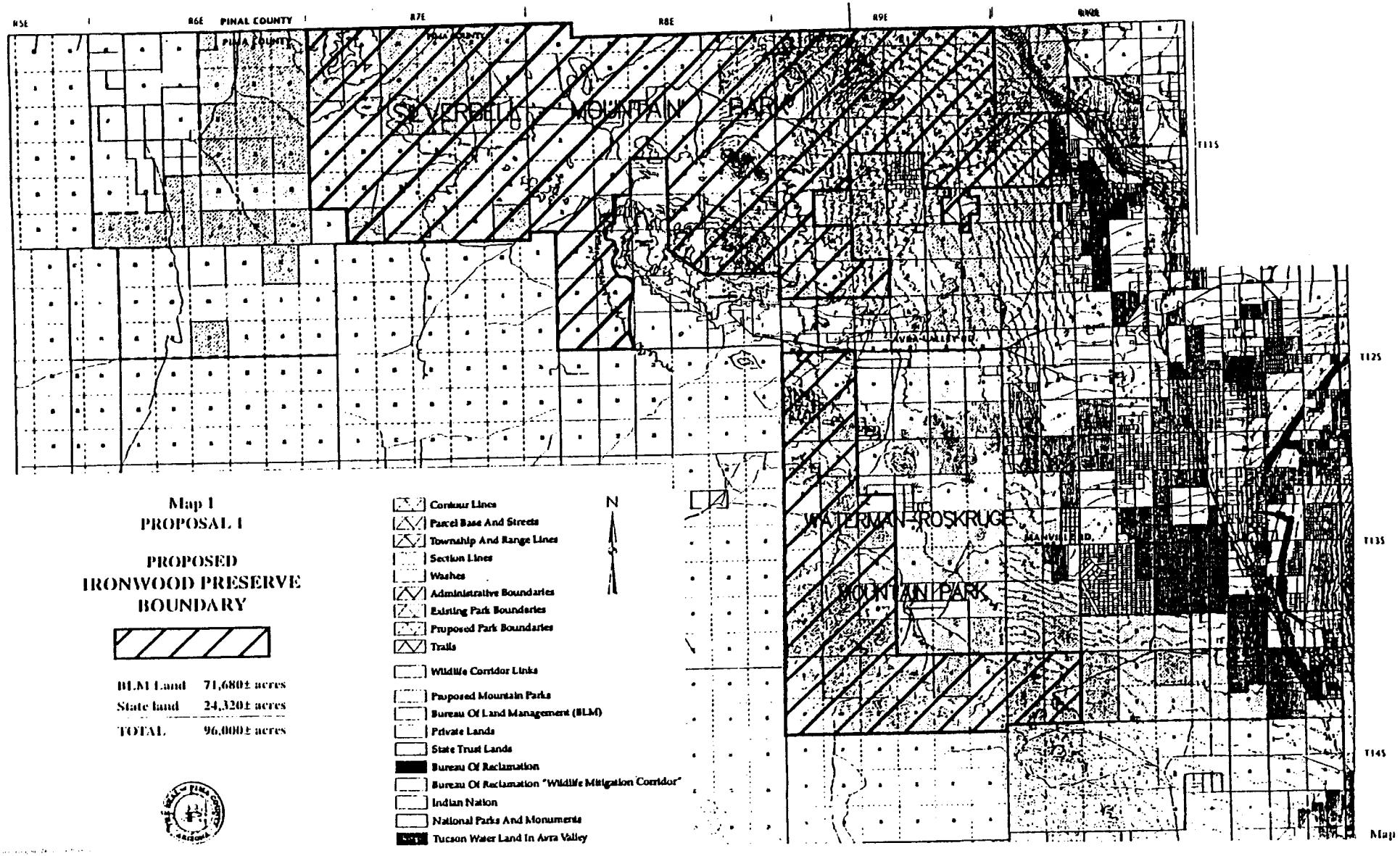
VII. Proposed Federal Action in Response to Recommendations -- Ironwood Preserve Proposal

In addition to actions at the local level, it is proposed that federal protections could be achieved through the establishment of an Ironwood Preserve. The U.S. Bureau of Land Management administers a large quantity of land in the Silverbell Mountains region of Pima County northwest of the Tucson Basin -- in fact, more than 100 sections. A large quantity of State Trust Land in excellent condition also exists in this area, and is interspersed among the BLM lands.

Maps that show land ownership and the range of options for the preserve design of the proposed Ironwood Preserve are found on the following pages. From the many options available, two proposals are mapped:

- Proposal 1 -- The more comprehensive preserve proposal includes BLM land, some State Trust lands, and a buffer of BLM land along the Tohono O'odham Nation through the Waterman-Roskruge area to the Cocoraque Butte area. The total acreage is approximately 96,000, with over three quarters of that currently in BLM ownership.
- Proposal 2 -- The second proposal mirrors the first, but excludes the land in the Waterman-Roskruge area. The total acreage is approximately 73,600. About 77 percent of that land belongs to BLM.

PROPOSED IRONWOOD PRESERVE



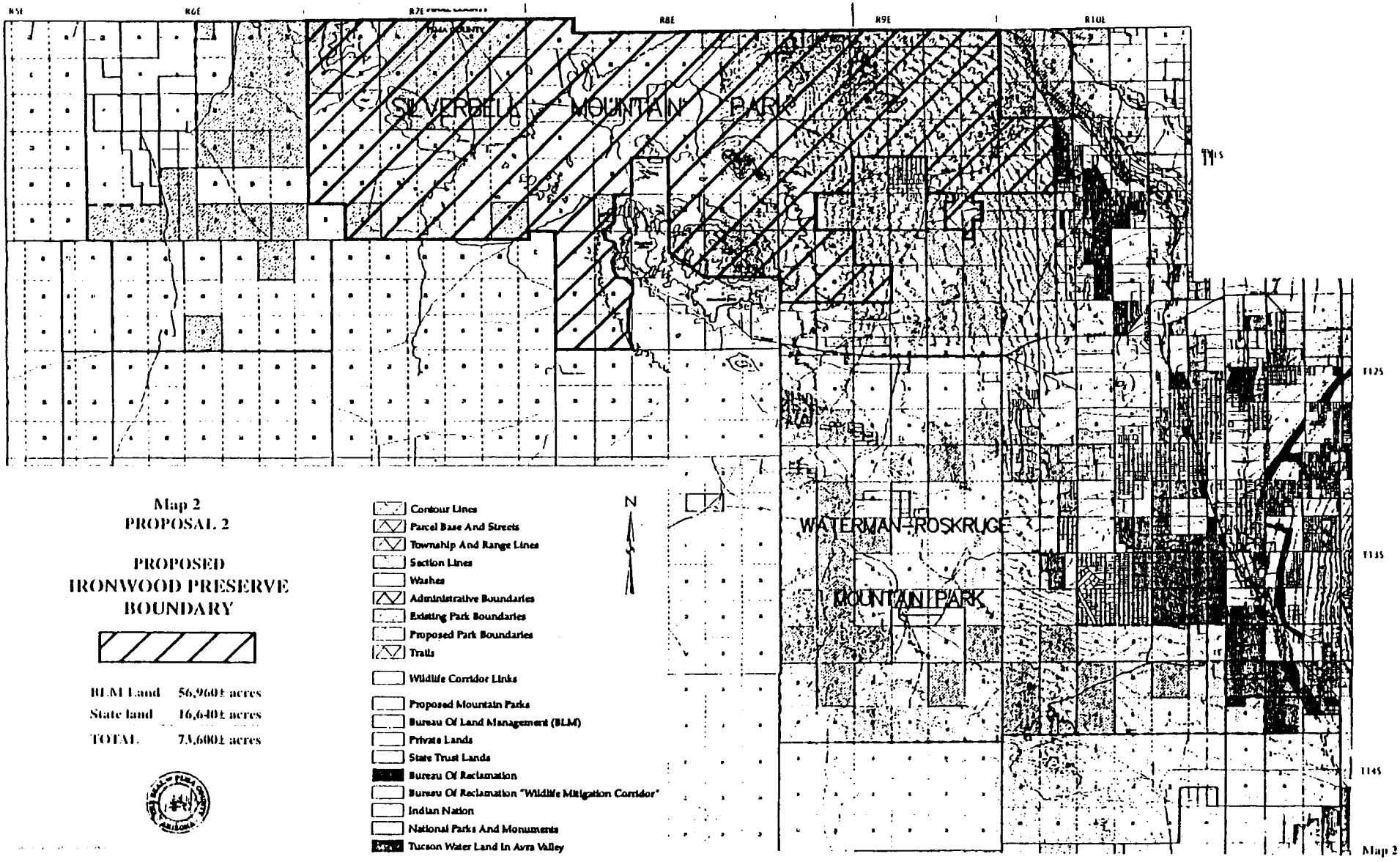
Map 1
PROPOSAL 1

PROPOSED IRONWOOD PRESERVE BOUNDARY

BLM Land	71,680± acres
State land	24,320± acres
TOTAL	96,000± acres

- Contour Lines
- Parcel Base And Streets
- Township And Range Lines
- Section Lines
- Washes
- Administrative Boundaries
- Existing Park Boundaries
- Proposed Park Boundaries
- Trails
- Wildlife Corridor Links
- Proposed Mountain Parks
- Bureau Of Land Management (BLM)
- Private Lands
- State Trust Lands
- Bureau Of Reclamation
- Bureau Of Reclamation "Wildlife Mitigation Corridor"
- Indian Nation
- National Parks And Monuments
- Tucson Water Land In Avra Valley

PROPOSED IRONWOOD PRESERVE



VIII. Conclusion

The Ironwood forest has served as a quiet but enormously important protector of species diversity within the Sonoran Desert. A Ragged Top and Silverbell Mountains Ironwood Preserve would honor this species for its role in upholding the ecosystem, protect valuable cultural resources, and the Preserve would achieve practical conservation goals that are necessary to promote the recovery of the endangered pygmy-owl.

