DRAFT

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.

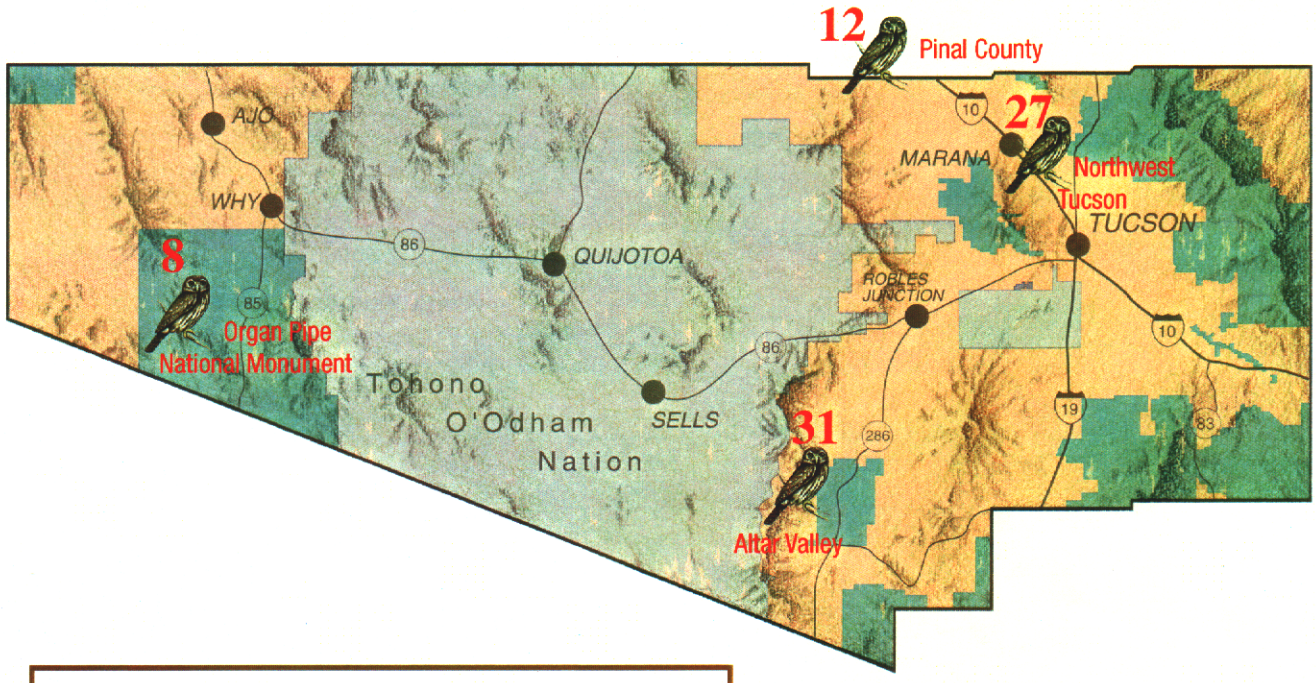
I will be bringing specific reports on each of these elements to the Board in the next two months that will require Board direction.

CHH/jj

Attachment

Location of the cactus ferruginous pygmy-owl. Pima County, Arizona, spring 1999

(after Harris Environmental Group, Inc.)



Location	Pygmy-owls
Altar Valley	31
Northwest Tucson	27
Organ Pipe National Monument	8
Pinal County	12
	78 total

NOVEMBER 1999

PYGMY-OWL UPDATE

Progress Report on the Sonoran Desert Conservation Concept Plan

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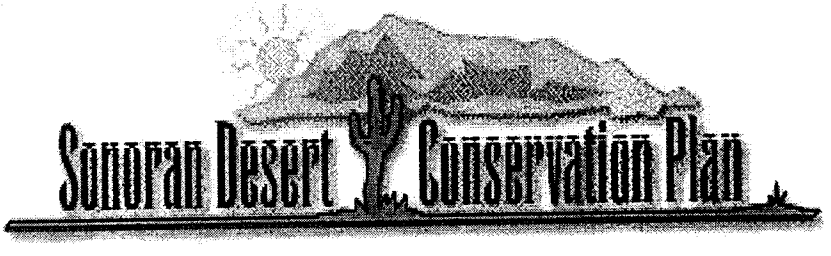

PYGMY-OWL UPDATE

1. Introduction

A. Purpose of the Report
B. Factors Contributing to Listing

One day old ferruginous pygmy owl from the Texas population
Photo courtesy of Glenn Proudfoot

I. Introduction

A. Purpose of the Report: Any effort to delist or downlist the endangered cactus ferruginous pygmy-owl will have to address the basis of the listing itself. Under Section 4 of the Endangered Species Act, endangered status can be determined if one or more of five factors exists. On March 10, 1997, the United States Fish and Wildlife Service determined endangered status for the pygmy-owl based primarily on these factors:

- The present or threatened destruction, modification, or curtailment of its habitat or range;
- The inadequacy of existing regulatory mechanisms; and
- Other factors, including environmental, demographic and genetic vulnerability to random extinction.[1]

During the two and one half years since the listing, studies have been conducted, federal guidelines formulated, and court decisions rendered. This report provides an update on pygmy-owl research and rulings in order to assess whether -- in the midst of this activity -- efforts are leading to the resolution of the basic problems that caused the listing.

B. Factors Contributing to Listing: The seventeen page Final Rule published in the Federal Register dedicates five full pages to a description of the factors that contributed to listing. A few highlights are summarized below.

Factor 1 - Habitat destruction, modification, or curtailment -- The listing document states in part that:

- "The pygmy-owl is threatened by past, present, and potential future destruction and modification of its habitat, throughout a significant portion of its range in Arizona."
- "Population numbers have been drastically reduced in Arizona, which once constituted its major United States range."
- "The majority of these losses are due to destruction and modification of riparian and thornscrub habitats. It is estimated that between 85 to 90 percent of low-elevation riparian habitats in the southwestern United States have been lost or modified."
- "These alterations and losses are attributed to urban and agricultural encroachment, woodcutting, water diversion and impoundment, channelization, livestock overgrazing, groundwater pumping, and hydrologic changes resulting from various land use practices."
- "Potential threats to pygmy-owl habitat in Arizona persist. Through the public comment period, the Service was made aware of five specific housing and development projects operating or in the planning stages that would affect habitat where the majority of birds in Arizona currently exist."

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[1] The Service discussed two more factors: threats of disease or predation and overutilization for recreational purposes.

- "Housing and industrial developments continue to expand in the Tucson area, and the northwest portion of the Tucson area is experiencing rapid growth."

- "In summary, very few pygmy-owls remain throughout the pygmy-owl's historic range in Arizona due to extensive loss of habitat. In addition, the remaining pygmy-owl habitat faces numerous and significant threats."

Factor 2 - Lack of adequate regulatory mechanisms -- The listing document states in part 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."

- "There are no provisions for habitat protection under Arizona endangered species law."

- "Most Federal agencies have policies to protect species .... However, until agencies develop specific protection guidelines, evaluate their effectiveness, and institutionalize their implementation, it is uncertain whether any general agency policies adequately protect the pygmy-owl and its habitat."

- "No conservation plans or habitat restoration projects specific to the cactus ferruginous pygmy-owl exist for lands managed by the United States Government, Indian Nations, State agencies, or private parties."

- "In summary, individual owls are protected from taking by one or more State or Federal statutes, and some Federal agencies are developing programs to protect riparian areas. However, there are currently no regulatory mechanisms in place that specifically protect pygmy-owl habitat."

Factor 3 - Vulnerability to environmental, demographic and genetic threats of extinction -- The listing document states in part that:

- "Environmental, demographic, and genetic vulnerability to random extinction are recognized as interacting factors that might contribute to a population's extinction. Environmental random extinction refers to random events, climate, nutrients, water, cover, pollutants, and relationships with other species such as prey, predators, competitors, or pathogens, that may affect habitat quality."

- "Populations without genetic variation are often considered imperiled due to either the effect of low population numbers, increased chance of inbreeding, or both."

Summary of factors: "In Arizona, the pygmy-owl exists in extremely low numbers, the vast majority of its former habitat can no longer support the species, and much of the remaining habitat is under immediate and significant threat. The Service thus determines that the cactus ferruginous pygmy-owl faces imminent extinction and therefore meets the definition of endangered under the Act."

Conclusion: The pygmy-owl listing is considered to be one of the most difficult in the United States due to the low number of known individuals and factors described above. This report reviews efforts to date in light of these underlying factors, to assess whether and to what degree efforts are contributing to the resolution of problems that led to the listing itself.

2. Research Initiatives

A. Past Efforts
B. Current Study Series
C. Ongoing and Future Research

1999 Arizona cactus ferruginous pygmy owls
Photo courtesy of Arizona Game and Fish

II. Research Initiatives

Under the Endangered Species Act, civil or criminal liability can attach to actions that take animals such as the pygmy-owl, including actions that significantly alter the habitat of animals listed as endangered. When the pygmy-owl was listed in 1997, the Arizona population had not been throughly studied, so basic questions related to habitat needs and the tolerance of this bird for human encroachment could not be answered. The combination of too few owls and too little scientific information placed individual landowners and government entities in the most difficult of situations. There was enough information about the imperiled status of the pygmy-owl to invoke the prohibitions of the federal law, but not enough information about how to protect and recover this tiny bird so that local land use plans in potential owl habitat could be made with certainty. Today -- three survey seasons after the listing -- the local science community knows more about the pygmy-owl than it did at the time of listing. This information should continue to be developed in a rational but fast paced research context to resolve some of the problems identified in the 1997 Final Rule designating the pygmy-owl as endangered.

One of three major factors underlying the listing is vulnerability to environmental, demographic and genetic threats of extinction. 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.

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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 begin to be addressed. This section of the report describes the historical backdrop of pygmy-owl information provided by the early naturalists and the role of riparian habitat, the results of research initiatives to date, and proposals for continuing the study series in order move closer to downlisting, delisting, and recovery of the cactus ferruginous pygmy-owl.

A. Past Efforts:

1. First Records - Bendire and the Rillito -- Between 1860 and 1880, the population of Tucson went from 623 to 7,007. One of the residents who passed through during that period was Captain Charles Bendire of the United States Army, an avid bird collector who went on to publish the *Life Histories of North American Birds with Special Reference to Their Breeding Habits and Eggs* in 1892 through the Smithsonian Institution. In that text, Bendire recounts that on January 24, 1872, he collected and recorded the first specimen of a ferruginous pygmy owl in Arizona "in the heavy mesquite thickets bordering Rillitto Creek, near the present site of Camp Lowell, in the vicinity of Tucson, Arizona." This fact was brought forward by Mr. Russell Duncan, who, after the pygmy-owl was listed as endangered, researched museum records and identified numerous locations where collectors have found pygmy-owls in the past. Based in part on this historical data, Mr. Duncan has been able to locate owls since the listing, and provide information for the major survey strategies conducted during 1998 and 1999.

Bendire's accounts about pygmy-owls are interesting for several reasons. They are the first in what has become an unbroken chain of tales through time about the surprising boldness possessed by the 6 inch, 2 ½ ounce pygmy-owl. While discussing the ferruginous pygmy-owl, Bendire quotes one source that claimed: "small as the Ferruginous Pygmy Owl is, it has been known to carry off young chickens, and it ... even attack[s] ... hens, a bird of greater size than domestic fowls. ... I am aware, from personal observations, that some of our small Owls are the peer, as far as courage is concerned, of the noblest Falcon ever hatched." At the same time Bendire writes about the *Life History of North American Birds*, he describes a good bit of his own experience. In one episode, he describes a Grouse hunting trip with a military colleague who shot at what he thought was "a baby Owl riding on a rat." Bendire, somewhat more knowledgeable about pygmy-owls,[2] said the "matter was fully explained" as a pygmy-owl that had descended on a gopher, and despite the "rapidly approaching" hunter, "showed no uneasiness whatever" but sat upright on the scrambling gopher's back for "nearly a couple of minutes" while "trying to keep an eye on the sergeant."

Bendire's records also provide a snapshot of the riparian habitat conditions that supported owls in the 1870s. The "heavy mesquite thickets bordering Rillitto Creek" in 1872 quickly became a habitat of the past after Fort Lowell was established. Pygmy-owls were found in the Fort Lowell area in 1881, 1884 and 1916, but records for that site do not exist from that point on. Hydrologist G.E.P. Smith reported (in 1910) that when the U.S. Army post was established at the junction of the Pantano Wash and Rillito in 1872, human impacts and cattle grazing impacts to the grasses and lands caused a "new and unusual flood cut," ... a "wide channel [that] washed the big cottonwoods away." As a result, "the amount of total runoff from the land must have increased very greatly, and yet meanwhile the permanency of the small surface flow in the river was decreased." By the time of Smith's report in 1910, the Rillito had become an ephemeral stream.

One hundred and twenty-five years after the first pygmy-owl was "taken" by Major Bendire, the human population of Tucson rose from about 7,000 to over 455,000 within the city limits, and approximately 800,000 in Pima County. Rillito Creek at Fort Lowell was the subject of a water color (next page) in 1875. Another stretch of the Rillito -- representative of the change in riparian habitat -- is shown from above in 1941 and 1985 on the pages that follow.

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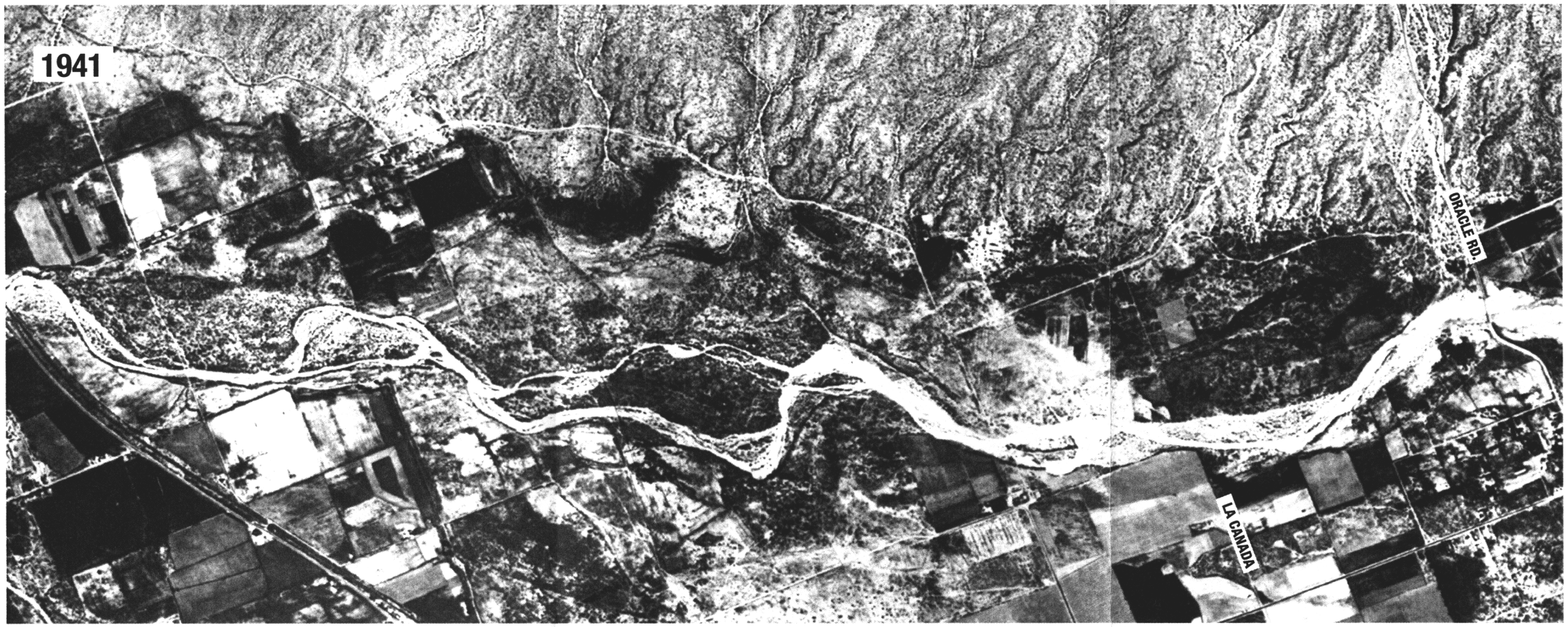
[2] This owl was identified as a Glaucidium gnoma Wagler pygmy-owl.