IX. Recommendation

I recommend that the Board adopt Resolution No. 2000- _____, A Resolution to Pursue the Establishment of a Ragged Top and Silverbell Mountains Ironwood Preserve Consistent with the Sonoran Desert Conservation Plan.

Respectfully Submitted,

C. Huckelberry

C.H. Huckelberry
County Administrator

Attachment

MEMORANDUM

Date: March 24, 2000

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

From: C.H. Huckelberry
County Administrator

Re: *Resources of the Middle San Pedro*

I. Overview

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

II. Habitat and Corridors Elements

The Nature Conservancy has provided an assessment of resources of the Middle San Pedro area. The subarea concept plan found at Attachment A is a synthesis of information about the historical, social, economic, and ecological backdrop of the Middle San Pedro area. As Mr. David Harris, the author of the report, states: "The San Pedro River is considered the best example of a desert riparian system remaining in the Southwest." The report:

- Characterizes ecological processes of the area by discussing riparian and aquatic communities, water quality, native fishes, the Lowland leopard frog, riparian birds, cotton-willow forest, grassland, wetlands, the role of beaver, issues of landscape connectivity between mountain ranges, and rare plants;

- Offers a stress assessment and proposes a number of conservation zones that achieve river protection, establish corridors, and achieve watershed enhancement; and

- Suggests strategies ranging from best management practices for ranching to conservation easements to fee acquisition to retirement of mining claims.

The Nature Conservancy report is a valuable contribution that will facilitate discussion at the subarea panel level and contribute to the efforts of the Science Technical Advisory Team.

III. Riparian Element

Attachment B is a chapter of a watershed and watercourse study by authors including Barbara Tellman of the Arizona Water Resources Research Center. Human impacts on the Middle San Pedro watershed are described, along with existing public and private land uses and projected land uses. The report identifies issues for discussion in achieving a goal of watercourse protection. Similar to the report by Mr. Harris, options include preservation, ranch conservation, rivercourse rehabilitation and mining issues. Ms. Tellman will discuss her work in the context of the Middle San Pedro area at the March 25, 2000 meeting.

IV. Ranch Conservation Element

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

V. Cultural Resources Element

Attachment D is a cultural and historic resources inventory report by Mr. David Cushman, the lead staff of the Cultural and Historic Resources Technical Team. Three kinds of resources are described: archaeological sites, historic resources, and traditional cultural resources, which are all defined and quantified within the report. This highly educational document includes maps that depict: the zone of archaeological sites along the San Pedro River; general archeological site and survey locations; and archaeological sites in relation to land ownership, vegetation communities, and water sources.

VII. Land Use Considerations

Attachment E is the contribution of Mr. Ben Changkakoti of the Planning Division. This report offers information about current and planned land use, zoning, housing types, viewsheds, infrastructure (including roads, access, water, sanitary sewer, natural gas, telephone and electricity), schools, parks, open space, real estate market conditions, capital improvement projects, and permits issued for residential and commercial activities.

VIII. Conclusion

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

MEMORANDUM

Date: March 24, 2000

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

From: C.H. Huckelberry
County Administrator

Re: *Resources of the Altar Valley*

I. Overview

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

II. Habitat and Corridors Elements

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

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

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

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

III. Riparian Element

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

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

IV. Ranch Conservation Element

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

V. Cultural Resources Element

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

VII. Land Use Considerations

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

VIII. Conclusion

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

MEMORANDUM

Date: April 26, 2000

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

From: C.H. Huckelberry
County Administrator

Re: **Committed Lands in Pima County**

Report

The attached report entitled *Committed Lands in Pima County* contributes to the Sonoran Desert Conservation Plan by describing the various levels of built, zoned, and planned land within unincorporated and incorporated areas of Pima County. Maps and analysis are provided at a level of detail which differentiates approved zoning from situations where subdivision plats or development plans are in process. Further distinctions are made for situations where subdivisions and development plans are already approved. These differentiations, fully mapped, provide a data layer which reflects the various levels of constraints and opportunities to conservation goals that will arise from the ongoing biological assessments.

Watershed Descriptions

In addition to providing numerical and mapped portrayals of the status of land in Pima County, a narrative account is included for each watershed. Highlights include:

Middle San Pedro Watershed

- All private land is zoned RH (rural homestead)
- There are no approved or planned subdivisions in the watershed
- Mining operations exist under an Industrial designation

Cienega-Rincon Watershed

- About half of the land in this watershed is in federal or county ownership
- Private land not considered vacant is used primarily for grazing
- Almost 90% of the existing zoning is RH (rural homestead)
- Two specific plans have been approved for the area
- Most of the residential growth is taking place in the northern and eastern areas

Upper Santa Cruz Watershed

- Agricultural uses dominate this area
- Over 90% of the vacant land is zoned for rural homestead

Middle Santa Cruz

- This relatively urbanized watershed includes the Cities of South Tucson and Tucson
- Approximately 60% of the parcels in Pima County (5.9 million acres) are found within this watershed (362,000 acres)
- The two major zoning plans of the watershed are substantially built out: Agua Caliente-Sabino Canyon Zoning Plan and the Catalina Foothills Zoning Plan
- 7.5% of the land is currently used at a density of .75 to 3 residences per acre
- 6.6% of the land is currently used at a density of .2 to .75 residences per acre
- 3.2% of the land is currently under rural use
- 2.0% of the land is currently used at a density of 3 or more residences per acre

Tortolita Fan

- This watershed has experienced rapid population growth in recent years
- 3.8% of the land is currently used at a density of .2 to .75 residences per acre
- 2.6% of the land is currently under rural use
- 2.5% of the land is currently used at a density of .75 to 3 residences per acre
- 1.7% of the land is currently used at a density of 3 or more residences per acre

Altar Valley

- 94% of vacant land in Altar Valley is zoned rural homestead
- The majority of land in the Valley is considered vacant
- With over 700,000 acres, this is by far the largest watershed in Eastern Pima County

Avra Valley

- Like Altar Valley, Avra Valley is considered to be mostly vacant land
- 84% of zoning on vacant land is rural homestead
- Ranching and grazing are the primary uses on vacant land

Western Pima County

- Some analysis is provided for the Ajo area in Western Pima County
- 65% of zoning on vacant land is rural homestead

Summary

EXISTING LAND USE -- UNINCORPORATED PIMA COUNTY

SDCP Planning Unit	% rural	% .2. to .75 R/AC	% .75 to 3.0 R/AC	% 3.0 R/AC & HIGHER	% AG	% COM	% IND	% PUBLIC LAND	% OTHER	% VACANT
1. Middle San Pedro	0.2 %	0	0	0	9%	0.5%	0.2%	48%	1.3%	40%
2. Cienega Rincon	2 %	0.5%	0.2%	0	10%	0.2%	0.2%	50%	2 %	35%
3. Upper Santa Cruz	1 %	1 %	0.4%	0.4%	16%	0.5%	8%	**23%**	2 %	**48%**
4. Middle Santa Cruz	3.2%	6.6%	7.5%	2.0%	1.6%	0.5%	0.5%	**57%**	6.1%	**15%**
5. Tortolita Fan	2.6%	3.8%	2.5%	1.7%	8.7%	0.2%	0.4%	39%	4%	**37%**
6A. Altar Valley	1 %	0.7%	0.4%	0.1%	10%	0.1%	0	24%	0.5%	**63%**
6B. Avra Valley	1.8%	1.4%	1.4%	0	11%	0	2%	8%	4.4%	**70%**
7. Western Pima Co.	0.06%	0.05%	0.03%	0.13%	0.8%	0	0.3%	71%	1.63%	26%

ZONING ON VACANT LAND -- UNINCORPORATED PIMA COUNTY

SDCP Planning Unit	% IR	% RH	% SR/SH	% CR1-3	CR 4-5	% GR	%TR	MH/TH	% CB	OTHER
1. Middle San Pedro	0	**100 %**	0	0	0	0	0	0	0	0
2. Cienega Rincon	2 %	**88 %**	2 %	0	0	4 %	0	0	0	4 %
3. Upper Santa Cruz	2 %	**92 %**	0.3 %	0.7 %	0	3 %	0	0	0	2 %
4. Middle Santa Cruz	2.%	0	49%	17%	1.5%	4.4%	0.9%	0.6%	1.4%	23%
5. Tortolita Fan	0.05%	83%	10.5%	0.6%	0.6%	3.7%	0.2%	0	0.4%	1%
6A. Altar Valley	0.1%	**94%**	0.6%	1.8%	0.1%	1.8%	0.1%	0.1%	0	1.4%
6B. Avra Valley	9.3%	**84%**	2%	0	0	3.7%	0	0	0	1%
7. Western Pima Co.	25%	65%	0.6%	1.5%	0.8%	0.2%	0	0.4%	0.2%	6%

Conclusion

A significant amount of land, currently zoned as rural homestead, exists in the areas surrounding the Middle Santa Cruz watershed. A rational, fact-based approach to balancing issues of urban form, conservation, and planned development is entirely possible, if state lands are planned responsibly, and unregulated development that is proliferating under state law is curbed, in the near term.

MEMORANDUM

Date: April 28, 2000

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

From: C.H. Huckelberry
County Administrator

Re: ***Resources of the Avra Valley***

I. Background

This memorandum provides a brief summary of a compilation of resource investigations that have been submitted so far, to help develop the Sonoran Desert Conservation Plan within the watershed planning area of the Avra Valley. The Steering Committee, interested members of the public, and stakeholding private citizens and governmental entities are invited to submit additional documents and comments.

Presentations at the April 29, 2000 Steering Committee meeting will be followed by subarea land panel meetings for all interested parties so that topics ranging from biological, to riparian, to ranch, to cultural, land and fiscal resources can be discussed in greater detail. Contributions resulting from the subarea process will be forwarded to the Steering Committee, Technical Teams, and the Board of Supervisors for consideration.

The attached document, *Resources of the Avra Valley*, also includes a number of proposals related to the Ironwood Preserve. On February 22, 2000, the Arizona-Sonora Desert Museum published the *Desert Ironwood Primer,* which established the importance of ironwood as a habitat modifying keystone species and nurse plant that has a role in supporting the biodiversity of over 500 Sonoran Desert species, including the endangered cactus ferruginous pygmy-owl.

Some of the findings of the study by the bi-national team of scientists led by Dr. Gary Nabhan were that:

- The ironwood-bursage habitat in the Silverbell Mountains of Pima County is associated with 674 species, including 64 mammals and 57 bird species;
- Within the Sonoran Desert the Ragged Top site ... contributed the highest levels of species richness of the study;
- "Ironwood generates a chain of influences on associated understory plants, affecting their dispersal, germination, establishment, and rates of growth. ... Ironwood is the dominant nurse plant in some subregions of the Sonoran Desert;"

- "The mere presence of ironwood and other legume trees can increase the number of bird species in desertscrub habitat by 63%;"
- "Recent studies show that without the protective cover of the desert legumes, the distributional ranges of saguaro, organ pipe, and senita cactus would retreat many miles, to more southern, frost-free areas;"
- "Protecting ironwood habitat in Pima County, Arizona, will benefit a different mix of native species than would be conserved in ironwood habitats currently being protected on the islands or coasts of the Gulf of California;"
- "North of the U.S. - Mexico border, the highest ironwood densities we recorded per hectare came from Arizona Uplands sites in Pima County (Ragged Top, 35 trees/ha; Cocoraque and Saguaro National Park West 22 trees/ha);"
- The United States offers limited protection for ironwood, compared to Mexico, despite the importance of the ironwood stands to the species itself, and to the larger Sonoran Desert system;
- The Ragged Top and Cocoraque Rock areas are identified by the science community as priorities for new protection and for strengthened conservation management;
- In addition to its valuable rock art sites, the Cocoraque Butte, listed in the National Register, is considered to be a traditional cultural place by the Tohono O'odham and Hopi Nations.

Following the publication of the *Ironwood Primer*, Pima County drew up a concept proposal for an Ironwood Preserve, which acknowledged that in addition to actions at the local level, federal protections could be achieved through the establishment of a Ragged Top and Silverbell Mountains Ironwood Preserve.

The attached document further develops this proposal by compiling twelve new studies and goals statements by scientists, landowners, conservationists, hydrologists, ranchers, cultural resource managers, economists, mining interests, and land use planners. These studies are summarized in part within this memorandum, and presented in the context of the major elements of the Sonoran Desert Conservation Plan: Habitat and Corridors; Riparian Protection; Ranch Conservation; and Cultural Resources. Land use and economic considerations are also covered.

Following discussion and development of these ideas, a revised proposal may be created by Pima County and forwarded to federal representatives, to reflect new information and the overall wishes of the local community.

CONTENTS AND ATTACHMENTS

II. Habitat and Corridors Elements

Geological and Ecological Diversity in the Proposed Ironwood Preserve

The Arizona-Sonora Desert Museum has provided an assessment of resources of the Silverbell, Ragged Top, Waterman, and Roskruge mountains. The summary of the study, found at Attachment A, includes the following points:

- "The geologic and topographic diversity contributes to the area's high biological diversity. For example, there are 484 taxa (species and subspecies) of plants in 72 families within the study area. Although Saguaro National Park and Organ Pipe Cactus National Monument have substantially larger floras, the study area is considerably richer than typical desert ranges such as the South Mountains (274 taxa) or the Sierra Estrella (330 taxa)."

- "The Silverbells have only half as many exotic plants as the two major preserves in Pima County, reflecting a lower degree of human disturbance."

- "The Silverbell Mountains support the highest densities of desert ironwood trees recorded to date in the Sonoran Desert. The ironwoods here harbor more associated plant species than anywhere else studied."

- "A total of 177 vertebrate species and at least 821 invertebrate species have been recorded in the study area. These numbers include several species federally listed as Threatened and Endangered, including historic and potential habitat for the Cactus Ferruginous Pygmy-Owl. The desert bighorn sheep in the Silverbells may represent the last viable population indigenous to the Tucson basin."

- "Other species of concern harbored in the study area include California leaf-nosed bat, Mexican long-tongued bat, lesser long-nosed bat, western red bat, Merriam's mesquite mouse, Rufous-winged Sparrow, Tucson shovel-nosed snake, ground snake, Pima pineapple cactus, Nichol's turk's head cactus, and three talus snails."

- "The Waterman Mountain range along with the Vekol Mountains the Tohono O'odham [Nation] are the only massive limestone mountains within Arizona Upland."

- "The Watermans support 29 plant species, including the federally endangered Nichol's turk's head cactus, that do not occur anywhere in the rest of the area. This cactus is known from only three localities in Arizona and a fourth in Sonora."

- "The study area could form the cornerstone for protecting the range of ancient ironwood and cactus habitats, which vary from upland habitats, across bajadas to floodplains on valley floors."

The assessment by the Arizona-Sonora Desert Museum is a valuable contribution that will facilitate discussion at the subarea panel level and contribute to the efforts of the Science Technical Advisory Team.

Landowners Report, Ragged Top-Silverbell Mountain Area -- Ironwood National Monument

Attachment 2 is submitted by a group of landowners from the section of private land near Ragged Top Mountain. Divided into parts, the report contains a description of the area, a mission and vision statement, proposed boundaries, highlights from Secretary Babbitt's March 24, 2000 speech to the BLM, a report by BLM biologists, a letter from Dr. Paul Krausman of the University of Arizona, and a list of suggested uses within the proposed national monument.

The mission statement reads as follows:

> "We are landowners in the Ragged Top - Silverbell Mountain Area who wish to protect this beautiful and unique area for all present and future generations. We will work to provide protection for all the vulnerable plants, animals, cultural and historic sites, and the water in the area. We are particularly concerned about the ancient ironwood trees, the pygmy-owl, the desert bighorn sheep, and the watershed.
>
> We are willing to work with the County and the BLM as well as all of the various BLM and State lease holders in the area including the ranchers, the gliderport, the jeep trail guides, and our neighbor to the south, Asarco to develop a management plan for the area. We believe that good stewardship of the land includes good management of herds of animals by Arizona Game and Fish. We want the public as well as the lease users to enjoy the area and respect the needs of all species. We are willing to make adjustments to our plan whenever the animals and plants need extra protection from human encroachment and activities."

The vision statement reads:

> "Our vision is the establishment of the Ironwood National Monument, for all future generations to see and enjoy. The combined stewardship of all interested parties will make this a reality. We would like to establish the largest possible boundaries for the Monument that will respect private property and yet provide sufficient habitat preservation to ensure the survival of vulnerable plant and animal species."

A report by BLM biologists reviews the sensitive habitat and species in the area. A letter from Dr. Paul Krausman discusses Bighorn Sheep in the area.

The report from the landowners includes these suggested uses within the proposed national monument:

- Higher level of protection for the densest areas of Ironwood trees.
- Protected area for desert bighorn sheep
- Protection and management for pygmy-owls and lesser long nosed bats
- Buffer zones for cattle grazing, managed to optimize the ecosystem
- Designated hiking trails and camping areas
- Prohibit off-road vehicle use
- Provide hunting permits as deemed appropriate by resource agencies
- Prohibit new mining on public land and reclaim sites
- Monitor and protect ancient petroglyphs
- Maintain access for recreational use

The summary of the report by the landowners states in part and concludes that:

> "We are deeply encouraged by the new directives that Secretary Babbitt has given to the Bureau of Land Management. We believe that with the support of the BLM, the community, and all the scientists and interested parties, we can develop a land management plan that will protect this fragile area and allow the community and all visitors to enjoy the beauty and serenity forever."