"Rillito Creek Near Fort Lowell." Watercolor by Post Surgeon J.B. Girard, 1875.

Figure 1

The Rillito has ceased to flow year-round by 1941, and much of the floodplain is under cultivation. Still, important pockets of riparian vegetation are maintained by tributary flows along the north margin of the floodplain.



By 1985 the tributaries had been channelized and urban growth had encroached on the floodplain.

2. Early Naturalists and Riparian Habitats

Following in Bendire's footsteps, two more collectors wrote about the pygmy owl before the turn of the century.

In 1893, A.K. Fisher, M.D. wrote about the ferruginous pygmy owl in *The Hawks and Owls of the United States in their Relation to Agriculture.* Fisher "found this species quite common at New River, thirty-five miles NNW of Phoenix, Ariz., in June, 1892. Referring to it as "this beautiful little Owl," Fisher "secured" two specimens and observed others "among the mesquit [sic] and other thick shrubbery scattered through the groves of giant cactus."

Geo. Breninger, another collector, wrote about the ferruginous pygmy owl in an 1898 issue of *The Osprey.* "Among the growth of cottonwood that fringes the Gila and Salt rivers of Arizona this Owl is of common occurrence."

Breninger had this to say, in keeping with the tradition of remarking on the seeming confidence of pygmy-owls:

- "Although small in body it is by no means small in fighting capacity, often attacking and bringing to the ground birds whose weight would equal and often exceed that of the Owl. ... I have had them pounce down upon and carry away wounded birds as large as robins."

- "With eyes that never sleep and pluck that never diminishes until death, it is a formidable foe even to the large rodents that burrow in the sands and alluvial deposits of the river bottoms."

In an interesting twist on the riparian habitat descriptions of early pygmy-owl reports, Breninger states that:

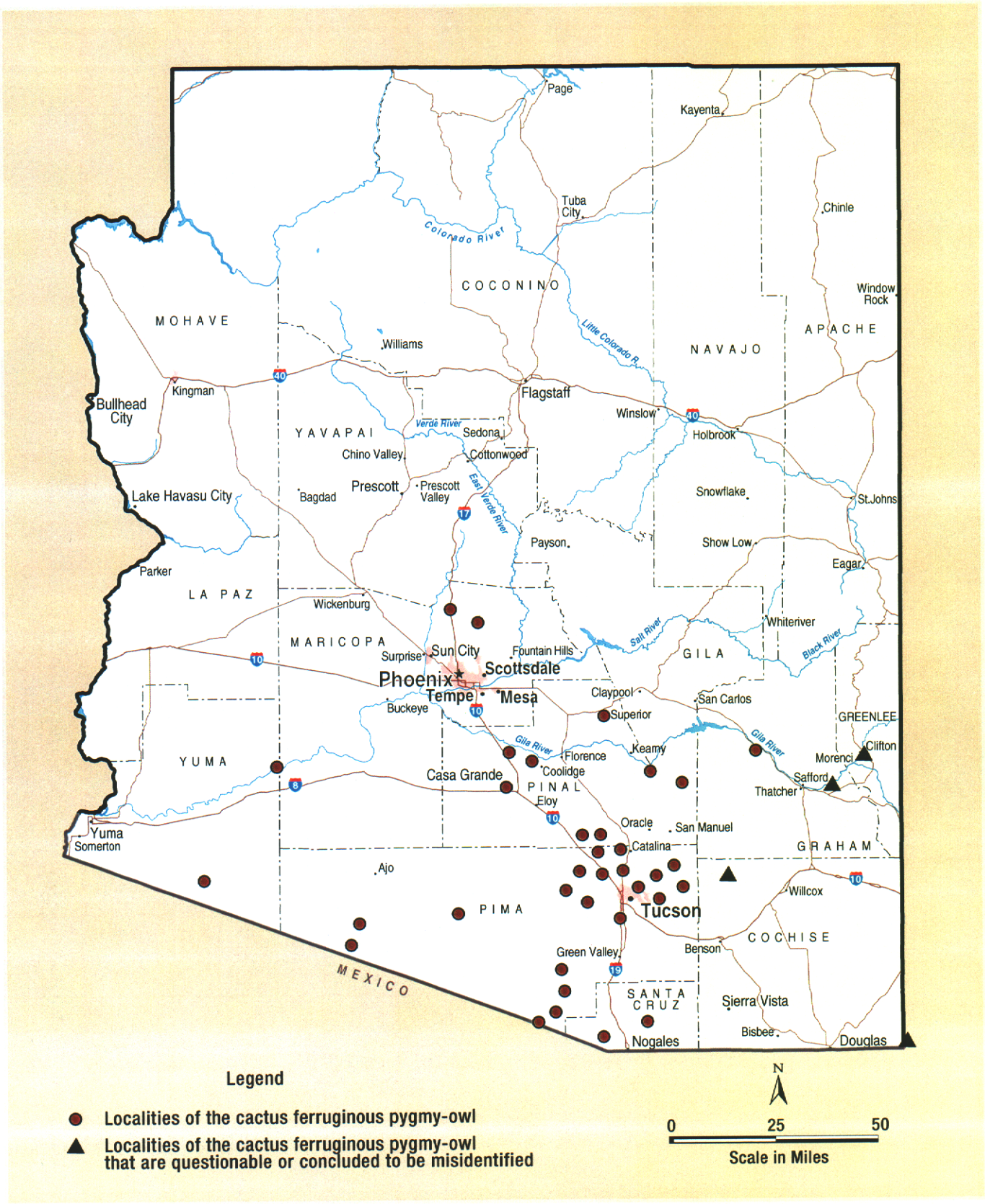
- "In more recent years, and since trees planted by man have become large enough to afford nesting sites for woodpeckers, this Owl has gradually worked its way from the natural growth of timber bordering the rivers to that bordering the banks of irrigating canals, until now it can be found in places ten miles from the rivers."

Other collectors found pygmy-owls during the late 1800s in the Santa Cruz River area, near the San Xavier District of the Tohono Nation, and in the Santa Catalina Mountains.

For the first fifty years of the 1900s, two owl watchers have their names on most of the records. Their sightings were concentrated in the Sabino Canyon, Catalina Mountains and Catalina foothills areas. Records from 1950 through 1980 are in the same area.

Beginning in the 1980s, pygmy-owl recorded sightings begin to occur in the locations now maintaining the largest known populations: northwest Tucson and the Altar Valley.

The map by Russell Duncan found on the next page shows the location of cactus ferruginous pygmy-owls that were collected or sighted in Arizona from 1872 to 1998. On the following page, a comparison from above of the Canada del Oro Wash in 1941 and 1998 reflects the experience of some riparian areas that have undergone rapid transitions to urbanized uses.



Location of the cactus ferruginous pygmy-owl in Arizona, 1872-1998

(from Harris Environmental Group, Inc.)

Figure 3

Pima County Graphic Design 11/99 sb

Cañada del Oro Wash, 1941.
This historically ephemeral stream had a braided channel within a broader floodplain.

Cañada del Oro Wash, 1998.
The stream has been channelized and nearly all of the floodplain has been urbanized. The potential for large flood flows originating in this watershed to dissipate energy has been greatly reduced by the loss of the braided channel pattern and natural overbank storage areas.

3. Study Efforts in the Early 1990s

Although the pygmy-owl has only been listed as endangered since 1997, its tenure for the highest level of species protection under federal law began to be considered as long ago as 1989. Federal action leading up to the listing in 1997 includes the following:

- In 1989, the Service included the pygmy-owl as a category 2 candidate species throughout its range. (55 FR 554)
- In 1991, the cactus ferruginous pygmy-owl was elevated to category 1. (56 FR 58804)
- In 1992, the Service was petitioned to list the pygmy-owl as an endangered subspecies.
- In 1993, the Service initiated a status review, after publishing a finding that the petition indicated listing might be warranted. (58 FR 13045)
- In 1994, a 12 month finding was published along with a proposed rule for listing the pygmy-owl as endangered in Arizona, with critical habitat. (59 FR 63975)
- The comment period for the proposed rule closed in April of 1995, reopened until the end of May, 1995, and then was reopened again from October to November 1996. One hundred and fifty-six oral or written comments were submitted.
- The Final Rule was published in the Federal Register in March of 1997, listing the pygmy-owl as endangered in Arizona, without critical habitat. (62 FR 10730)
- Critical habitat was designated in July of 1999. (64 FR 37419)

Despite having a long period of advance warning, the study effort by wildlife agencies and other interested parties prior to the listing was minimal. State and federal wildlife funding typically is not preventive in nature. As a result, land use prohibitions are established before information about recovery and protection is available. 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 other listed and imperiled species) protection in a proactive, instead of reactive fashion. This approach, had it been adopted one decade earlier, would have addressed two of the three reasons for the pygmy owl listing.

- The inadequacy of existing regulatory mechanisms (i.e., lack of conservation planning);
- Other factors, including environmental, demographic and genetic vulnerability to random extinction

The knowledge gained by prior planning also could have been used to alleviate the third basis of the listing: the present or threatened destruction, modification, or curtailment of its habitat or range. If the scientific knowledge had been available and development had been directed to less sensitive areas from the outset, the conflicts currently experienced on the northwest side could have been reduced too.

According to a 1998 *Status of the Species Report* prepared by U.S. Fish and Wildlife:

- 1990 - "Formal surveys for the pygmy-owl on Organ Pipe Cactus National Monument began in 1990, with one pygmy-owl located that year."
- 1992 - "Beginning 1992, in survey efforts conducted in cooperation with the Arizona Game and Fish Department, three single pygmy-owls were located on the Monument."
- 1993 - "In 1993, ... surveys again located three single pygmy-owls in Arizona."
- 1994 - "During the 1993 to 1994 survey period, one pair of pygmy-owls was detected in north Tucson, near the sightings in 1992 and 1993."
- 1995 - "Two individual pygmy-owls were found in northwest Tucson during 1995 surveys, and an additional pygmy-owl was detected at Organ Pipe."
- 1996 - "In 1996, the Arizona Game and Fish Department focused survey efforts in northwest Tucson and Marana and detected a total of 16 pygmy-owls, two of which were a pair, and two of which were fledglings. Three additional pygmy-owls were detected at Organ Pipe in 1996, with three additional but unconfirmed reports also from Organ Pipe."
- 1997 - "In 1997, survey efforts of the Arizona Game and Fish Department located a total of ten pygmy-owls in the Tucson Basin study area .... Eight of the 10 pygmy-owls were found in the northwest Tucson area, and the remaining two were found on the western bajada of the Tortolita Mountains. The total of 10 pygmy-owls from northwest Tucson for the year included one pair which successfully fledged four young. ... Two adult males were also located at Organ Pipe."

Reports from Arizona Game and Fish reflect that survey efforts from 1993 to 1996 had the following scope.

YEAR	SURVEY HOURS	DAYS	AREA SURVEYED
1993	136.2	54	62.4 sq. miles
1994	184.6	62	70.1 sq. miles
1995	155.7	68	39.7 sq. miles
1996	127.5	82	22.1 sq. miles
TOTAL	**194.3**	**266**	**194.3 sq. miles**

Following the listing of the pygmy-owl in 1997, U.S. Fish and Wildlife Service and Pima County began to fund surveys in addition to the work performed by the Arizona Game and Fish Department. Pima County also funded habitat, telemetry and genetics studies in 1999. The results of post-listing study efforts are discussed in the next section.

B. Current Study Series

1. 1998-1999 Survey and Telemetry Season Results

In 1998, U.S. Fish and Wildlife contracted with Dr. Lisa Harris and Russell Duncan to conduct surveys in the historic range of the pygmy-owl. These surveys were in addition to the work of Arizona Game and Fish.

Scope of USF&W surveys: Harris and Duncan covered 86,000 acres, or 134.4 square miles.

Total owls identified through intergovernmental effort: By covering three to six times the area traditionally surveyed by the State, combined intergovernmental efforts succeeded in identifying **31 owls in 1998** -- up from 12 in 1997.

More details are provided in the U.S. Fish and Wildlife 1998 *Status of the Species Report*: "In 1998, a total of approximately 31 pygmy-owls were observed, including 11 juveniles in the Tucson basin, and at least two juveniles at Organ Pipe. Two adults were found along xeroriparian drainages in semi-desert grassland in southern Arizona. The Service believes that the increase in the number of observed owls in 1998 is largely due to increased survey effort."

In 1999, a total of five governments funded survey work: U.S. Fish and Wildlife Service, the Forest Service, the Bureau of Land Management, Arizona Game and Fish, and Pima County.

Scope of Pima County surveys: Pima County alone, contracting through the Harris and Duncan team, covered 226,068 acres, or 353.2 sq. miles, which is almost three times the call area covered under the 1998 U.S. Fish and Wildlife Service contract, and it is five to fifteen times the area covered by the State survey efforts conducted between 1993 and 1996.

Total owls identified through intergovernmental effort: The combined intergovernmental effort resulted in the observation of **74 to 78 pygmy-owls in 1999**: 41 adults and 33 to 37 offspring[3]: 31 owls were found in Altar Valley; 27 were found in Northwest Tucson; 12 owls were found in Pinal County; and 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:

- Eleven nest sites were located and monitored and owls at each site were banded
- Nest size varied from 2 to 5 babies and at least 16 of 35 fledglings dispersed
- At least 13 owls had transmitters (including 3 adult males)
- At least 8 juvenile owls were tracked through dispersal
- At least 5 owl mortalities occurred during the survey season (2 predations; 2 mortalities when a saguaro arm fell; 1 owl collided with a fence)
- One adult male pygmy-owl successfully fledged his offspring after the adult female was predated.