Proposal for Establishment of a Morris K. Udall Ironwood-Upland Corridor National Monument Located in Pima and Pinal Counties of Arizona

Attachment 3 is submitted by the Coalition for Sonoran Desert Protection, an alliance of forty-two conservation groups and neighborhood associations. Expanding on the original concept proposal for an Ironwood Preserve, the Coalition recommends that an Ironwood Forest-Upland Corridor National Monument be created "in order to realistically promote recovery of the endangered cactus ferruginous pygmy-owl" since "we cannot continue to focus on single sites and expect adequate protection." The Coalition also would like to see the proposed monument named for the late Congressman Morris Udall, as a tribute to his leadership in conservation.

Encompassing 479,000 acres in Pima and Pinal Counties, the proposed Monument includes these nine biologically connected units:

(1) Silverbell-Ragged Top unit;
(2) Waterman -Roskruge unit;
(3) Tortolita-Durham Hills unit;
(4) Tortuga unit;
(5) Sawtooth unit;
(6) Picacho unit;
(7) Cat Hills-Grayback unit;
(8) Box Canyon unit; and
(9) the Tortilla unit.

This recommendation for management of the land is offered: "The establishment of a monument should ... limit management discretion by mandating protection of the historic and scientific objects within the proposed Monuments."

A lengthy report on the resource base follows, covering geological resources, surface hydrology, biological resources, archaeological resources, and cultural resources. Potential threats to the area are identified as grazing, mining, off-road vehicle use, and conversion of state lands.

Proposal in Support of the Ironwood Preserve

The March 2000 concept proposal from Pima County is included at Attachment 4. Two reserve designs are suggested, covering 96,000 total acres, or 73,600 acres. Both proposals cover less of a land base than suggestions from the science, landowner and conservation community.

Proposal One: One proposal would protect both the Ragged Top and Cocoraque areas, and bring over 71,000 acres of land owned by the Bureau of Land Management into protective status. A checkerboard of approximately 24,000 acres of State Land could contribute to the contiguity of the preserve land and bring important slope and xeroriparian areas into protection. This proposal includes a buffer along the Tohono O'odham Nation which would protect important cultural resources and include the Cocoraque area that is so rich in biological and cultural resources.

Proposal Two: A second proposal protects Ragged Top and brings approximately 57,000 acres of BLM land into protection. Another 16,640 acres of State Land could add to an even more biologically sound preserve design. The Ragged Top area, shown on the next page, is considered to offer the highest value in terms of species diversity and richness and in terms of the density of the Ironwood forest itself.

III. Riparian Element

Cocio Wash and the Gila Topminnow

Attachment 5 is a study by Pima County, in collaboration with fish biologists, on the fate of the Gila Topminnow in the Silverbell area. The Gila Topminnow was considered to be among the most common of fishes in the Santa Cruz River system in the early 1940s. Three decades later it was considered endangered; and in another three decades time, its recovery is not foreseeable by the science community, given the piecemeal approach to protection efforts. The most recent draft recovery plan for the Gila Topminnow states that "delisting of the subspecies is not considered feasible in the foreseeable future." Avoiding extirpation of the less-than-twenty populations that existed in 1997, and reintroduction of populations, constitute the modest strategies of the draft plan.

The report at Attachment 5 entitled *Cocio Wash and the Gila Topminnow* chronicles how the intention to conserve a relic population of Gila Topminnow under current resource conditions is generally insufficient. As is true in most local riparian areas, and even in some upland areas, we have let the resource base degrade too far to expect project and site specific responses to stem losses, much less lead to recovery. I would add that the regulatory schemes offered by the Endangered Species Act, when applied on the project-by-project level, also serve as disincentives to proactive recovery programs. Recovery efforts have been concentrated on federal land, but as the attached report indicates, "most perennial waters in the Southwest are controlled by private parties." Therefore, meaningful recovery will have to involve private parties, and will have to provide rewards for conservation efforts.

Pima County has within its ownership at least two areas that could serve as potential sites for the recovery of Gila Topminnow and other native fish: the Agua Caliente Park and the downstream segment of the Cienega Creek Preserve. I have directed staff to work with fish biologists and resource agencies to open up County parks for recovery of native fishes. That collaboration has already started. I have also directed staff to work with the regulatory agencies to create an incentive program and safe harbor options as part of the Sonoran Desert Conservation Plan so that once the County model is established, private parties will have assurances that their willingness to play a proactive role in resolving our local endangered species dilemmas will be rewarded. Perhaps at that point the half century decline in native fish populations can begin to be reversed. As the attached report indicates, the system for protection that is currently in place is not going to be enough.

Pima County's Watersheds and Watercourses

Attachment 6 is a chapter of a watershed and watercourse study by authors including Barbara Tellman of the Arizona Water Resources Research Center. Human impacts on the Avra watershed are described, along with existing public and private land uses and projected land uses. The report identifies issues for discussion in achieving a goal of watercourse protection.

IV. Ranch Conservation Element

Mission Statement of the Avra Valley / Silverbell Conservation Alliance

Attachment 7 is a draft mission statement from the ranch community in the Silverbell area. Eight principles are identified including:

- Continued cooperation with government entities
- Preservation of open spaces
- Protection of endangered species, honey production and dark beautiful skies for star gazing
- Continuation of economically productive use of land
- Protection of the landowner's ability to manage and improve lands with independence, flexibility and predictability
- Ability to maintain and accelerate the rate of resource improvement
- To assist and advise appropriate land and resource management agencies for the next 100 years
- To preserve the private property rights and associated land values.

Ranching in the Avra Valley

Attachment 8 includes a descriptive summary of Ranching in the Avra Valley, drafted by Ms. Linda Mayro, the lead staff of the Ranch Conservation Team. Ranches in the area are described, along with grazing allotments, the carrying capacity per square mile by grazing allotment, the role of stock tanks and other ranch related resource topics.

V. Cultural Resources Element

Attachment 9 is a cultural and historic resources inventory report by Mr. David Cushman, the lead staff of the Cultural and Historic Resources Technical Team. Three kinds of resources are described: archaeological sites, historic resources, and traditional cultural resources, which are all defined and quantified within the report. This document includes maps that depict: the zone of archaeological sites in the Avra Valley; general archeological site and survey locations; and archaeological sites in relation to land ownership.

VII. Land Use Considerations

Mining Interests in the Ironwood Preserve Area

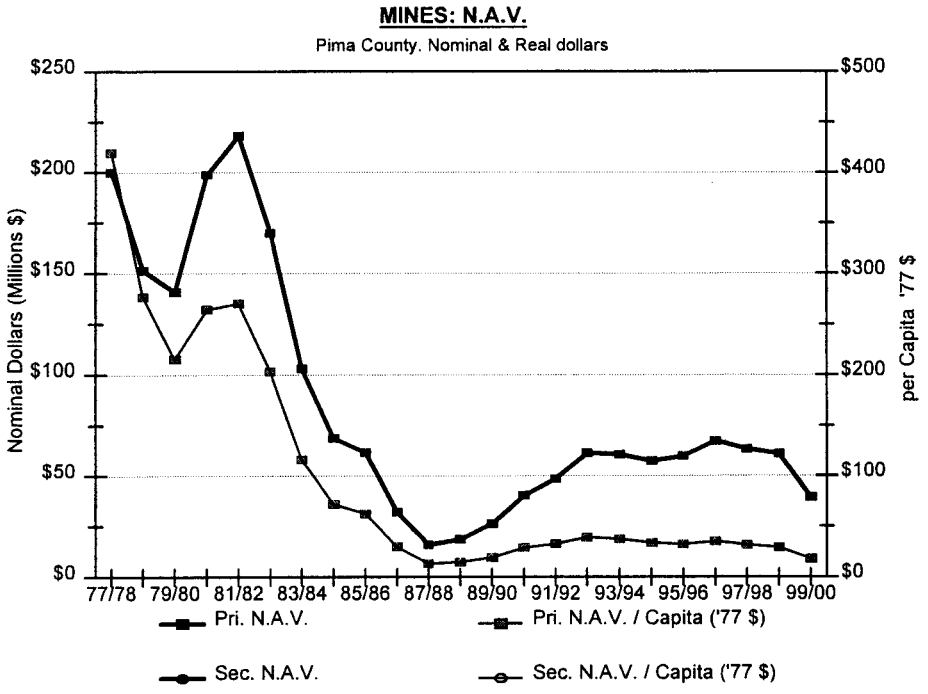
Attachment 10 discusses property valuation issues and property classification of the mining interests in the Ironwood Preserve area. The larger context of the status of Pima County mining property in relation to the tax base includes these four understandings:

1. Primary Net Assessed Value: In fiscal year 1999-2000, the Primary Net Assessed Value of mines was 1% of the total Net Assessed Value of Pima County. In 1977, mines constituted more than 15% of the Pima County tax base.

2. Full Net Value: In fiscal year 1981-82, the Full Net Value of mines in Pima County was at a high of almost $420 million. During the next six years, the value plummeted 79.2% to $87.2 million. Since 1987, the value has crept to $158 million.

3. Assessment Ratios: Assessment ratios have dropped for mining property from 60% in the late 1970s down to 25% in fiscal year 1999-2000. Records reflect that most of the Asarco Silverbell mine is covered by a classification under state law which drops the assessment ratio to 5 %.

4. Net Assessed Value: Net Assessed Value has dropped 91.5% in response to the combined effects of lower market values and dropping assessment ratios.



In the Silverbell area, the majority of the holdings owned by mining interests are owned by Asarco. Asarco holdings in the Silverbell area recently taxed by the Pima County Assessor have a full cash value of $69.8 million. The total land area in acres is 18,217.5. All other mining interests in the area have a full cash value of $424,848, and cover 843.3 acres.

Under state law, a low assessment ratio (of 5%) applies to much of the Asarco holdings. This low ratio is due to a state law (41-1514.02) that allows the state department of commerce to "establish and conduct an environmental technology assistance program to promote business and economic development by recruiting and expanding companies that manufacture, produce or process solar and other renewable energy products or products from recycled materials." As a result of having the main value of the mine fall under the most minimal assessment ratio, the actual taxes paid by the mine are relatively small. Although the Full Cash Value of the property covered by the reduced ratio is $54 million, the assessed value is $2.7 million. The Pima County primary levy resulted in an Asarco payment of $299,391. The secondary tax payment by the mine was $95,477.

Dividing this total amount of $394,868 across the 18,217.5 acres of holdings, the mine paid Pima County $21.68 per acre in taxes. To put this in perspective, a comparison could be made to the contribution of the mine to a representative section (square mile) of land developed for residential use through the regulated process. In a recent County study of nearly 100 sections of land developed at different densities, a section of platted residential development generally contributed from $400,000 to $1.4 million per section, with most falling between $500,000 and $800,000, and the average of platted sections in the study paid $621,812 to Pima County in primary and secondary taxes. Dividing this average amount across 640 acres (one section), the average section of platted residential development paid $972 per acre -- almost 45 times more per acre than the major mining interest in the Silverbell area paid. Residential development has an assessment ratio of 10%. It would not be unreasonable to conclude that regulated development is almost 45 times better for the property tax base than mining land use.

Mining and Mineralization in the Silverbell Mountains

Attachment 11 is from Asarco. The document describes the long history of mining in the Silverbell area, the footprint of the mining district, recent investments by the company in technology, the known geology of the area, and the current and future exploration potential of the area. Economic benefits to the state, county and community are discussed. Disparities exist between the perspectives of the company and the county, however, these differences can be discussed during the land panel process so that a common understanding of the data and assumptions is reached. The role of regulatory issues is discussed, covering air quality, waste inspections, mine reclamation, and wildlife projects. A map of the Asarco Silverbell Mine property and a proposed buffer zone has been forwarded by the company.

Land Use in Avra Valley

Attachment 12 is the contribution of Mr. Ben Changkakoti of the Planning Division. This report offers information about current and planned land use, zoning, housing types, viewsheds, infrastructure (including roads, access, water, sanitary sewer, natural gas, telephone and electricity), schools, parks, open space, real estate market conditions, capital improvement projects, and permits issued for residential and commercial activities.

VIII. Conclusion

After subarea meetings are held, additional contributions and comments are received, discrepancies are eliminated in the data of individual reports and resource reports are perfected, a synthesizing subarea evaluation will be drafted that includes landowner goals and suggestions for conservation strategies. This initial presentation of resource information is intended to both educate and serve as an invitation to greater participation in crafting the Sonoran Desert Conservation Plan.

MEMORANDUM

Date: May 8, 2000

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

From: C.H. Huckelberry
County Administrator

Re: ***Resources of the Cienega-Rincon Valley***

I. Background

This memorandum provides a brief summary of a compilation of resource investigations that have been submitted so far, to help develop the Sonoran Desert Conservation Plan within the watershed planning area of the Cienega-Rincon Valley. The Steering Committee, interested members of the public, and stakeholding private citizens and governmental entities are invited to submit additional documents and comments. Presentations at the May 20, 2000 Steering Committee meeting will be followed by subarea land panel meetings for all interested parties so that topics ranging from biological, to riparian, to ranch, to cultural, land and fiscal resources can be discussed in greater detail. Contributions resulting from the subarea process will be forwarded to the Steering Committee, Technical Teams, and the Board of Supervisors for consideration.

CONTENTS AND ATTACHMENTS

II. Habitat and Corridors Elements

Landowners Position Statements, SDCP and Davidson Canyon Natural Preserve

Attachment 1 is submitted by a group of landowners from the section of private land near the proposed Davidson Canyon Natural Preserve. The Andrada Property Owners Association, representing 240 acres of land east of the Old Sonoita Highway, have forwarded eight position statements which are summarized below:

- "The Sonoran Desert and the Davidson Canyon riparian area are valuable natural resources that contribute to the quality of our lives and should be protected for generations to come"
- "While the Andrada Property Owners respect the rights of the public to enjoy these natural resources, they also request that the public access to the proposed Davidson Canyon Natural Preserve be developed in a way that is respectful of our property rights and privacy of our homes."
- "The Andrada Property Owners have established a set of Covenants, Conditions, Restrictions and Water Rights (CC&Rs) which are consistent with preservation of the Sonoran Desert and the Davidson Canyon Natural Preserve while permitting the homeowners to live in harmony with the environment."
- "Neighboring ranches, the Andrada Ranch and the Bar V Ranch, engage in activities that are consistent with the intent of the Sonoran Desert Conservation Plan and should be supported in an effort to preserve open space."
- "Mining presents a clear and present threat to the Sonoran Desert Conservation Plan and the Davidson Canyon Natural Preserve."
- "Rapid and uncontrolled residential development presents another serious threat to the Sonoran Desert Conservation Plan and the Davidson Canyon Natural Preserve."
- "The State Land Department and State Land Commission must be active and supportive partners in the development of the Sonoran Desert Conservation Plan."
- "Pima County must prioritize a set of interim policies to prevent destruction of critical environments prior to full implementation of the Sonoran Desert Conservation Plan."

The Proposed Las Cienegas National Conservation Area

Attachment 2 is Resolution No. 1999-204, passed by the Board of Supervisors on October 5, 1999, in support of the proposed Las Cienegas National Conservation Area. The legislation proposed by Congressman Jim Kolbe for the Las Cienegas National Conservation Area is a practical and progressive response to natural resource and fiscal management issues in Pima County. It has broad public support and complements the goals of the Sonoran Desert Conservation Plan. The Sonoran Desert Conservation Plan includes six major elements, all of which are found in the land base that makes up the proposed Las Cienegas National Conservation Area. These elements are:

Ranch Conservation	Mountain Park Expansion
Historic and Cultural Preservation	Establishment of Biological Corridors
Riparian Restoration	Critical and Sensitive Habitat Protection

The National Conservation Area legislation provides the opportunity to consolidate public ownership and management of the Cienega watershed and set specific management guidelines to ensure conservation of riparian and grassland ecosystems. It also represents a milestone in the development of the Sonoran Desert Conservation Plan.

The origins of this proposal date back more than a decade. In 1987, Pima and Santa Cruz Counties urged the Arizona Congressional delegation to authorize the Bureau of Land Management (BLM) to acquire the privately-owned Empire-Cienega Ranch. Through subsequent land exchanges, the BLM acquired roughly 42,000 acres of deeded land and assumed management of another 57,000 acres of state grazing land. The acquisition marked the beginning of a local effort to control urban sprawl, maintain open space through ranch conservation, provide for public recreation, and protect native plants and wildlife. Toward this end, Pima County established Colossal Cave Mountain Park and Cienega Creek Natural Preserve and acquired several adjacent ranches at a cost of approximately $14 million. These acquisitions brought nearly 5,800 acres into public ownership, and included management of over 31,000 acres of State Trust land leased for grazing.

Purpose of the Proposed Las Cienegas National Conservation Area

The proposed Congressional legislation will elevate the conservation status and establish a "Las Cienegas National Conservation Area." If enacted, it will be similar to the 1988 legislation which authorized the 56,000 acre San Pedro Riparian National Conservation Area in Cochise County.

Purpose - The stated purpose for establishing the Las Cienegas National Conservation Area is to "conserve, protect, and enhance for the benefit and enjoyment of present and future generations the unique and nationally important aquatic, wildlife, vegetative, agricultural, archaeological, paleontological, scientific, cave, cultural, historical, recreational, educational, scenic, rangeland, and riparian resources and value of the public land ... while allowing environmentally responsible and sustainable livestock grazing and recreation to continue in appropriate areas."

Within this opening statement of the legislation, each of the six elements of the Sonoran Desert Conservation Plan finds support, including (1) Corridor Protection for wildlife; (2) Protection of Critical and Sensitive Habitat; (3) Riparian Restoration and water resource protection; (4) Mountain Park and recreation goals; (5) Ranch Conservation; and (6) Historic and Cultural Preservation.

As a watershed unit, the entire Las Cienegas basin also fits well within the ongoing process for developing the Sonoran Desert Conservation Plan. A July 1999 report to the Board described how research was being conducted in subarea planning units based on watersheds, since the riparian link to subareas enhances the ecosystem integrity of the Sonoran Desert Conservation Plan. The Cienega-Rincon watershed planning unit includes lands within the proposed Las Cienegas National Conservation Area.

Habitat and Corridor Considerations of the Las Cienega National Conservation Area

Preserving large blocks of suitable land and important wildlife movement corridors is necessary to maintain the present diversity of plant and animal life in the area. The BLM's acquisition of the Empire-Cienega Ranch in 1988 was a good start in this respect. BLM has, since then, substantially improved habitat conditions for several species of wildlife.