A final report on monitoring and telemetry is due to the County in February of 2000.

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[3] The number of eggs did not equal the number of owls identified as fledglings.

2. 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. This section of the report provides highlights of the Harris study and compares the scope of the effort to prior survey seasons.

In 1998, Dr. Lisa Harris and Russell Duncan were the successful bidders for a contract with U.S. Fish and Wildlife Service. Under that contract, the team surveyed 86,000 acres. Building off this base of 86,000 acres, Harris and Duncan teamed in 1999 to add another 226,000 acres to the search.

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 nine survey districts and two thousand six hundred thirty two (2,632) call stations were established, under the Pima County contract.

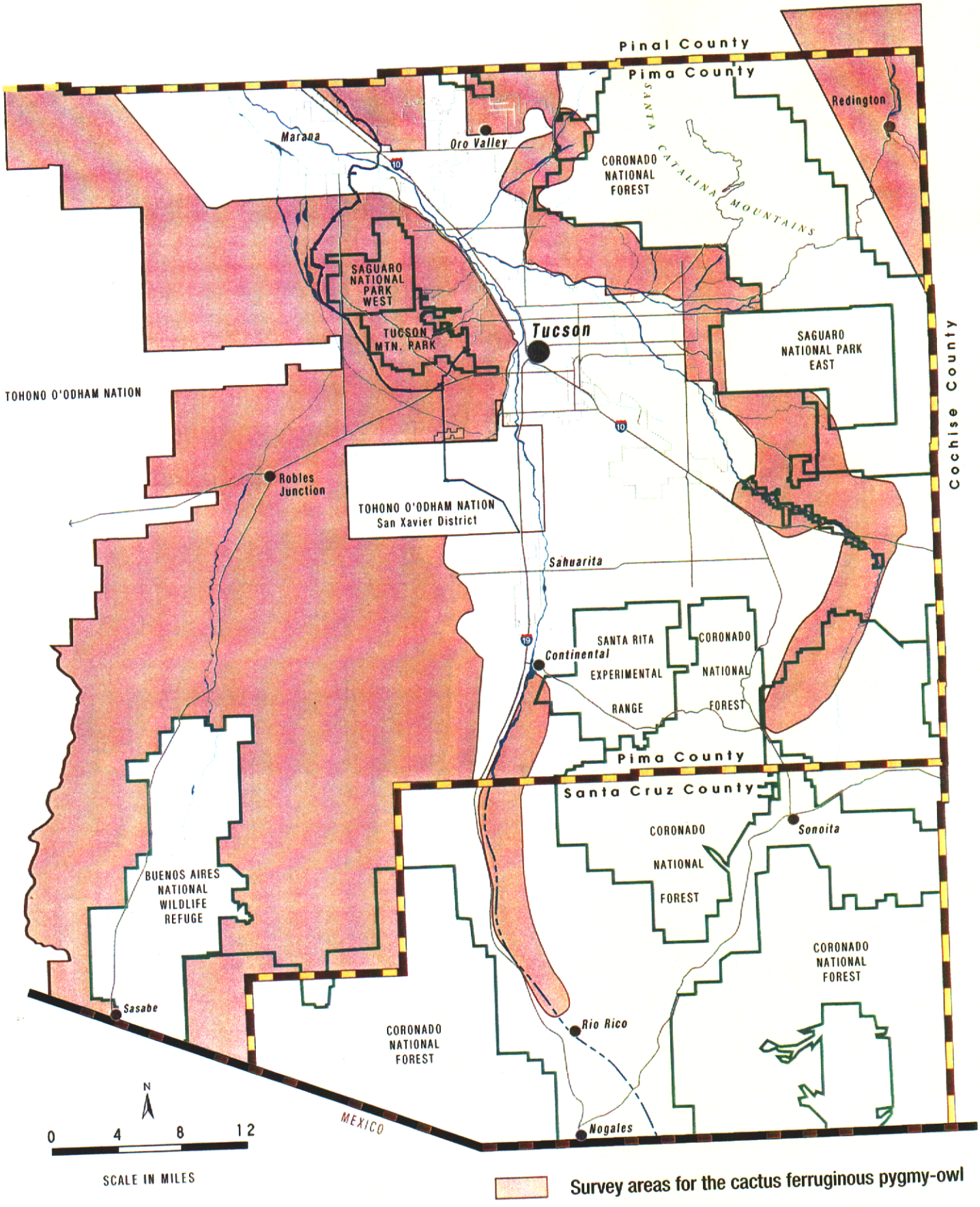
To put this in perspective, in 1998, the same team staked out 768 call points. In 1996, Arizona Game and Fish worked from a total of 356 call points. The 1999 survey effort allowed the research to take place in areas that have not been surveyed in the past.

	CALL STATIONS	ACRES
1996 AZ G&F EFFORT	356	14,144
1998 USF&W EFFORT	768	86,000
1999 PIMA C. EFFORT	**2,632**	**226,000**

It is significant that 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)." (P. 25)

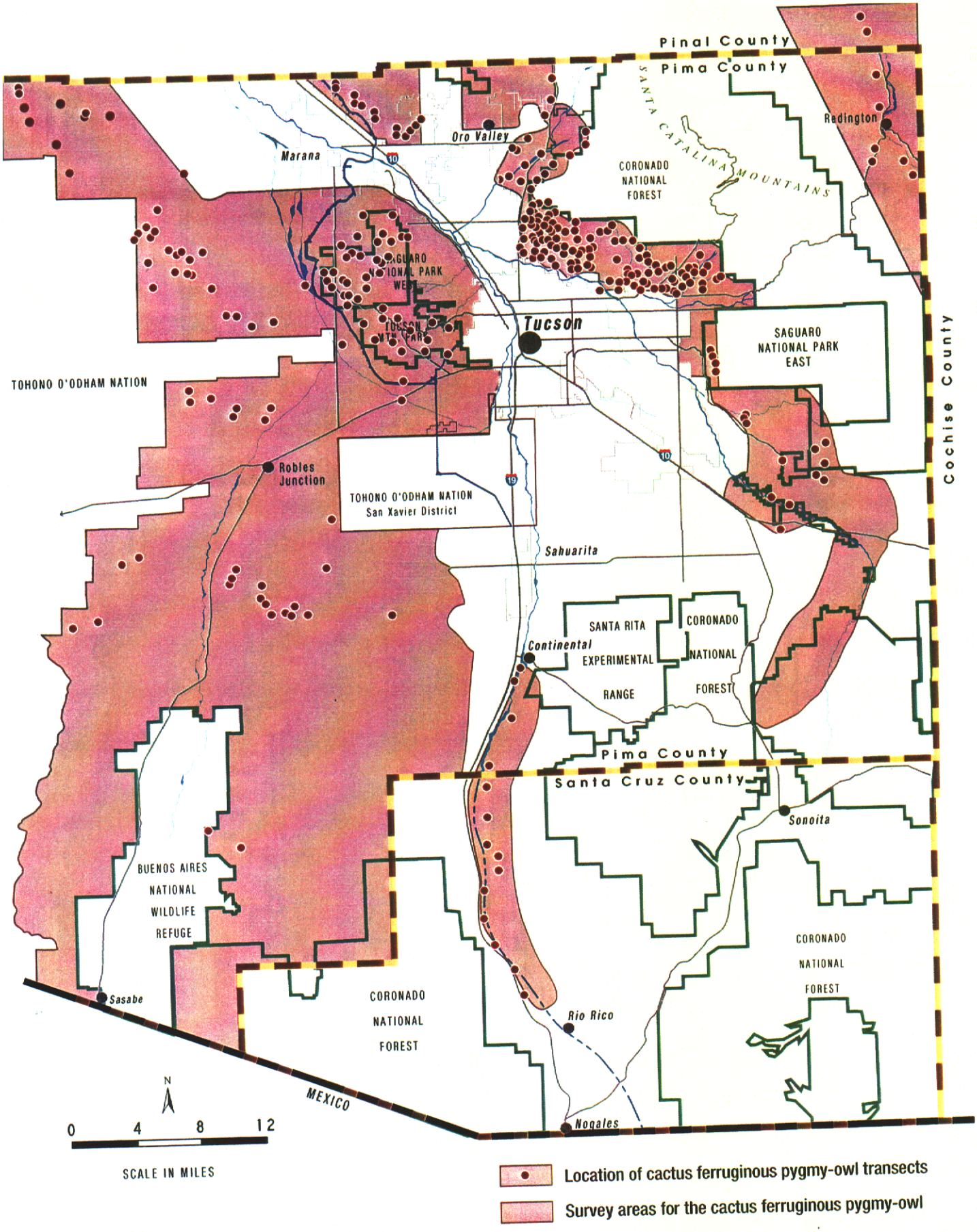
While mobbing can mean many things, it may indicate that "local birds are familiar with pygmy-owls." (P. 30) The report states that: mobbing "behaviors may be evidence that the birds have had experiences with pygmy-owls, either in the area surveyed, or other places (Mexico and Central America) if the birds are migratory (i.e., both flycatcher species, western kingbird, Lucy's warbler, lesser nighthawk, and broadbilled hummingbird)." The report recommends that "areas where mobbing occurred be resurveyed in future efforts."

The pages that follow show the survey study area for the 1999 effort, the location of the transects where call stations were established, and the locations where mobbing occurred in response to broadcast calls during 1999.



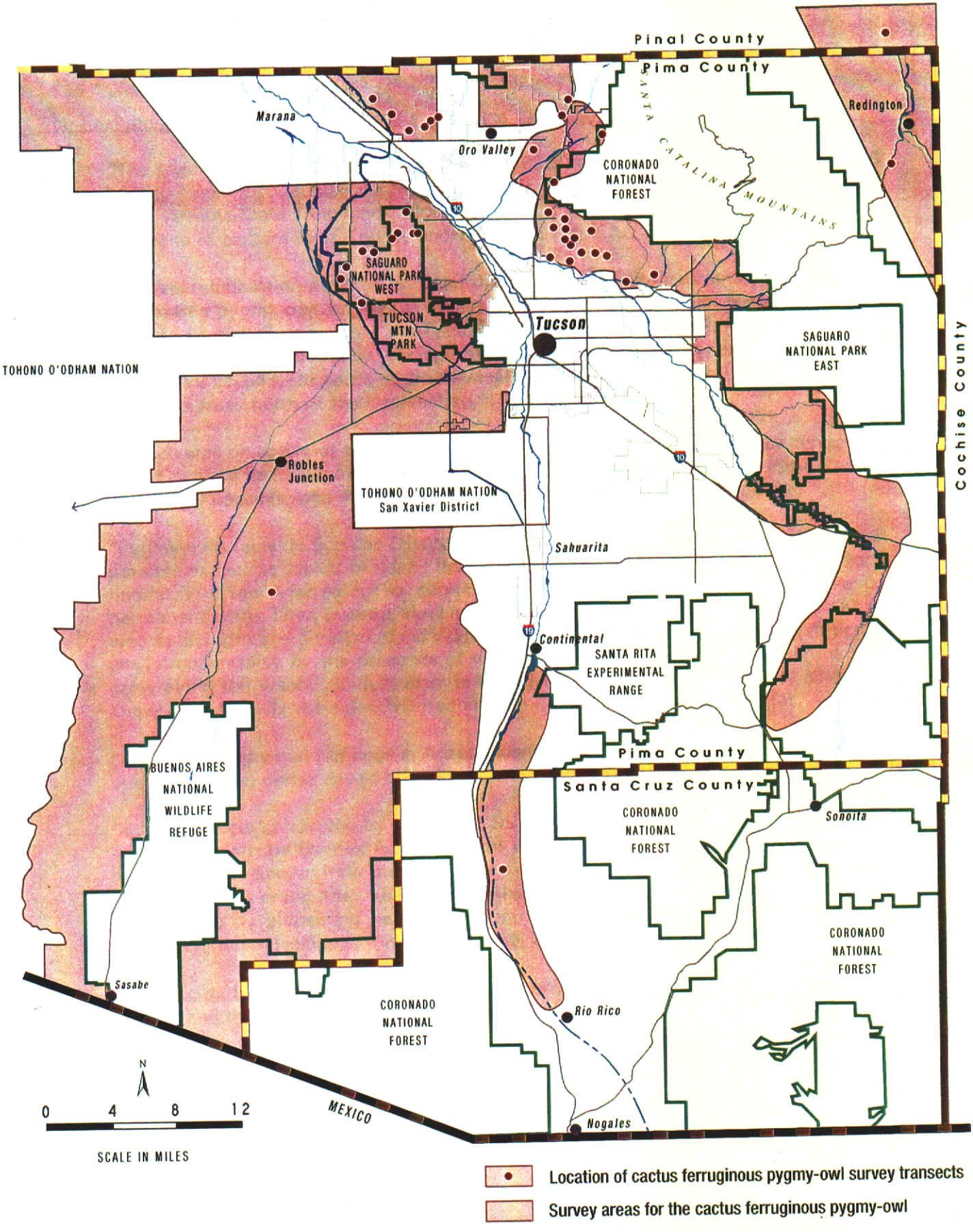
Location of survey areas for the cactus ferruginous pygmy-owl in eastern Pima County and western Santa Cruz County, Arizona, spring 1999
(after Harris Environmental Group, Inc.)

Figure 6



Location of cactus ferruginous pygmy-owl survey transects in eastern Pima County and western Santa Cruz County, Arizona, spring 1999
(after Harris Environmental Group, Inc.)

Figure 7



Location of cactus ferruginous pygmy-owl survey transects where mobbing and responses from birds to broadcast calls occured, Arizona, spring 1999
(after Harris Environmental Group, Inc.)

Figure 8

Graphic Design 11/99 sb

The final report, attached in the appendix, contains these highlights.