The southeast corner of Pima County plays an important role in the overall conservation plan. Traditionally, grassland in southern Arizona has been subject to extensive development, while mountainous land has been isolated in separate Coronado National Forest units, the so-called "sky islands."

But many wildlife species, principally large mammals and birds, depend at some point in the year upon the availability of lower elevation plant communities lying outside National Forest boundaries. The uplands are habitat for grassland-dependent wildlife such as the Chihuahuan Pronghorn, Baird's Sparrow and Sprague's Pipit.

The Las Cienegas National Conservation Area, particularly if it adopts management goals that are adaptive and developed in a manner consistent with the Sonoran Desert Conservation Plan, will preserve wildlife movement corridors linking a number of mountain ranges to the Cienega Creek corridor and adjacent grasslands. The area involved also allows animals to take advantage of local variations in rainfall and elevation, and to respond to periodic fires.

Riparian Protection as a Result of the Las Cienegas National Conservation Area

Depletion of water tables and surface water diversions have led to the loss of riparian habitat and to the precipitous decline in the populations of many species. The Science Technical Advisory Team for the Sonoran Desert Conservation Plan has received a report which found that over 100 plants and animals in Pima County are vulnerable. A disproportionate number of extirpated native species are (or were) dependent on aquatic habitat which is now lost.

Riparian habitat itself has been targeted by the Team for protection under the Sonoran Desert Conservation Plan. Another report to the Team confirms the need for such attention; in answer to the question of what percentage of each vegetation community exists in public preserves, riparian habitat was found to be the most unprotected, with a range of 67 percent to 100 percent of the existing community lacking representation in the current system of public land preserves. Threats to the riparian resources and wildlife community within the proposed Las Cienegas National Conservation Area include the following:

1. Much of the proposed National Conservation Area lies outside the Tucson Active Management Area (TAMA), wherein groundwater pumping is restricted and water conservation measures are required. Even within the Tucson Active Management Area, measures are not taken to conserve the shallow water tables upon which riparian areas depend.

2. The Desert Fishes Recovery Team, comprised of scientists from a variety of state and federal agencies, has listed Cienega Creek as its top priority for protection. The remnant cienegas and desert wetlands along this stream are home to the endangered Gila Topminnow and Huachuca Water Umbel as well as the Lesser Long-nosed Bat. The Chiricahua Leopard Frog, Gila Chub, and Yellow-Billed Cuckoo also occur within the proposed National Conservation Area. These are species which may soon become listed as endangered or threatened .

3. In general, mesquite woodlands, fish, frogs and cottonwood trees along Cienega, Davidson, Wakefield, Mescal and Agua Verde Creeks all depend on the presence of a shallow water table..

Potential benefits from the Las Cienegas National Conservation Area include at least that perennial stream segments could be protected and restored, and thus contribute to recovery of several species listed under the Endangered Species Act.

Historic and Archeological Considerations of the Las Cienegas National Conservation Area

Over 615 archaeological sites have been recorded in the proposed National Conservation Area. Most of our knowledge of the life paths of prehistoric culture groups in southern Arizona are based on prehistoric adaptations to the Arizona upland component of the Sonoran Desert. Little research has been conducted in semi-arid and arid grassland environments of the Cienega Valley. Therefore, the potential difference in prehistoric adaptive strategies in grassland and Sonoran Desert environments is not well understood. Preservation of prehistoric sites in the Cienega Valley will allow the various prehistoric adaptive strategies to be studied and compared. Such comparisons are necessary to understand how culture groups respond to different environmental variables. Cienega Valley sites are also ideally situated to address questions relating to the social interaction of prehistoric culture groups occupying the Santa Cruz and San Pedro river valleys.

The area also contains a number of historic sites worthy of conservation. Over 65 historic period sites associated with ranching, mining, and transportation activities have been identified. These sites include historic ranches (e.g., the Empire, Gardiner, O'Leary, Hopley and Kane ranch), historic towns (e.g., Greaterville and Pantano), mines (such as Total Wreck Mine and other mining claims), and historic travel routes (e.g., the Butterfield Stage Line, Southern Pacific Railroad, and historic road alignments of State Route 83 and 88).

Ranch Conservation Considerations of the Las Cienegas National Conservation Area

The proposed National Conservation Area supports the element of the Sonoran Desert Conservation concept which seeks to keep ranches from being subdivided. Today, ranching is giving way to subdivisions and second home development, and portions of the proposed National Conservation Area near Vail and Empirita Ranch have conditional zoning for urban, commercial, and industrial development. The Empire-Cienega Resource Conservation Area has become a laboratory for the exercise of a conservation ethic which reflects the growing understanding among the ranch community that science-based practices and protection of habitat lead to ecologically sound and financially viable ranching. The Las Cienegas National Conservation Area legislation promotes the continued extension of these practices to other neighboring ranches, while protecting them from urban encroachment.

Public Recreation Considerations of the Las Cienegas National Conservation Area

The proposed Las Cienegas National Conservation Area could facilitate the development of recreation management strategies. The recreation opportunities are numerous. The Arizona Trail corridor will pass through a considerable portion of the proposed NCA. The Arizona Trail is a 750 mile non-motorized recreational trail that stretches from Utah to Mexico, passing through some of Arizona's most scenic back country. The trail is now nearly 70 percent complete. It is open to hikers, equestrians and mountain bicyclists. Fifteen trails listed on the Eastern Pima County Trail System Master Plan (Pima County Ordinance No. 1996-75) cross or are located within the proposed National Conservation Area, including two utility corridor trails that will link with the Arizona Trail. These trails are presently being used for recreational purposes. Hunting areas in eastern Pima County have been reduced by development, but hunting is also occurring within the proposed Area and will be permitted under the proposed legislation.

Summary

By making a long term commitment to conserve natural resources in defined parts of the region, we will also create certainty for other land uses under within the region. The proposed National Conservation Area, consistent with the Pima County Sonoran Desert Conservation Plan initiated by the Board of Supervisors, holds a great deal of promise for the long term stability of the economic and natural resources of our region.

Excerpts, Biological Stress Assessment and Review of Vulnerable Species

Attachment 3 is the Cienega-Rincon chapter from the Biological Stress Assessment, issued by Recon consulting as part of the biological evaluation in March of 2000. The *Biological Stress Assessment* examines past land and water uses, existing uses, and some major uses foreseeable over the next 30 years in an effort to determine the greatest potential threats to vulnerable species within each watershed planning unit. The Cienega-Rincon subarea is discussed in pages 41 through 65 of the text. A summary of the stress analysis is available in Table 32, and reproduced in part below.

Areas and Habitats of Concern	Species, Federal Concern	Sources of Stress
Perennial stream flows	Gila topminnow	Population growth
Shallow ground water areas	Pygmy-owl	Conversion of ranches
Associated aquatic habitats	Huachuca water umbel	Groundwater pumping
Cottonwood-willow riparian areas	Mexican spotted owl	Increased lot splitting
Cienega marshlands	Yellow billed cuckoo	Existing zoning near preserve
Sacaton grassland areas	Lesser long nosed bat	Excavation of Pantano Wash
Cave habitats	Pima pineapple cactus	Recreational uses
Tributary connections		Invasive species
		Developable land near preserve
		High mineral resource areas

Potential threats and stressors to other vulnerable species in the Cienega-Rincon subarea, including species of federal concern, are discussed in the report such as the:

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

III. Riparian Element

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

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

Over 25 percent of the priority streams within the County are found within the Cienega Rincon subarea.

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

Pima County's Watersheds and Watercourses

Attachment 4 is a chapter of a watershed and watercourse study by authors including Barbara Tellman of the Arizona Water Resources Research Center. Human impacts on the Cienega-Rincon watershed are described, along with existing public and private land uses and projected land uses. The report identifies issues for discussion in achieving a goal of watercourse protection.

The Cienega-Rincon subarea is discussed in pages 81 through 90 of the text. The summaries of the (1) potential and existing impacts on the watercourses within the subarea, and (2) potential options for reducing stress on watercourses within the subarea, are reproduced below.

Potential and existing impacts on the watercourses in the Cienega-Rincon subarea

REGION WITHIN THE SUBAREA	GRAZING	WILDCAT SUBDIVISION	PLANNED SUBDIVISION	COPPER MINE	SAND & GRAVEL MINE	PUMPING	AGRI CULT URE	REC
CIENEGA CREEK	yes	yes	yes	potential	yes	yes		yes
RINCON VALLEY	yes	yes	yes		yes	yes		yes

Potential options for reducing stress on watercourses within the Cienega-Rincon subarea

REGION WITHIN THE SUBAREA	LESS PUMPING (ALT WATER)	NON STRUC FLOODPLAIN MANAGE	LAND USE MANAGE MENT	FEDERAL LAND, PROTECTION	STATE TRUST LAND PROTECTED	OTHER PRESERVE INCREASE	BETTER GRAZING
CIENEGA CREEK	potential	potential	potential	potential		potential	potential
RINCON VALLEY	potential	potential	potential	potential	potential	potential	

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

- Should efforts be taken to preserve surface water supplies?
- Should alternate sources of water, such as CAP, be provided to landowners?
- Are additional measures needed to prevent damage from downstream flooding?
- What should be done, if anything, to protect watercourses from mining?
- What measures, if any, should be taken to protect limestone caves and springs?
- Should the majority of the watershed become and NCA or have protection?