- "The team of Harris Environmental Group, R.B. Duncan & Associates, and Dames & Moore, Tucson, conducted surveys between mid-April through June 1999 on federal lands, Arizona State Trust lands, Pima County holdings, and some private lands" ... in "portions of eastern Pima County and western Santa Cruz County." (P.3)

- "To avoid duplication of effort and confusion, surveys were coordinated with others conducting pygmy-owl surveys in Arizona, such as the Coronado National Forests, BLM, USF&W at Buenos Aires and Cabeza Prieta National Wildlife Refuges, and AGFD. For example, in Altar Valley, we split up the area between 2 survey efforts. The USF&W surveyed lands south of the Arivaca and Bata Mote roads intersection, and we surveyed areas north of the intersection." (P. 19)

- "The overall objective of the 1999 cactus ferruginous pygmy-owl survey funded by Pima County was to survey as much suitable habitat in selected areas of Pima County as feasibly possible, and if time permitted, survey the areas twice." (P. 8)

- "Pygmy-owls found in Sonoran Desertscrub habitats are typically found associated with structurally diverse stands of desert riparian scrub with saguaros along washes. Such habitat is often referred to as xeroriparian vegetation. These washes have no permanent water flow; instead, flow is [ephemeral] and based on seasonal rainfall as well as strength and duration of individual storms. Desert riparian scrub vegetation is easily recognizable by the presence of a linear assemblage of trees and shrubs that grow along the wash. ... Just prior to listing the species as endangered, all of the known pygmy-owls were documented in such Sonoran Desertscrub habitat." (P. 11)

- "All of the pygmy-owl sightings in Arizona identified between 1993 and 1997 were in, or peripheral to, dense desert riparian scrub bordering dry desert washes." (P. 13)

- "Survey efforts conducted by Harris and Duncan in 1998 located pygmy-owls in the Altar Valley on the Buenos Aires National Wildlife Refuge. Prior to 1998 only one recent site was known from the Altar Valley on private lands near Sasabe. Habitat at two of the sites in the Altar Valley and on the Refuge were like many of the historical descriptions by pioneering naturalists from the late 1800s and early 1900s, i.e., Sonoran riparian deciduous forest, woodland, and scrub habitat." (P. 13)

- "**We targeted areas between occupied pygmy-owl territories that contained suitable habitat and areas that contained potential suitable habitat but were not necessarily adjacent to occupied habitat.** Our study area consisted of approximately 1,612,919 acres in the:

  [1] Altar Valley,
  [2] Avra Valley,
  [3] Saguaro National Park (East and West units),
  [4] Catalina Mountain foothills,
  [5] Rincon Mountain foothills,
  [6] Rincon Valley,
  [7] Redington Pass,
  [8] portions of Marana and Oro Valley, and
  [9] Santa Cruz River between Continental Road and Rio Rico in Santa Cruz County."

"These 9 areas were chosen for 3 reasons.

First, the undeveloped areas of Avra Valley, Saguaro National Park (East and West Units), and portions of the Santa Cruz River contain suitable, but previously unoccupied pygmy-owl habitat in the recent past.

Second, the Catalina Mountain foothills, Rincon Mountain foothills, and portions of Oro Valley, contain vegetation characteristic of pygmy-owl habitat but with higher density housing development than that found in occupied pygmy-owl territories in northwest Tucson.

Third, the Altar Valley area and the Marana area between I-10 and the Dove Mountain housing development contains suitable habitat and are adjacent to known occupied territories." (P. 16)

Within the 9 survey districts, the following reflects the distribution of call points.

DISTRICT	SUBAREAS		TOTAL CALLS
AVRA VALLEY			**932 stations**
Silverbell East	Avra/West of Avra	Gap Tank	
Silverbell West	La Tortuga Butte	Green Reservoir	
Waterman Peak	Cocoraque Butte	Three Points	
CATALINA FOOTHILLS			**855 stations**
Tucson North	Sabino Canyon	Agua Caliente Hill	
ALTAR VALLEY			**186 stations**
Cerro Colorado	Kitt Peak	Stevens Mountain	
Las Guijas	Palo Alto Ranch	Samaniego Peak	
TUCSON MNT PARK / SAGUARO NAT PARK (WEST UNIT)			**142 stations**
Cat Mountain	Brown Mountain	Avra	
ORO VALLEY			**124 stations**
Oro Valley	Tucson North		
RINCON MNTS / SAGUARO NAT PARK (EAST UNIT)			**123 stations**
Vail	Rincon & TV Peak	Mount Fagan	
MARANA			**117 stations**
Marana	Ruelas Canyon		
SANTA CRUZ RIVER			**104 stations**
Rio Rico	Tubac	Amado	
Green Valley	Esperanza Mill	Pena Blanca	
REDINGTON PASS			**49 stations**
Redington	Peppersauce Wash	Buehman/Soza Canyon	
TOTAL			**2,632stations**

Report Recommendations:

One of the common refrains before the 1999 survey season was that a broader survey effort might show that there are perhaps more owls than have been detected. By targeting areas between occupied pygmy-owl territories that contained suitable habitat, and areas that contained potential suitable habitat but were not necessarily adjacent to occupied habitat, the Pima County effort began to address this issue. Pygmy-owls were not detected in the 329 transects, although mobbing responses at almost 350 of the 2,632 call points suggests that some of these areas may support pygmy-owl populations. The recommendations for future survey efforts include:

- Begin surveying earlier in the season, if funding is available.

- Survey areas where mobbing occurred within the following survey districts:

  - Avra Valley
  - Catalina Foothills
  - Marana
  - Santa Cruz

- Conduct a broader survey effort in Altar Valley, which (along with the Tohono O'odham Nation) may support the largest extant pygmy-owl population in Arizona.

- Survey areas that have not been completely covered by past efforts, including:

  - Redington Pass, particularly Bellota Ranch
  - Ciengea Creek Preserve
  - Rincon Valley and Saguaro National Park (East Unit)
  - Santa Cruz River corridor south from Continental Road
  - Amado area
  - Altar Valley, west of highway 286.

- Survey near the Arizona border in Mexico, particularly south of Altar Valley and the Tohono O'odham Nation.

- Survey areas in Mexico where historical populations have been documented, including:

  - Sonoyta
  - Caborca
  - Magdalena
  - Between Guaymas and Empalme
  - Obregon
  - Agiobampo
  - Guiracoba
  - Alamos

- Survey in Pinal County, beginning just north of the Pima County line where known populations exist, and moving north toward Maricopa County.

Many of these suggestions will be carried out. A description of research efforts underway for the 2000 survey season is provided below.

C. Ongoing and Future Research

1. 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.

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

3. 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. Genetics information about owls in both countries will also begin to address information gaps that led to the listing of the pygmy-owl.

4. 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 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.

The implementation of the Recovery Plan recommendations will provide the most comprehensive and studied approach to addressing one of three basic factors that led to the listing: i.e., the existing data gaps about the environmental, demographic and genetic vulnerability of the pygmy-owl.

5. 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.

3. Regulatory and Legal Actions

A. Past Actions
B. Army Corps/404 Permits
C. Pending Decision - Amphi

Twenty day old ferruginous pygmy owls
Photo courtesy of Glenn Proudfoot

III. Regulatory and Legal Actions

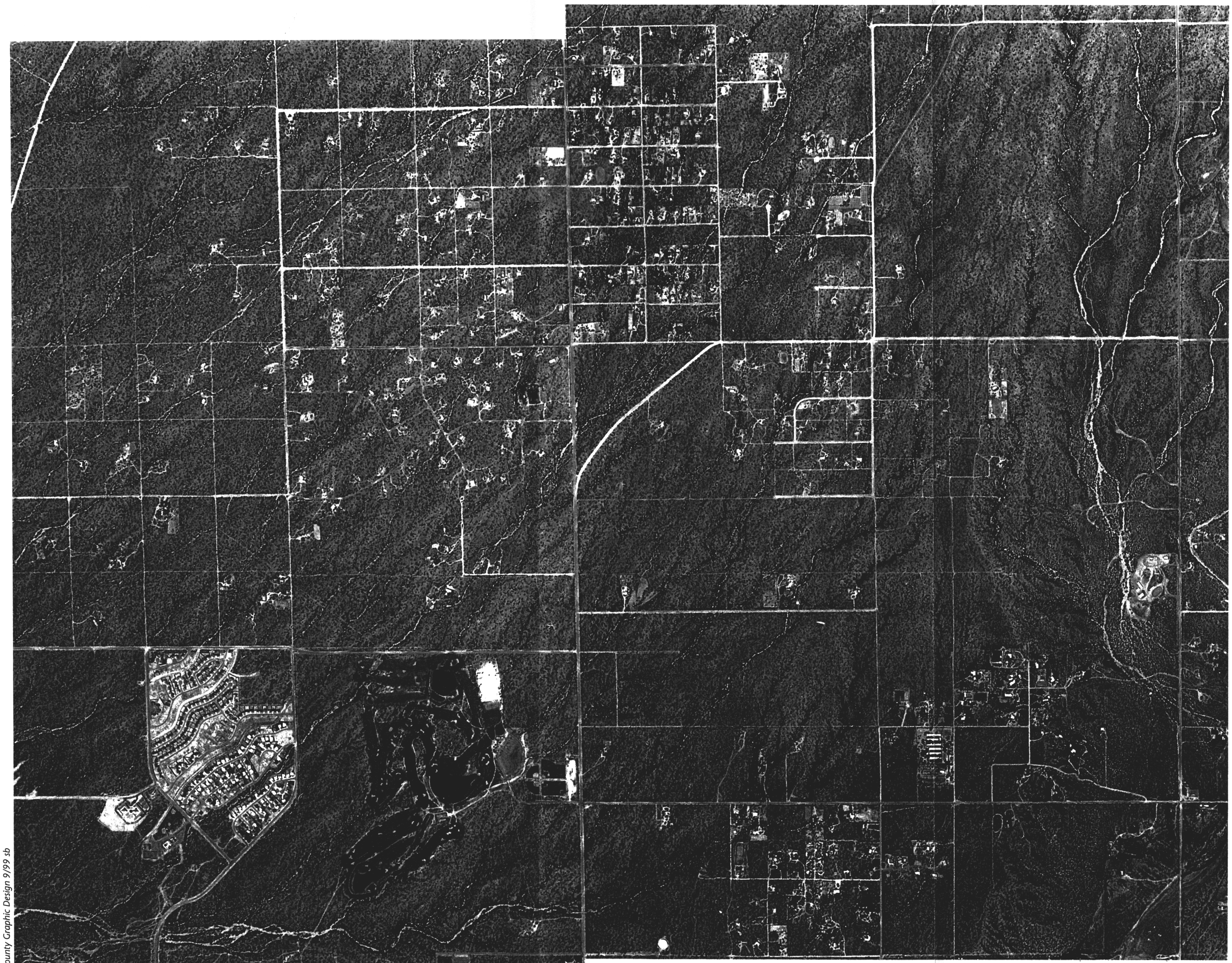
A. Past Actions

1. Listing of the Pygmy-Owl -- The discussion thus far has focused on the extent to which research initiatives will resolve one of three prongs that led to the listing of the pygmy-owl, i.e., identifying environmental, demographic and genetic vulnerabilities to random extinction. This section of the *Pygmy-Owl Update* report will concentrate on the other two major prongs of the listing: the inadequacy of existing regulatory mechanisms; and the present or threatened destruction, modification, or curtailment of its habitat or range. Since the listing of the pygmy-owl, federal guidelines have been formulated for survey protocol and take guidance, and critical habitat has been designated. Court decisions have been rendered on habitat designation and permitting issues. A decision is pending from the 9th Circuit on whether a particular construction plan will constitute "take" in the form of harm or harassment. These rulings and regulations are summarized below in the context of two major factors for the listing.

Policy and planning factors underlying the listing -- inadequacy of existing regulatory mechanisms -- On the regulatory side, the Final Rule listing the pygmy-owl as endangered noted that protection is not offered under State law, and this remains true three years later. Another factor in the decision to list the owl was that "no conservation plans or habitat restoration projects specific to the cactus ferruginous pygmy-owl exist." The Sonoran Desert Conservation Plan will address this deficiency on a County-wide scale, *to the extent it is formulated, adopted and implemented by government entities within the region*. Pima County is also pursuing riparian protection and restoration projects that will enhance the viability of the pygmy-owl. A third factor discussed as part of the listing is that "most Federal agencies have policies to protect species .... However, until agencies develop specific protection guidelines, evaluate their effectiveness, and institutionalize their implementation, it is uncertain whether any general agency policies adequately protect the pygmy-owl and its habitat." Since all relevant federal agencies have agreed to participate in the conservation planning process, this aspect of the listing may be resolved in the future. Finally, the listing document notes 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 permitting program. Federal agency actions taken in response to this injunction might adequately address this factor in the original listing. A more detailed discussion of the Court order is found below.

Resource utilization factors that led to the listing -- habitat destruction, modification, or curtailment -- The listing document states in part that "the pygmy-owl is threatened by past, present, and potential future destruction and modification of its habitat, throughout a significant portion of its range in Arizona." The impact of urbanization and in particular, population growth on the northwest side were factors in the listing. At the time of the listing, the Service 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 birds in Arizona currently exist."

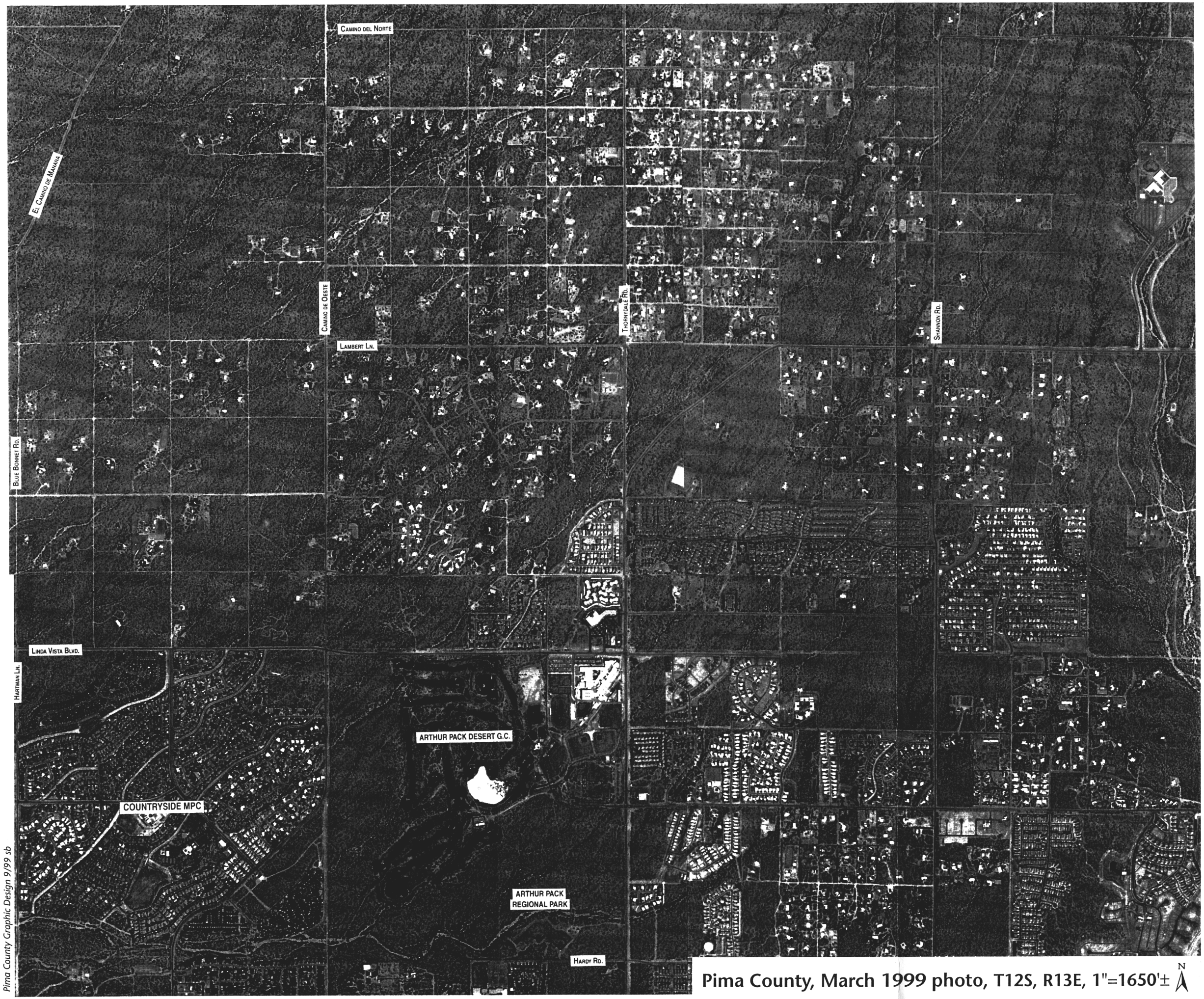
The aerial photos and maps on the next pages show (1) the build-out of occupied pygmy-owl habitat around Arthur Pack Park from 1983 to 1999, and (2) the committed and vacant land in the same area. Both indicate that growth pressures on the northwest side exceed the impact predicted by the Service at the time of listing.



Pima County, October 1983 photo, T12S, R13E, 1"=1650'± N

Pima County Graphic Design 9/99 sb

Figure 9



Pima County, March 1999 photo, T12S, R13E, 1"=1650'±

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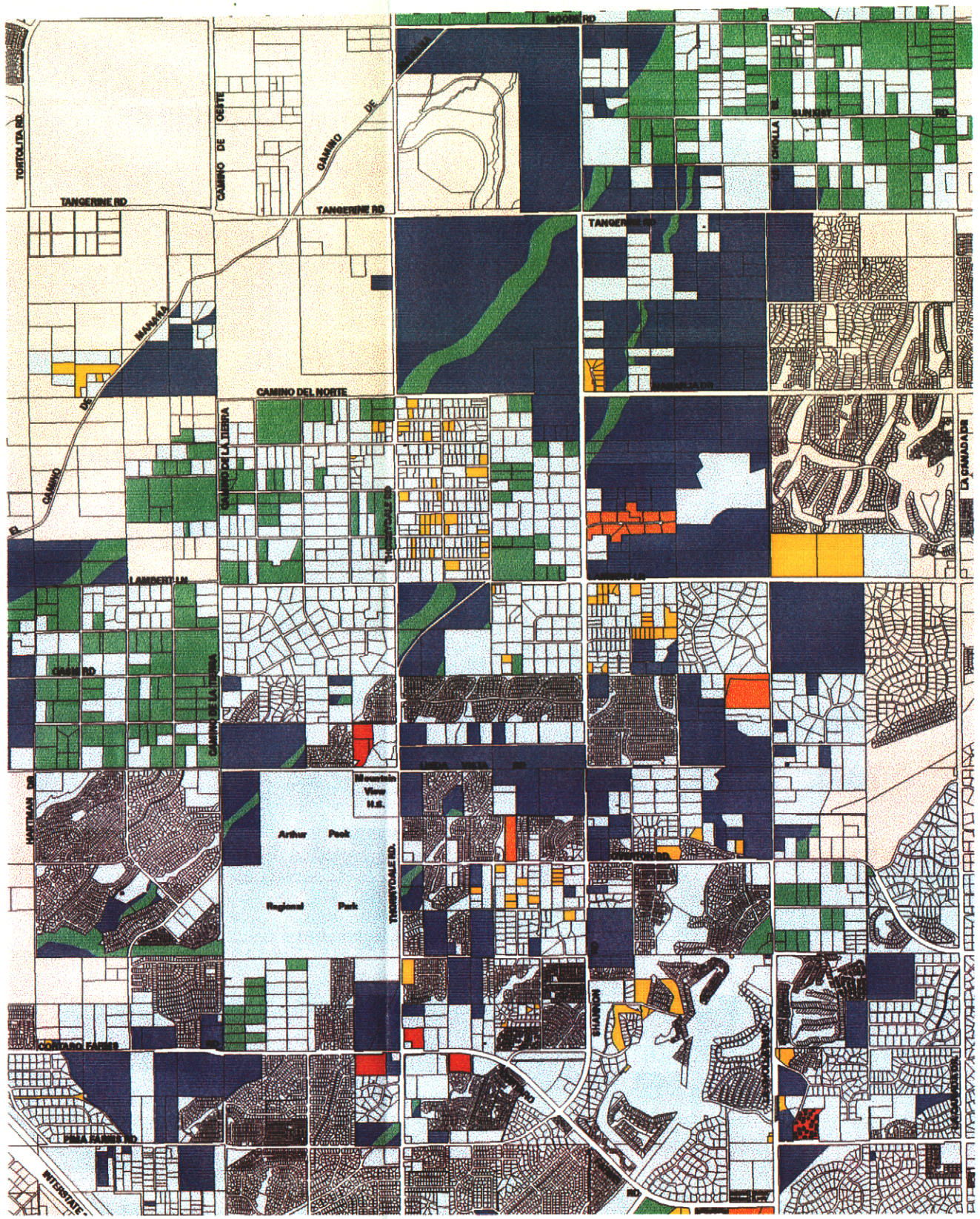
Pima County Graphic Design 9/99 sb

Figure 10



COMMITTED LAND

Northwest Area

02-NOV-1999

Legend

- Built or Graded

Categories of Vacant Land

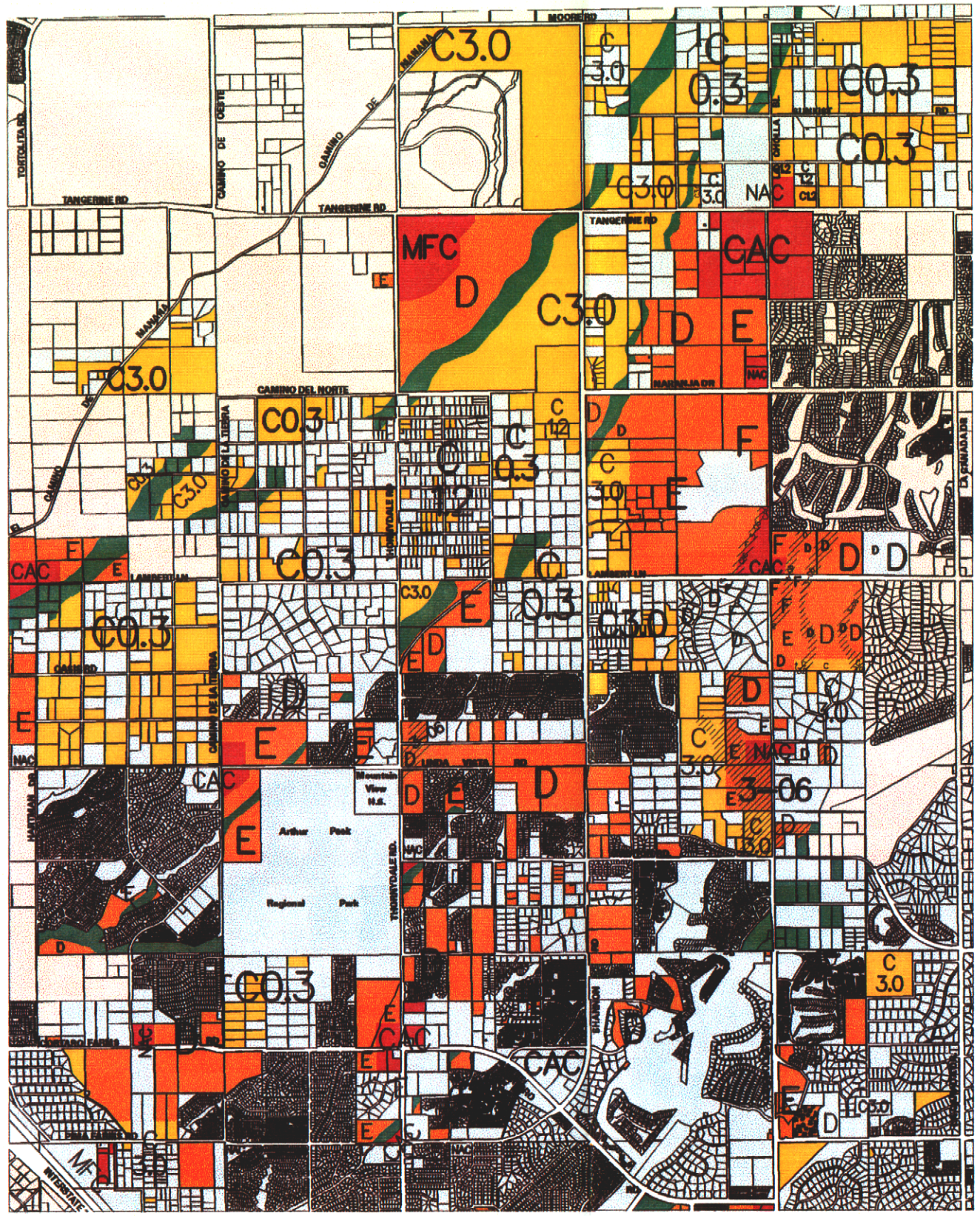
- Approved Plat or Development Plan
- Development Plan under Review
- Existing or Conditional Zoning
- Planned for Greater than SR Densities
- Vacant Land Planned and Zoned at SR or Less
- Cities and Towns

PLAN COORDINATION:
Pima County Development Services Department
Planning Division - Comprehensive Plan Section
201 N. Stone Ave.
Tucson, Arizona 85701
520 740 6800

Figure 11

/turbo2/projects/thornydale/thorny.aml

MAF



PLANNED LAND USE
Vacant Land
Northwest Area

02-NOV-1999

Legend

Planned Land Use

C,AC Activity Centers
- REAC Regional Activity Center
- CAC Community Activity Center
- NAC Neighborhood Activity Center
- MFC Multifunctional Corridor

D Medium/High Intensity Urban
- D Medium Intensity Urban
- E Medium High Intensity Urban
- F High Intensity Urban

C1,2 Low Intensity Urban
- 3.0 Low Intensity Urban 3.0
- 1.2 Low Intensity Urban-1.2
- 0.5 Low Intensity Urban-0.5
- 0.3 Low Intensity Urban-0.3

Development Reserve

RUAC,RX Rural Activity Centers
- RUAC Rural Activity Center
- RX Rural Crossroads

Medium Intensity Rural

Low Intensity Rural

Resource Transition

Resource Productive

RX Industrial
- I Urban Industrial
- HI Heavy Industrial

Resource Conservation

HP Special Areas

Basemap Features

Built or Graded

Cities and Towns

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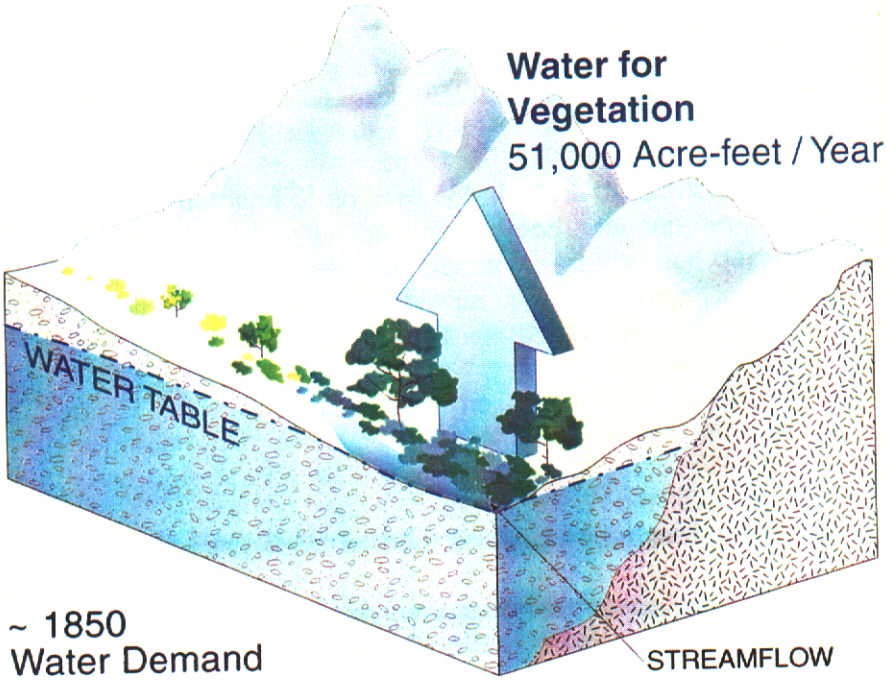
Figure 12

/urbo2/projects/thornydale/thorny_pl.eml

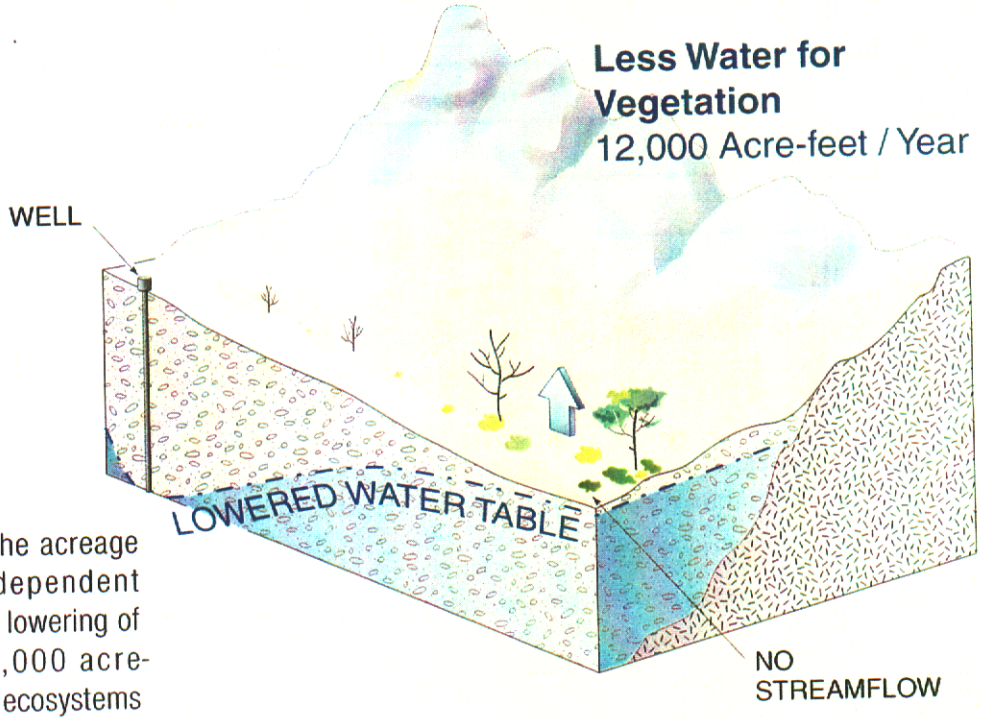
MAF

Water Needed for Riparian Ecosystems



~ 1850
Water Demand

A high groundwater table supports flowing streams with native fish. Groundwater-dependent riparian vegetation provides extensive, high-quality habitat for many other wildlife species.