IV. Ranch Conservation Element

Ranching in the Cienega-Rincon Valley

Attachment 5 includes a descriptive summary of Ranching in the Cienega-Rincon Valley, drafted by Ms. Linda Mayro, the lead staff of the Ranch Conservation Team. Ranches in the area are described, along with grazing allotments, the carrying capacity per square mile by grazing allotment, the role of stock tanks and other ranch related resource topics.

V. Cultural Resources Element

Attachment 6 is a cultural and historic resources inventory report by Mr. David Cushman, the lead staff of the Cultural and Historic Resources Technical Team. Three kinds of resources are described: archaeological sites, historic resources, and traditional cultural resources, which are all defined and quantified within the report. This document includes maps that depict: the zone of archaeological sites in the Cienega-Rincon Valley; general archeological site and survey locations; and archaeological sites in relation to land ownership.

VII. Land Use Considerations

Land Use in the Cienega-Rincon Valley

Attachment 7 is the contribution of Mr. Ben Changkakoti of the Planning Division. This report offers information about current and planned land use, zoning, housing types, viewsheds, infrastructure (including roads, access, water, sanitary sewer, natural gas, telephone and electricity), schools, parks, open space, real estate market conditions, capital improvement projects, and permits issued for residential and commercial activities.

VIII. Conclusion

After subarea meetings are held, additional contributions and comments are received, discrepancies are eliminated in the data of individual reports and resource reports are perfected, a synthesizing subarea evaluation will be drafted that includes landowner goals and suggestions for conservation strategies. This initial presentation of resource information is intended to both educate and serve as an invitation to greater participation in crafting the Sonoran Desert Conservation Plan.

MEMORANDUM

Date: May 11, 2000

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

From: C.H. Huckelberry
County Administrator

Re: ***Resources of the Upper Santa Cruz Valley***

I. Background

This memorandum provides a brief summary of a compilation of resource investigations that have been submitted so far, to help develop the Sonoran Desert Conservation Plan within the watershed planning area of the Upper Santa Cruz Valley. The Steering Committee, interested members of the public, and stakeholding private citizens and governmental entities are invited to submit additional documents and comments. Presentations at the May 20, 2000 Steering Committee meeting will be followed by subarea land panel meetings for all interested parties so that topics ranging from biological, to riparian, to ranch, to cultural, land and fiscal resources can be discussed in greater detail. Contributions resulting from the subarea process will be forwarded to the Steering Committee, Technical Teams, and the Board of Supervisors for consideration.

CONTENTS AND ATTACHMENTS

II. Habitat and Corridors Elements

Biological Stress Assessment and Review of Vulnerable Species

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

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

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

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

III. Riparian Element

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

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

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

SDCP Planning Unit	Number of Priority Streams	Percentage of Total
1. Middle San Pedro	8	12
2. Cienega Rincon	17	26
3. Upper Santa Cruz	3	4
4. Middle Santa Cruz	9.5	15
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Pima County's Watersheds and Watercourses

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

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

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

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

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

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

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

IV. Ranch Conservation Element

Ranching in the Upper Santa Cruz Valley

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

V. Cultural Resources Element

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

VII. Land Use Considerations

Land Use in the Upper Santa Cruz Valley

Attachment 5 is the contribution of Mr. Ben Changkakoti of the Planning Division. This report offers information about current and planned land use, zoning, housing types, viewsheds, infrastructure (including roads, access, water, sanitary sewer, natural gas, telephone and electricity), schools, parks, open space, real estate market conditions, capital improvement projects, and permits issued for residential and commercial activities.

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

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

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

VIII. Conclusion

After subarea meetings are held, additional contributions and comments are received, discrepancies are eliminated in the data of individual reports and resource reports are perfected, a synthesizing subarea evaluation will be drafted that includes landowner goals and suggestions for conservation strategies. This initial presentation of resource information is intended to both educate and serve as an invitation to greater participation in crafting the Sonoran Desert Conservation Plan.

MEMORANDUM

Date: May 18, 2000

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

From: C.H. Huckelberry
County Administrator

Re: ***Resources of Western Pima County***

I. Background

This memorandum provides a brief summary of a compilation of resource investigations that have been submitted so far, to help develop the Sonoran Desert Conservation Plan within the watershed planning area of Western Pima County. The Steering Committee, interested members of the public, and stakeholding private citizens and governmental entities are invited to submit additional documents and comments. Presentations at the May 20, 2000 Steering Committee meeting will be followed by subarea land panel meetings for all interested parties so that topics ranging from biological, to riparian, to ranch, to cultural, land and fiscal resources can be discussed in greater detail. Contributions resulting from the subarea process will be forwarded to the Steering Committee, Technical Teams, and the Board of Supervisors for consideration.

CONTENTS AND ATTACHMENTS

II. Habitat and Corridors Elements

Biological Stress Assessment and Review of Vulnerable Species

Attachment 1 is Western Pima County chapter from the *Biological Stress Assessment*, issued by Recon consulting as part of the biological evaluation in March of 2000. The *Biological Stress Assessment* examines past land and water uses, existing uses, and some major uses foreseeable over the next 30 years in an effort to determine the greatest potential threats to vulnerable species within each watershed planning unit.

The Western Pima County subarea is discussed in pages 180 through 198 of the text. A summary of the stress analysis is available in Table 39, and reproduced in part below.

Areas and Habitats of Concern	Species, Federal Concern	Sources of Stress
Areas of shallow groundwater	Pygmy-owl	Overflights
Riparian and xeroriparian habitat	Lesser long nosed bat	Livestock grazing, recreation
Aquatic and riparian habitat	Sonoran pronghorn	Groundwater pumping
Mine adit	Desert pupfish	Mining
Ironwood plant communities		Invasive species
Palo verde mixed scrub		Resource damage at boarder

Potential threats and stressors to other vulnerable species in the Western Pima County subarea, including species of federal concern, are discussed in the report such as the:

- Trelease Agave;
- Organ Pipe shovelnosed snake;
- Red-backed whiptail lizard;
- Acuna cactus;
- Sonoyta mud turtle;
- Ajo rock daisy;
- Quitobaquito tryonia (snail); and
- Tumamoc globeberry.

III. Riparian Element

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

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

A very small percent of the priority streams within the County are found within the Western Pima County subarea.

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

Pima County's Watersheds and Watercourses

Attachment 2 is a chapter of a watershed and watercourse study by authors including Barbara Tellman of the Arizona Water Resources Research Center. Human impacts on the Western Pima County watershed are described, along with existing public and private land uses and projected land uses. The report identifies issues for discussion in achieving a goal of watercourse protection. The Western Pima County subarea is discussed in pages 151 through 158 of the text.

Potential and existing impacts on the watercourses in the Western Pima County subarea

REGION WITHIN THE SUBAREA	GRAZING	WILDCAT SUBDIVISION	PLANNED SUBDIVISION	COPPER MINE	SAND & GRAVEL MINE	PUMPING	AGRI CULT URE	REC
AJO / WHY		yes	yes	yes		yes		
PUBLIC LANDS	yes							yes

Potential options for reducing stress on watercourses within the Western Pima County subarea

REGION WITHIN THE SUBAREA	LESS PUMPING (ALT WATER)	NON STRUC FLOODPLAIN MANAGE	LAND USE MANAGE MENT	FEDERAL LAND, PROTECTION	STATE TRUST LAND PROTECTED	OTHER PRESERVE INCREASE	BETTER GRAZING
AJO / WHY			potential				
PUBLIC LANDS							potential

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

- Are grazing management changes needed to protect watercourses?
- What measures are needed to minimize impacts of recreation?
- Should the current road between Lukeville and I-10 be widened?
- What should be done, if anything, to protect watercourses from mining?

Summary of the species of concern within the watershed, as identified in the Recon reports

Suggested for potential coverage under the multi-species conservation plan:

- Pygmy-owl
- Lesser long nosed bat
- Organ Pipe shovelnosed snake
- Red-backed whiptail lizard
- Acuna cactus
- Tumamoc globeberry

Other species of concern:

- Sonoran pronghorn
- Desert pupfish
- Trelease Agave
- Sonoyta mud turtle
- Ajo rock daisy
- Quitobaquito tryonia (snail)

IV. Ranch Conservation Element

Ranching in Western Pima County

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

V. Cultural Resources Element

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

VII. Land Use Considerations

Land Use in Western Pima County

Attachment 5 is the contribution of Mr. Ben Changkakoti of the Planning Division. This report offers information about current and planned land use, zoning, housing types, viewsheds, infrastructure (including roads, access, water, sanitary sewer, natural gas, telephone and electricity), schools, parks, open space, real estate market conditions, capital improvement projects, and permits issued for residential and commercial activities.

VIII. Conclusion

After subarea meetings are held, additional contributions and comments are received, discrepancies are eliminated in the data of individual reports and resource reports are perfected, a synthesizing subarea evaluation will be drafted that includes landowner goals and suggestions for conservation strategies. This initial presentation of resource information is intended to both educate and serve as an invitation to greater participation in crafting the Sonoran Desert Conservation Plan.