1990
Water Demand

Aquatic habitats are gone, and the acreage and quality of groundwater-dependent riparian habitat is reduced due to lowering of the water table. At least 39,000 acre-feet/year is diverted from riparian ecosystems in the Tucson area. There is no protection for existing shallow groundwater zones.

(after Freethey and Anderson, 1986. USGS Atlas HA-664)

Figure 13

Pima County Graphic Design 10/99 ab

Resource utilization factors that led to the listing --- habitat destruction, modification, or curtailment (continued) - 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. The Rule states:

- "The majority of these losses are due to destruction and modification of riparian and thornscrub habitats. It is estimated that between 85 to 90 percent of low-elevation riparian habitats in the southwestern United States have been lost or modified."

- "These alterations and losses are attributed to urban and agricultural encroachment, woodcutting, water diversion and impoundment, channelization, livestock overgrazing, groundwater pumping, and hydrologic changes resulting from various land use practices."

- "In summary, very few pygmy-owls remain throughout the pygmy-owl's historic range in Arizona due to extensive loss of habitat. In addition, the remaining pygmy-owl habitat faces numerous and significant threats."

The Sonoran Desert Conservation Plan includes a Riparian Restoration Element that will provide a more comprehensive assessment of the decline in water, riparian habitat and riparian dependent wildlife. In order to gain a sense of the magnitude of riparian losses, four questions help to establish preliminary benchmarks:

(1) What amount of water maintained the Upper Santa Cruz sub-basin ecosystem before agricultural and development uses competed for water resources?

(2) What amount of water maintains the vegetation community, and the various types of vegetation we have today?

(3) How adequate is the current resource base from the perspective of maintaining suites of species and from the perspective of compliance with federal law?

(4) What is the relationship of current conditions and pre-development conditions to the Sonoran Desert Conservation Plan?

(1) What amount of water maintained the Upper Santa Cruz sub-basin ecosystem before agricultural and development uses competed for water resources? The illustration on the next page describes the baseline conditions for wildlife within the Santa Cruz sub-basin before water was mined and diverted for intensive human consumptive uses. In pre-development conditions, the amount of water available for aquatic and riparian habitat was equal to the net natural recharge rate, on the order of 51,000 acre feet per year. Current volumes, which support about 6,000 remaining acres of groundwater dependent vegetation, are around 12,000 acre feet per year. The 39,000 acre-foot difference between conditions at the beginning and end of the century reflects how great the alteration of water resources from wildlife to human uses has been. This estimate of water diverted from wildlife use does not consider the areas outside the Upper Santa Cruz subbasin such as the Santa Cruz River outside the Tucson Active Management Area, Arivaca Creek, Sopori Wash, Cienega Creek, and the San Pedro River. In these areas, diversions of water and groundwater pumping may have also diminished aquatic and riparian habitat for wildlife. This estimate also does not include natural off-channel springs whose flows are now diverted or eliminated.

(2) What amount of water maintains the vegetation community and the various types of vegetation we have today?

The water demand of an acre of habitat is different depending on whether the vegetation type is hydroriparian[4] (such as cottonwood), mesoriparian[5] (such as mature, dense mesquite), xeroriparian[6] (such as less dense mesquite), or desert upland[7] (such as native grass or creosotebush). Meso- and hydroriparian vegetation are groundwater dependent, i.e., they use water stored underground for their life cycles.

Table 1 quantifies the water needed (per unit area) to support various types of native vegetation which could occur or might occur in or along our watercourses. These figures are derived from staff's review of existing literature. Whereas desert upland vegetation requires the least amount of water, young cottonwoods and willows require the most. Desert upland vegetation can persist without artificial irrigation, but young cottonwoods and willows require nearly constant moisture until their root systems mature. Also listed is the water needs of various other features for comparison purposes. A typical park is irrigated with enough water to support mesoriparian vegetation. A pecan grove uses about as much water as a grove of cottonwood or willow trees or evaporation from a lake.

Table 1. Water Needs for Vegetation (in Tucson area)

Type of Vegetation	Water Needs (acre-feet/acre)
Desert Upland	
Saltbush, native grass	0.5 - 1
Creosotebush	0.8
Xeroroparian	
Less dense mesquite	1.6

[4] Hydroriparian vegetation is generally found along perennial watercourses or wetlands. The vegetation is dominated by wetland plants and plants such as willow or cottonwood that need large amounts of water supplied for long amounts of time. While this is the least common riparian community type, it is vitally important for the life cycles of many specialized forms of wildlife. Mature and immature stands of these trees provide different functions for wildlife, and are both important

[5] Mesoriparian vegetation is generally found along intermittent watercourses or where groundwater is close to the surface. Mesquite bosques and sycamore-ash vegetation are examples of this type of vegetation.

[6] Xeroriparian vegetation grows in areas where stormwater flows provide additional moisture, such as in ephemeral stream channels. In a landscaping setting, depressions and constructed channels can be used to harvest stormwater to supply xeroriparian vegetation. These plant communities typically contain plant species which are also found in upland habitats, however these plants are typically larger or occur at higher densities than adjacent uplands. Xeroriparian vegetation is the most common type of riparian vegetation, and provides important food and shelter for wildlife.

Mesoriparian	
Mature, dense mesquite	3.0
Hydroriparian	
Mature cottonwoods	5.0 - 5.8
Young cottonwoods, willows	8.3
Wetlands	
Cattails	6.9
Other features	
Open water	5.4
Park with turf and trees	2.9 - 4.0
Pecan grove with ground cover	5.7
Golf course with water features	4.7

Current Santa Cruz Subbasin Water Budget -- This table allows water budgets to be determined by habitat type, and by the quality of the vegetation. A relatively low annual rate of evapotranspiration (2 AF of water/acre of land) is assumed in determining that the volume of water currently supporting 6,000 acres of vegetation in the Upper Santa Cruz subbasin is 12,000 acre-feet per year. The basis of this assumption incudes factors such as: (1) the groundwater table decline in many places has already eliminated cottonwood-willow forest, and has caused canopy dieback of mature mesquite trees and decreased leaf volumes, and (2) the vegetation in many riparian areas is young and scrubby due to previous disturbance.

Current Eastern Pima County Hydromesoriparian Vegetation Water Budget -- A similar analysis based on the amount, type and quality of habitat can be performed for Eastern Pima County. Arizona Game and Fish Department (AGFD) estimated based on early 1990's mapping that there were 7402 acres of hydromesoriparian vegetation in eastern Pima County, primarily along Sabino Canyon and Cienega Creek. Of this amount, AGFD estimated there were 1049 acres of cottonwood-willow and 3430 acres of mesquite. Pima County mapped 8241 acres of hydromesoriparian vegetation in eastern Pima County in the early 1990's, but this mapping did not extend into the existing public reserves. A figure of approximately 10,000 acres of hydromesoriparian vegetation is not unreasonable for eastern Pima County, including those portions of the Santa Cruz and San Pedro watersheds.

The water demand to support existing hydromesoriparian vegetation is probably around 3 feet per acre, considering that a) some riparian zones are at a higher elevation than Tucson and therefore require less water, and b) cottonwood-willow is a low percentage of the total area of hydromesoriparian vegetation.

Therefore 30,000 acre feet is an estimate of the total water needs of existing vegetation.

(3) How adequate is the current resource base from the perspective of maintaining suites of species and complying with federal law? The ability to measure reductions in water budgets over time and the commensurate reduction in the size and quality of vegetation communities, helps to explain why we find a disproportionate number of riparian dependent species imperiled today. 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. These include that:

- 75 to 85 plants and animals in Pima County are in need of protection under the conservation plan. A large percent of these, and a disproportionate number of extirpated native species are (or were) dependent on riparian or aquatic habitat which is now lost.

- Continued groundwater mining has contributed to substantial damage to riparian environments and ecosystems. It is estimated that 60 to 85 percent of Sonoran Desert wildlife depends on this riparian habitat for some part of its life cycle, including the long list of endangered, extirpated and imperiled species.

- Loss of riparian environments has been identified as a factor contributing to the decline in the population of pygmy-owls.

- Riparian habitat itself has been targeted by the Science Technical Advisory Team for protection under the Sonoran Desert Conservation Plan. A recent report to the Team confirms the need for such protection. In answer to the question of what percentage of each vegetation community exists in public preserves, riparian habitat was found to be largely unprotected.

The Riparian Restoration Element of the Sonoran Desert Conservation Plan recognizes the importance of riparian areas in achieving a balanced and sustainable ecosystem in Pima County. To meet Federal Endangered Species Act criteria, we will be required to commit to significant riparian restoration and protection. Without such, the balance of the Conservation Plan is essentially meaningless.

(4) What is the relationship of current conditions and pre-development conditions to the Sonoran Desert Conservation Plan? Just restricting analysis to the Upper Santa Cruz subbasin, we find that if water is to be allocated for riparian and aquatic restoration sufficient to recover a level of natural function, something on the order of 39,000 acre-feet per year would be needed. The present water budget of 12,000 acre feet is supporting an often scrubby 6,000 acres of vegetation that has populations of riparian dependent species crashing at an increasing rate. A balance point between the inadequate ecosystem in existence today, and the historic conditions of 51,000 acre-feet/ year is likely to be the baseline recommended by the Science Team and Steering Committee of the Sonoran Desert Conservation Plan. Similar analysis can be performed to determine baseline resource goals on a smaller or larger scale within Pima County. Over half of the remaining 6000 acres of groundwater dependent vegetation is jeopardized by existing and future groundwater pumping, as well as outright habitat destruction. Measures are needed to reduce groundwater pumping in the vicinity of riparian areas along Sabino Creek, Tanque Verde Creek and Agua Caliente Wash, and to prevent increased pumping along Rincon Creek. Substitution of effluent for groundwater-based turf uses will be needed to protect these systems, among other measures.

2. Protocol and Take Guidance

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

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

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

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

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

(4) Other proposed survey protocol changes include:

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

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

Before the start of the next survey season, it is expected that the Service will exercise one of several options: the newly proposed protocol and guidance could become the advisory standard; the existing guidance could remain in place as the advisory standard; or the Service could decide not to issue any advisory standard to assist landowners in assessing their risk of liability under Section 9 of the Endangered Species Act, which prohibits "take" of an endangered animal,[8] or a revised standard may be issued.

---

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

3. Critical Habitat Designation

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

Federal Register Table of Approximate Critical Habitat Acreage in Pima County

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

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

What Factors Went into Determining Critical Habitat? In the December 1998 Federal Register notice, the Service described factors that went into determining areas that are essential for the survival and recovery of the species, including: (1) "In an effort to map areas essential to the conservation of the species, we used data on known pygmy-owl locations to initially identify important areas. We then connected these areas based on the topographic and vegetative features believed most likely to support resident pygmy-owls and / or facilitate movement of birds between known habitat areas." (2) "We did not propose all pygmy-owl historical habitat as critical habitat. We proposed only those areas that we believe are essential for the conservation of the pygmy-owl and in need of special management or protection." (3) "We used the best scientific information obtainable in the time allowed by the court."

How is Critical Habitat Applied? The designation of critical habitat applies to federal projects and entails these factors, according to literature from the Service: Critical habitat is a "classification used to identify areas in which Federal agencies need to exercise special care to avoid damage to federally listed endangered and threatened species." "Federal projects and activities [within critical habitat] are individually evaluated by the implementing agency and the U.S. Fish and Wildlife Service ...." In other words, landowners with projects in critical habitat that have a federal nexus will have to consult with the Fish and Wildlife Service. This should not represent a change in practices for those who understand their liability under the Endangered Species Act. Until the County has a Section 10 permit, potential Section 9 liability exists, regardless of the status of habitat designation or protocol standards. When Pima County receives its Section 10 permit under the Endangered Species Act, the critical habitat designation will be replaced by the terms of the conservation plan. Therefore, the U.S. Fish and Wildlife Service continues to recommend that development of a region-wide, multi-party, comprehensive conservation plan is the preferred long-term option to allow for the survival and ultimate recovery of the pygmy-owl in Arizona.

B. Recent Army Corps Nation Wide Permit (404) Injunction -- Wash Protection

In October of 1999, in the case of *Defenders of Wildlife v. Lt. General Ballard / United States Army Corps of Engineers*, a United States District Court Order (1) enjoined the Army Corps of Engineers "from any further authorization under Nation Wide Permits 13, 14, and 26, until the [Corps] conducts a regionally based, programmatic impact analysis," and (2) the Corps was further ordered to "engage in Section 7 consultation with the Fish and Wildlife Service regarding the effect of its Nation Wide Permit program on the pygmy-owl and its habitat in this region." This section of the report discusses the meaning of the District Court Order, and opportunities for pursuing a broad solution to the fragmentation in the federal permitting process that exists once endangered species issues arise.

1. The injunction on the Army Corps of Engineers "from any further authorization under Nation Wide Permits (NWP) 13, 14, and 26, until the [Corps] conducts a regionally based, programmatic impact analysis." A few questions and answers are found below to convey the meaning and impact of the District Court injunction.

Question 1: What is Section 404 of the Clean Water Act?

Answer 1: In 1977, the Clean Water Act amended the 1972 Federal Water Pollution Control Act to establish the framework for regulating the discharge of pollutants into the waters of the United States. Section 404 of the Clean Water Act provides authority to the Army Corps of Engineers to permit discharges under certain circumstances.

Question 2: What government agencies are involved in administering Section 404?

Answer 2: From Pima County's perspective, the Administration of Section 404 involves the U.S. Army Corps and the Environmental Protection Agency. The U.S. Fish and Wildlife Service is involved if the 404 permit activity may affect a species listed under the ESA.

Department of Defense: Section 404 of the Clean Water Act allows the Secretary of the Army to issue permits to discharge dredged or fill material into the waters of the United States.

Environmental Protection Agency: The guidelines for this activity are developed by the Administrator of the Environmental Protection Agency (EPA), along with the Secretary of the Army. The EPA can deny, prohibit, restrict or withdraw the use of disposal site areas when discharge would have an unacceptable adverse effect on municipal water supplies, shellfish beds and fishery areas, wildlife, or recreational areas. EPA regulations provide a definition for "unacceptable adverse effect."

Department of the Interior: Definition for fish and wildlife protection also calls on the expertise of the U.S. Fish and Wildlife Service. In addition, the Service consults with the Army Corps under Section 7 of the ESA if the issuance of a permit may affect a listed species.

Pima County Government: As these federal entities work to have edges of their standards and processes align on various permit issues, Pima County -- in both its projects and permitting practices -- is guided by the resulting federal decision. Under Title 16 of the Pima County Code, floodplain use permits require the County engineer to "review the proposed development to assure that all necessary permits have been received from those governmental agencies from which approval is required by federal or state law, including Section 404 of the Federal Water Pollution Control Act...."

Question 3: What is a Nation Wide Permit and how does it compare to other types of permits that are issued under the Clean Water Act?

Answer 3: Under Section 404(e), the Secretary of the Army can specify low impact activity that is exempt from individual permit (project-by-project) requirements. Individual permits are available, but require more time since an Environmental Assessment or Environmental Impact Statement is prepared for the project that would be permitted. For Nationwide Permits, the National Environmental Policy Act analysis is done on a programmatic level.

In 1996, the Department of Defense published Final Notice of Issuance, Reissuance, and Modification of Nationwide Permits. Forty NWP categories are listed, covering activities such as Structures in Artificial Canals (NWP 2); Scientific Measurement Devices (NWP 5); Utility Line Discharges (NWP 12); Single Family Housing (NWP 29); Cranberry Production Activities (NWP 34); and Farm Buildings (NWP 40).

All Nationwide Permits are subject to General Conditions in addition to the specific conditions of the particular permit. There are general conditions for protection of endangered species and historic properties.

Under the general condition relating to endangered species, "no activity is authorized under any NWP which is likely to jeopardize the continued existence of a threatened or endangered species or a species proposed for such designation under the ESA, or which is likely to destroy or adversely modify the critical habitat of such species."

Question 4: What Nationwide Permits were enjoined by the District Court?

Answer 4: The District Court enjoined further authorization under Nation Wide Permits 13, 14, and 26 until the Army Corps conducts a regionally based programmatic impact analysis.

- NWP 13 covers "bank stabilization activities necessary for erosion prevention."
- NWP 14 covers "fills for roads crossing waters of the United States (including wetlands and other special aquatic sites)."
- NWP 26 covers "discharges of dredged or fill material into headwaters and isolated waters." This permit was set to expire.

Question 5: What issues remain to be clarified?

Answer 5: On October 25, 1999, the Department of Justice filed in District Court for reconsideration of the Order, or in the alternative, for clarification of the Order. The Corps "believes that this injunction should properly be limited to NWPs 13, 14, and 26 in areas designated as critical habitat or that contain suitable habitat in Pima and Pinal Counties until the Corps completes an environmental analysis (EA) for this 'region.'" Clarification of the Order will provide Pima County with information about:

(1) Whether the injunction applies to more than Nationwide Permits 13, 14, and 26;

(2) Whether the injunction applies to particular permits in all of Pima County or in a more circumscribed area. Critical habitat is defined on the map, but suitable habitat is a greyer area. Proposed take guidance and survey protocol for pygmy-owls includes riparian habitat.

2. The Order to "engage in Section 7 consultation with the Fish and Wildlife Service regarding the effect of its Nation Wide Permit program on the pygmy-owl and its habitat in this region.

Under one part of the District Court Order discussed above, the Corps must complete a programmatic impact analysis for NWPs 13, 14 and 26. The Court further Ordered that the Corps must consult with the Service about the effect of the program on the pygmy-owl and its habitat. 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.

3. Fragmentation in the federal permitting process for endangered species issues.

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 gained assurances.

- Permitting programs for water and land protection could be streamlined and work in a coordinated fashion.

- The application of standards could be more accurately tailored to conditions within the Pima County environment. For instance, the current federal definitions of "wetland[9]" and "waters of the United States" does not work for riparian areas in Pima County. The east coast perspective on protecting riparian ecosystem is not particularly effective here, where the watertable is overdrafted and conditions are arid. In fact, the Army Corps definition has the effect of protecting the most valuable riparian habitat in Pima County the least. A better definition would capture riparian vegetation farther from the channel, so that the system itself -- and what it offers in terms of species protection -- would be covered.

4. Summary -- The District Court's scrutiny of federal permitting practices might result in a shared 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.

---

[9]Judicial interpretation of Section 404 has extended the regulations to apply beyond navigable waters to "wetlands." The definition of wetlands makes sense for east coast systems, but is not a neat fit for the arid west. Under 33 CFR 328.3(b), the term 'wetlands' means those "areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas." Even where the definition fits the ecosystem, the Corps and EPA do not always agree on implementation.

D. Pending Decisions - Amphi Litigation

Since March of 1998, construction activities on land slated for a future high school have been enjoined as litigation has been pursued through both the District Court and the Ninth Circuit Court of Appeals. A decision from the Ninth Circuit is anticipated in the near future.

The issues presented by the Defenders of Wildlife include:

- "Did the district court err in holding that the construction and operation of a large high school complex will not 'harass' or 'harm' pygmy-owls within the meaning of section 9 of the Endangered Species Act, where the district court found that one or more owls are in the immediate vicinity of the construction site, and where leading experts on pygmy-owls testified that defendants' activities are likely to impair the owl's essential biological functions?"

- "Did the district court abuse its discretion by disallowing plaintiffs from obtaining and presenting additional evidence concerning the impacts of the project on pygmy-owls?"

The arguments before the Ninth Circuit include:

- "construction activities will likely 'harass' or 'harm' the pygmy-owls which the court found were in the immediate vicinity of the construction site;"

- "opinions of the leading experts on a species [should] trigger the section 10 permitting process;" and

- if "evidence produced by plaintiffs was not adequate to invoke the ESA's safeguards, then the district court committed clear error by excluding addition critical testimony and evidence."

The decision from the Ninth Circuit might provide guidance on the reach of the Section 9 prohibition on take. Questions such as what constitutes 'occupied habitat' and how much habitat can be impacted outside the Section 10 permitting process might also be addressed.

4. Conclusion

Revisiting the factors that led to to listing

Two day old ferruginous pygmy owl from the Texas population
Photo courtesy of Glenn Proudfoot

IV. Conclusion

Three major factors contributed to the listing of the pygmy-owl as endangered in 1997:

(1) The original riparian habitat of the owl has been destroyed, modified or curtailed, and the Sonoran desertscrub habitat where most remaining owls live is under development pressures.

(2) The existing regulatory mechanisms were deemed inadequate and no conservation planning for the pygmy-owl was in place;

(3) The pygmy-owl population was extremely small and apparently declining, and information to protect the pygmy-owl was not available. In the absence of information to the contrary about life history and status, it appears that it is vulnerable to random extinction due to the interactions of environmental, demographic and genetic factors.

Since the 1997 listing, the pygmy-owl has been the source of much discussion. When the rulings and research efforts that have taken place are viewed in the context of the basic problems that caused the listing, it becomes clear that:

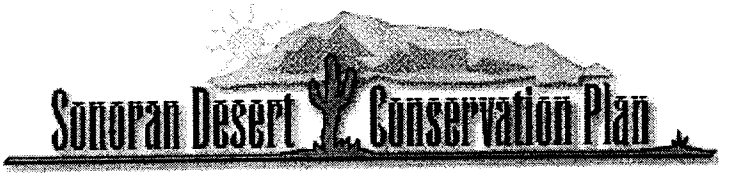
At times the underlying resource depletion problem has been exacerbated since the listing. The development pressures on the northwest side exceed what the Service described as "potential threats to pygmy-owl habitat" in 1997.

Some factors that led to the listing have not yet been addressed. In terms of resource protection, there has not been a region-wide effort to protect riparian habitat, although such an effort may result from the recent District Court decision enjoining certain permitting practices in riparian areas until an impact analysis is performed and the program is reviewed in consultation with the U.S. Fish and Wildlife Service.

In certain areas, efforts toward downlisting, delisting and the recovery of the pygmy-owl have started. The research strategies to gain knowledge about the pygmy-owl, and the initiation of the regional multi-species Sonoran Desert Conservation Plan, hold the most promise for resolving the current dilemmas caused by the listing of the pygmy-owl, and for reducing or avoiding future listings of endangered animals.

Meaningful financial support for these efforts has been limited to federal and county contributions.

A lasting solution to endangered species listings will occur only when these research efforts are completed and the resulting plans are implemented.



Appendix

Harris Environmental Survey Report

Pygmy Owl Update

Sonoran Desert Conservation Plan

PIMA COUNTY
CACTUS FERRUGINOUS PYGMY-OWL

VOLUME I

CONTRACT # 07-26-H-125828-0499

FINAL REPORT

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SEPTEMBER 1999

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EXECUTIVE SUMMARY

A survey of portions of eastern Pima County and western Santa Cruz County, Arizona, was conducted for the cactus ferruginous pygmy-owl (*Glaucidium brasilianum cactorum*), an endangered species under the Endangered Species Act of 1973, as amended. The team of Harris Environmental Group, R. B. Duncan & Associates, and Dames & Moore, Tucson, conducted the surveys between mid-April through June 1999 on federal lands, Arizona State Trust lands, Pima County holdings, and some private lands. The survey season was initiated when funding became available in mid-April. We utilized a taped playback methodology following Corman (1993) with modifications recommended by Glenn Proudfoot (Caesar Kleberg Wildl. Res. Inst., Texas A & M Univ., Kingsville, pers. comm. 31 December 1997). The interval between call points was 150 m in an urbanized setting and 400 to 480 m in a rural setting.

No pygmy-owls were detected in the 329 transects (totaling 2,632 call points) that we conducted from mid-April through June 1999. Approximately 226,000 acres of apparently suitable pygmy-owl habitat were effectively covered along these transects. The fact that we did not detect pygmy-owls does not mean that all areas surveyed did not then support pygmy-owls or could not support pygmy-owls. Habitats surveyed included, for the most part, vegetation representing the Paloverde-cacti-mixed scrub series of the Sonoran Desertscrub Arizona Upland subdivision, and also Sonoran riparian deciduous forest and woodlands found along larger drainageways with surface or near surface water present.

The survey season is January–June, with the highest response rate typically associated with mid-January–mid-April. As with the boreal owl *(Aegolius funereus)* and

other small cavity nesting owls, the pygmy-owl in Arizona seems to pare down its calling once pair bonding occurs and the female has sequestered herself away in a nest cavity to incubate eggs and brood young (Harris and Duncan 1998). However, during the 1999 field season, Arizona Game and Fish Department (AGFD) were detecting new pygmy-owls by broadcast calling into June (S. Richardson, AGFD, Tucson, pers. comm. 26 June 1999). In some areas, we did elicit responses from other birds in answer to our tape broadcasts of pygmy-owl calls. Responses included single species responding in an agitated manner to multiple species "mobbing" behavior.

As for recommendations for future pygmy-owl survey efforts, we suggest that some of the same areas surveyed in 1999 be resurveyed in the near future, and that the surveys be initiated earlier in the breeding season. We also recommend that surveys be conducted again in and near the transects where "mobbing" occurred and in areas that were not surveyed completely in 1999. In addition, Pima County should work with private landowners, including the Altar Valley area, and with the Tohono O'odham Nation to gain permission to survey these lands as thoroughly as possible for pygmy-owls. These two areas likely support the largest extant population of the species in Arizona. We also recommend that surveys be conducted in Mexico, immediately south of the Altar Valley and the Tohono O'odham Nation, and in southern Pinal County. Part of the survey effort in Mexico should be focused in areas where they have been historically documented south of the border, e.g. Sonoyta, Caborca, and Magdalena, and work southward. Surveys in Pinal County should begin in the areas where Harris and Duncan (1998) and AGFD have identified pygmy-owls and work toward Maricopa County, so as to refine the species' northern limits in Arizona.

INTRODUCTION

The U. S. Fish and Wildlife Service (USFWS) listed the cactus ferruginous pygmy-owl (*Glaucidium brasilianum cactorum*) in Arizona on 10 March 1997 (U.S. Fish and Wildlife Service 1997). Recently critical habitat for the species was designated on 12 July 1999 (USFWS 1999). A total of approximately 731,712 acres of riverine riparian and upland habitat were designated in Pima (260,883 acres), Cochise (4,832 acres), Pinal (432,606 acres), and Maricopa (33,391 acres) counties, Arizona. Conservation of the pygmy-owl now has become synonymous with a broader goal of conserving open space in the face of rapid development in southern Arizona, particularly in the Tucson area.

Prior to listing the species, only as many as 19 individuals were known in Arizona. Most of these were located in Pima County on private lands in northwest Tucson, on federal lands at Organ Pipe Cactus National Monument (OPCMN), and at a minimum of 2 localities in extreme southern Pinal County just north of Tucson within the incorporated boundary of Marana. A comparison of the historical and present-day range of the species in Arizona clearly shows a distributional change, the direct result of habitat changes brought about by human development. The change in distribution is most apparent north of Tucson. In the late 19th and early 20th centuries cactus ferruginous pygmy-owls were once found as far north as New River and Cave Creek north of Phoenix in Maricopa County, and most observations were found near the Phoenix area along the Salt and Gila Rivers (Figure 1). Despite recent efforts to locate the pygmy-owl in Maricopa County none have been found there since 1973. The furthest north that they are now found is well south of the Gila River in southern Pinal County just north of

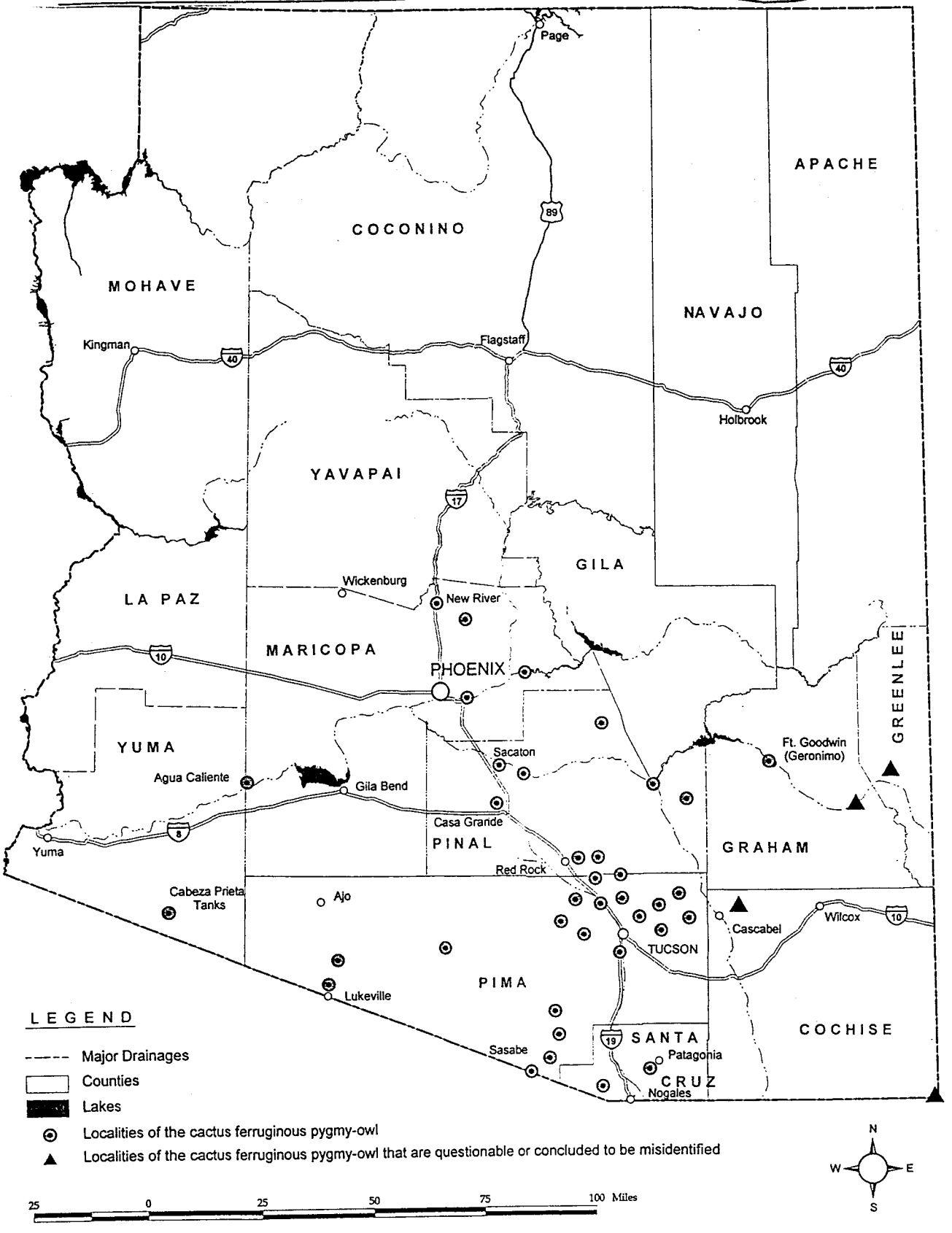

Figure 1. Location of the cactus ferruginous pygmy-owl in Arizona, 1872-1998.