MEMORANDUM

Date: May 30, 2000

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

From: C.H. Huckelberry
County Administrator

Re: ***Resources of the Tortolita Fan***

I. Background

This memorandum provides a brief summary of a compilation of resource investigations that have been submitted so far, to help develop the Sonoran Desert Conservation Plan within the watershed planning area of the Tortolita Fan. The Steering Committee, interested members of the public, and stakeholding private citizens and governmental entities are invited to submit additional documents and comments. Presentations at the June 3, 2000 Steering Committee meeting will be followed by subarea land panel meetings for all interested parties so that topics ranging from biological, to riparian, to ranch, to cultural, land and fiscal resources can be discussed in greater detail. Contributions resulting from the subarea process will be forwarded to the Steering Committee, Technical Teams, and the Board of Supervisors for consideration.

CONTENTS AND ATTACHMENTS

II. Habitat and Corridors Elements

Biological Stress Assessment and Review of Vulnerable Species

Attachment 1 is the Tortolita Fan chapter from the *Biological Stress Assessment*, issued by Recon consulting as part of the biological evaluation in March of 2000. The *Biological Stress Assessment* examines past land and water uses, existing uses, and some major uses foreseeable over the next 30 years in an effort to determine the greatest potential threats to vulnerable species within each watershed planning unit. The Tortolita Fan subarea is discussed in pages 115 through 135 of the text. A summary of the stress analysis is available in Table 35, and reproduced in part below.

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

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

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

III. Riparian Element

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

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

Eight percent of the priority streams within the County are found within the Tortolita Fan subarea.

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

Pima County's Watersheds and Watercourses

Attachment 2 is a chapter of a watershed and watercourse study by authors including Barbara Tellman of the Arizona Water Resources Research Center. Human impacts on the Tortolita Fan watershed are described, along with existing public and private land uses and projected land uses. The report identifies issues for discussion in achieving a goal of watercourse protection. The Tortolita Fan subarea is discussed in pages 117 through 128 of the text. The summaries of the (1) potential and existing impacts on the watercourses within the subarea, and (2) potential options for reducing stress on watercourses within the subarea, are reproduced below.

Potential and existing impacts on the watercourses in the Tortolita Fan subarea

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

Potential options for reducing stress on watercourses within the Tortolita Fan subarea

REGION WITHIN THE SUBAREA	LESS PUMPING (ALT WATER)	NON STRUC FLOODPLAIN MANAGE	LAND USE MANAGE MENT	FEDERAL LAND, PROTECTION	STATE TRUST LAND PROTECTED	OTHER PRESERVE INCREASE	BETTER GRAZING
S. Cruz River	potential	potential	potential				
Tortolita Fan	potential	potential	potential		potential	potential	
Oro Valley	potential	potential	potential		potential	potential	
Catalina	potential	potential	potential		potential	potential	
Public Lands							potential

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

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

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

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

- "Because this area is classified by the Federal Emergency Management Agency (FEMA) as an alluvial fan, a type of geological formation characterized by unpredictable changes in natural drainage patterns, FEMA will not approve development of this area before structural drainage improvements are constructed to control the drainage patterns."

- "Adjusting the construction cost estimates to account for inflation since the report by the Corps of Engineers was completed, our review indicates that the current cost for construction of the structural drainage improvements alone is approximately $80 million."

- "These cost estimates include only the cost of the structural drainage improvements and do not include any costs for mitigation that would likely be required to obtain Section 404 permits for the construction of either the drainage improvements or any proposed residential development, or mitigation that may be required to address Endangered Species Act concerns."

IV. Ranch Conservation Element

Ranching in the Tortolita Fan Area

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

V. Cultural Resources Element

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

VII. Land Use Considerations

Land Use in the Tortolita Fan

Attachment 5 is the contribution of Mr. Ben Changkakoti of the Planning Division. This report offers information about current and planned land use, zoning, housing types, viewsheds, infrastructure (including roads, access, water, sanitary sewer, natural gas, telephone and electricity), schools, parks, open space, real estate market conditions, capital improvement projects, and permits issued for residential and commercial activities.

VIII. Conclusion

After subarea meetings are held, additional contributions and comments are received, discrepancies are eliminated in the data of individual reports and resource reports are perfected, a synthesizing subarea evaluation will be drafted that includes landowner goals and suggestions for conservation strategies. This initial presentation of resource information is intended to both educate and serve as an invitation to greater participation in crafting the Sonoran Desert Conservation Plan.

MEMORANDUM

Date: June 1, 2000

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

From: C.H. Huckelberry
County Administrator

Re: ***Resources of the Middle Santa Cruz***

I. Background

This memorandum provides a brief summary of a compilation of resource investigations that have been submitted so far, to help develop the Sonoran Desert Conservation Plan within the watershed planning area of the Middle Santa Cruz. The Steering Committee, interested members of the public, and stakeholding private citizens and governmental entities are invited to submit additional documents and comments. Presentations at the June 3, 2000 Steering Committee meeting will be followed by subarea land panel meetings for all interested parties so that topics ranging from biological, to riparian, to ranch, to cultural, land and fiscal resources can be discussed in greater detail. Contributions resulting from the subarea process will be forwarded to the Steering Committee, Technical Teams, and the Board of Supervisors for consideration.

CONTENTS AND ATTACHMENTS

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Biological Stress Assessment and Review of Vulnerable Species

Attachment 1 is the Middle Santa Cruz chapter from the *Biological Stress Assessment*, issued by Recon consulting as part of the biological evaluation in March of 2000. The *Biological Stress Assessment* examines past land and water uses, existing uses, and some major uses foreseeable over the next 30 years in an effort to determine the greatest potential threats to vulnerable species within each watershed planning unit. The Middle Santa Cruz subarea is discussed in pages 89 through 114 of the text. A summary of the stress analysis is available in Table 34, and reproduced in part below.

Areas and Habitats of Concern	Species, Federal Concern	Sources of Stress
Shallow ground water areas	Gila topminnow	Population growth
Effluent-dominated stream flow	Pygmy-owl	Existing overdraft
Remaining xeroriparian	Mexican spotted owl	Groundwater pumping
Pygmy-owl critical habitat	Lesser long nosed bat	Increased lot splitting
	Yellow billed cuckoo	Invasive species
	Pineapple cactus	Recreational uses
		Developable land near preserve

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

- Trelease agave;
- Sabino canyon damselfly;
- Desert pupfish;
- Gila chub;
- Box Canyon Muhly;
- Weeping Muhly;
- Apache northern goshawk;
- Goodding onion;
- Needle-spined pineapple cactus;
- Pale Townsend's big-eared bat;
- Lowland Leopard Frog;
- Mexican Garter Snake; and
- Tumamoc globeberry.

III. Riparian Element

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

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

Fifteen percent of the priority streams within the County are found within the Middle Santa Cruz subarea.

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

Pima County's Watersheds and Watercourses

Attachment 2 is a chapter of a watershed and watercourse study by authors including Barbara Tellman of the Arizona Water Resources Research Center. Human impacts on the Middle Santa Cruz watershed are described, along with existing public and private land uses and projected land uses. The report identifies issues for discussion in achieving a goal of watercourse protection. The Middle Santa Cruz subarea is discussed in pages 103 through 116 of the text. The summaries of the (1) potential and existing impacts on the watercourses within the subarea, and (2) potential options for reducing stress on watercourses within the subarea, are reproduced below.

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

REGION WITHIN THE SUBAREA	GRAZING	WILDCAT SUBDIVISION	PLANNED SUBDIVISION	COPPER MINE	SAND & GRAVEL MINE	PUMPING	AGRI CULT URE	REC
MOUNTAINS	yes			potential				yes
FOOTHILLS		yes	yes			yes		yes
RIVERS AND TRIBUTARIES		yes	yes		yes	yes		yes
CENTRAL CORE			yes			yes		

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

REGION WITHIN THE SUBAREA	LESS PUMPING (ALT WATER)	NON STRUC FLOODPLAIN MANAGE	LAND USE MANAGE MENT	FEDERAL LAND, PROTECTION	STATE TRUST LAND PROTECTED	OTHER PRESERVE INCREASE	BETTER GRAZING
MOUNTAINS				potential			potential
FOOTHILLS	potential	potential	potential	potential	potential	potential	
RIVERS AND TRIBUTARIES	potential	potential	potential			potential	
CENTRAL CORE	potential	potential	potential				

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

- How should higher priority washes be protected or rehabilitated?
- Are stronger city and county riparian ordinances needed?
- What kind of floodplain management should be utilized without soil cement?
- Are there important floodplain properties that should be acquired?
- Should road accessibility policies be coordinated with watercourse preservation?

IV. Ranch Conservation Element

Ranching in the Middle Santa Cruz Area

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

V. Cultural Resources Element

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

VII. Land Use Considerations

Land Use in the Middle Santa Cruz

Attachment 5 is the contribution of Mr. Ben Changkakoti of the Planning Division. This report offers information about current and planned land use, zoning, housing types, viewsheds, infrastructure (including roads, access, water, sanitary sewer, natural gas, telephone and electricity), schools, parks, open space, real estate market conditions, capital improvement projects, and permits issued for residential and commercial activities.

VIII. Conclusion

After subarea meetings are held, additional contributions and comments are received, discrepancies are eliminated in the data of individual reports and resource reports are perfected, a synthesizing subarea evaluation will be drafted that includes landowner goals and suggestions for conservation strategies. This initial presentation of resource information is intended to both educate and serve as an invitation to greater participation in crafting the Sonoran Desert Conservation Plan.