Tucson (Duncan and Harris 1998, Harris and Duncan 1998). This range contraction is related to urban and agricultural development in Arizona, particularly construction of dams and associated water reclamation projects that precipitated the decline of pygmy-owl riverine riparian habitat. Extant populations of pygmy-owls in southern Arizona are now facing pressure from development in the Tucson area.

Beginning in 1993, the Arizona Game and Fish Department (AGFD) identified most of the northwest Tucson and Marana localities through focused survey efforts, using a tape broadcast survey methodology. In 1998, the U.S. Fish and Wildlife Service (USFWS) funded the first range-wide survey effort for the species in Arizona outside of the greater Tucson area (Harris and Duncan 1998, Duncan et al. 1998). A survey of more than 86,000 acres found 4 previously undocumented territories; 2 were located on the Buenos Aires National Wildlife Refuge (BANWR) in Pima County, and 2 were located east of the Red Rock/Interstate Highway 10 Interchange between Tortolita and Picacho Mountains in southern Pinal County. Additional cactus ferruginous pygmy-owls have been found in southern Arizona now that a more concerted effort is being made to locate them like that of Harris and Duncan (1998). The combined efforts of Harris and Duncan (1998) and that of AGFD and others in 1998 identified at least 31 individuals at a variety of locations between Tucson and OPCNM, the majority of which were in Pima County (Benesh and Rosenberg 1998).

Realizing a further need to survey additional lands within Pima County and adjacent lands for cactus ferruginous pygmy-owls, the Pima County Board of Supervisors funded surveys in eastern Pima County (excluding Tohono O'odham Nation lands) and portions of Santa Cruz County during 1999. This report summarizes the results of the

1999 survey efforts sponsored by Pima County and conducted by the team of Harris Environmental Group, R. B. Duncan & Associates, and Dames & Moore.

STUDY OBJECTIVES

The overall objective of the 1999 cactus ferruginous pygmy-owl survey funded by Pima County was to survey as much apparently suitable habitat in selected areas of Pima County as feasibly possible and, if time permitted, survey the areas twice. The survey areas included:

- lands selected by AGFD and the Pima County Administrator's Office east and south of the Tohono O'odham Nation in Pima County (permission to survey Tohono O'odham Nation lands has yet to be granted),
- lands within proposed (now designated) pygmy-owl critical habitat units in Pima County, and
- lands within Pima and Santa Cruz counties along the Santa Cruz River from Continental to Rio Rico.

SPECIES ACCOUNT

The cactus ferruginous pygmy-owl (hereafter pygmy-owl) is a small bird, brownish overall, with a cream-colored belly streaked with paler brown (Pyle 1997). The *cactorum* race, however, is described as "a well-marked, pale grayish extreme for the species" (Phillips et al. 1964). The call, for this mostly diurnal owl, is heard chiefly near dawn and dusk. The best field identification features are its small size, eye spots on the nape of the neck, and long reddish-barred tail, which is often nervously wagged or twitched (Monson 1998). Except where noted, much of the following information on the pygmy-owl was derived from the final rule to list the species as endangered in Arizona and from references cited therein (U.S. Fish and Wildlife Service 1997).

Distribution

Originally the pygmy-owl was described as a separate subspecies based on specimens from Arizona and Sonora, Mexico. The pygmy-owl was first documented in the United States from a collection by then Lieutenant Charles E. Bendire on 24 January 1872 in the "heavy mesquite thickets along Creek" near the present-day site of historic Camp Lowell, Tucson (Coues 1872, Bendire 1892).

Historically, the pygmy-owl occurred from the lowland central Arizona, south through western Mexico to the states of Colima and Michoacan, and from southern Texas south through the Mexican states of Tamaulipas and Nuevo Leon. In Arizona, the species was documented as far north as New River and Cave Creek in northern Maricopa County (Figure 1) (Fisher 1892, Lusk 1895). Elsewhere in Maricopa County, the species has been found west, near the Yuma County line along the Gila River at Agua Caliente, along the Salt River at Phoenix, and near the Verde River confluence. The eastern-most verifiable record was along the Gila River at Old Fort Goodwin, located approximately 2 miles southwest of present day Geronimo, Graham County, Arizona (Aiken 1937). Elsewhere in the southeastern part of the state, the species has been documented in recent times near Dudleyville along the lower San Pedro River between 1985 and 1987 (Sutton 1985, Bagnoli and Hunter 1986, Bock 1987), and probably also along lower Aravaipa Creek in 1987 (Monson 1987). Other localities in south central Arizona include historical records in Pinal County near Sacaton and Blackwater on the Gila River Indian Reservation, and at Casa Grande (Mearns 1885, Gilman 1908a, Gilman1908b, Gilman 1908c, Gilman 1909). Near the Mexican border, the species has been found in Santa Cruz County near Patagonia and in Sycamore Canyon west of Nogales. A likely accidental

sighting was documented once on 10 April 1955 in eastern Yuma County near the Mexican border at Cabeza Prieta Tanks on the Cabeza Prieta National Wildlife Refuge (Monson and Phillips 1981, Harris and Duncan 1998).

Historical Pima County Distribution

In addition to Bendire's collection, Pima County records include locations along the Santa Cruz River near Tucson and elsewhere in the Tucson basin including the foothills of the Santa Catalina and Rincon mountains (e.g., Brown 1884, Kimball 1920, Thornberg 1941, Thornberg 1943, Thornberg 1945, Phillips 1948, Brandt 1951, Davis 1973, Hayes and Zimmerman 1984). Also in Pima County, but outside of the Tucson basin, the pygmy-owl has been located near Ajo, Lukeville, Organ Pipe Cactus National Monument, on Tohono O'odham Nation lands, and in the Altar Valley north of Sasabe (e.g., Moore 1933, Corman 1997, Harris and Duncan 1998, Tibbitts and Dickson. 1998).

Habitat Description

Pygmy-owls have been documented in several habitat types in the northern portion of its range in Arizona and adjacent Mexico. In Arizona, these include streamside Sonoran riparian deciduous forest and woodland associations, and Sonoran Desertscrub representative of the Arizona Upland subdivision. Pygmy-owls also inhabit Sinaloan Deciduous Forest and Thornscrub in Mexico (not discussed here). The streamside associations include such species as cottonwood *(Populus fremontii)*, ash *(Fraxinus pennsylvannica* var. *velutina)*, net-leaf hackberry *(Celtis reticulata)*, willows *(Salix* spp.*)*, velvet mesquite *(Prosopis velutina)*, and others. The Sonoran Desertscrub associations are composed of relatively dense saguaro cactus *(Carnegiea gigantea)* stands

associated with short trees such as paloverde *(Cercidium* spp.*)*, mesquite, and ironwood *(Olneya tesota),* and an open understory of triangle-leaf bursage *(Ambrosia deltoidea)*, creosote bush *(Larrea tridentata),* and various other cacti and shrubs. For detailed descriptions of these habitat types see Brown (1982).

Pygmy-owls found in Sonoran Desertscrub habitats are typically found associated with structurally diverse stands of desert riparian scrub with saguaros along washes. Such habitat is often referred to as xeroriparian vegetation (Johnson and Haight 1985). These washes have no permanent water flow; instead, flow is intermittent and based on seasonal rainfall as well as strength and duration of individual storms. Desert riparian scrub vegetation is easily recognizable by the presence of a linear assemblage of trees and shrubs that grow along the wash. These plants are denser and taller than the sparse desertscrub vegetation that typically exists in the adjacent uplands. Just prior to listing the species as endangered, all of the known pygmy-owls were documented in such Sonoran Desertscrub habitat (Lesh and Corman 1995, Abbate et al. 1996).

At the northern periphery of the subspecies' range in southern Arizona, pygmy-owl distribution and preferred habitat is not well understood. However, it is believed that the pygmy-owl requires the cover of denser wooded areas with understory thickets, like riparian habitat, for nesting, foraging, and predator avoidance. Likely pygmy-owl predators include larger owls and diurnal birds of prey, such as Cooper's hawks (*Accipiter cooperii*). Riparian habitat is also known for its high density and diversity of animal species that constitute the pygmy-owl's prey base. In one pygmy-owl prey study in Texas, it was found that it has a diverse diet that includes mammals, birds, reptiles, and insects (Proudfoot and Beasom 1997).

Reproduction

The pygmy-owl nests in cavities of larger trees (typically defined as a tree with a trunk at least 6 inches in diameter, measured at breast height) or large columnar cactus. Cavities may be naturally formed (e.g. knotholes) or excavated by woodpeckers. Pygmy-owls do not construct their own nest holes. All currently known pygmy-owl nest sites in the Tucson area are in woodpecker-excavated holes in saguaros (Harris and Duncan 1998). Historically, the species has also been documented nesting in cottonwood, paloverde, and mesquite trees in Arizona. Throughout its range, the pygmy-owl occurs at low elevations, generally below 4,000 feet. Nesting activity for this owl species in Arizona begins in late winter to early spring (Lesh and Corman 1995, Abbate et al. 1996).

Current Pygmy-owl Locations

The 1999 documented spring population of pygmy-owls in Arizona is approximately 78 individuals (41 adults and 37 juveniles). These are concentrated in 4 areas: southern Pinal County (12 individuals), northwest Tucson (27), Altar Valley (31), and Organ Pipe Cactus National Monument (8) (Scott Richardson, AGFD, person. comm. 8 July 1999). Outside of Arizona, larger populations exist in Texas and Mexico. Although genetic continuity between pygmy-owl populations in Arizona and northwestern Mexico has occurred in the past, it is unknown if at present there is movement between the two. Historical records in northern Sonora, Mexico near the Arizona border include those from Sonoyta, Caborca, and Magdalena (e.g., van Rossem 1945, Russell and Monson 1998). One of the most recent records for the species in northern Sonora is one detected on 26 September 1997 during a tape playback survey by

R. B. Duncan (unpubl. field notes) at La Pera, about 1.5 km SW Cerro Gauna and 4 km W Estación Llano and Mexico Hwy 15. The La Pera area is about 65 miles SSW of Nogales, Arizona. Habitat at the La Pera site was desert riparian scrub habitat dominated by ironwood, mesquite, acacia, and saguaro within the Arizona Upland Sonoran Desertscrub plant community. A study to determine genetic similarity between the Arizona, Texas, and Mexico populations is currently underway (G. Proudfoot, Texas A & M, pers. comm. 26 June 1999).

All of the pygmy-owl sightings in Arizona identified between 1993 and 1997 were in, or peripheral to, dense desert riparian scrub bordering dry desert washes. Dominant plants in these washes include paloverde, ironwood, mesquite, acacia *(Acacia constricta* and *A. greggii*), canyon ragweed *(Ambrosia ambrosioides)*, various shrubs, as well as saguaro and/or organ pipe cactus *(Stenocereus thurberi)*. This is in contrast to the relatively open upland (non-riparian) desertscrub found in the same area.

Survey efforts conducted by Harris and Duncan in 1998 located pygmy-owls in the Altar Valley on the BANWR. Prior to 1998 only one recent site was known from the Altar Valley on private lands near Sasabe. Habitat at two of the sites in the Altar Valley on the BANWR were like many of the historical descriptions by pioneering naturalists from the late 1800s and early 1900s, i.e., Sonoran riparian deciduous forest, woodland, and scrub habitat. Dominant vegetation included velvet mesquite, net-leaf hackberry *(Fraxinus velutina)*, velvet ash *(Sambucus mexicana)*, acacia, Mexican elderberry *(Sambacus mexicana)*, and others. The riparian habitat occupied by pygmy-owls at BANWR is highly integrated, and occurs as intermittent stands in conjunction with other riparian communities of scrubland that is characterized by acacias, seep willow

(Baccharis salicifolia), desert broom *(Baccharis sarothroides)*, burrobrush (*Hymenoclea monogyra*), and other shrubs. Upland habitat was dominated by a semidesert grassland community with perennial bunch grasses, mesquite, acacia, and various other shrubs and cacti. The pygmy-owl occupied riparian habitat at BANWR differs from most other present-day pygmy-owl locations. At these sites they are found in vegetation representing palo verde-cacti-mixed scrub associations of the Arizona Upland Sonoran Desertscrub biome with structurally diverse desert riparian scrub habitat along normally dry washes. Similarities between the other sites and those at the BANWR include structurally diverse habitats coupled with a species rich prey base. As previously mentioned, pygmy-owl surveys conducted during 1999 for the BANWR located several other sites in the Altar Valley area (Scott Richardson, AGFD, person. comm. 8 July 1999). However, these sites were associated with stands of saguaro and not with the more mesic riparian habitats found at the two sites on BANWR found in 1998.

STUDY AREA

Pima County is located in the southeastern portion of Arizona and includes 5,880,331 acres (Figure 2). The Tohono O'odham Nation is located in the middle portion of the County. Our survey focused on eastern Pima County (2,490,280 acres), defined as the area of Pima County east of the Nation. Based on discussions with Pima County, AGFD, USFWS, and our previous range-wide survey efforts (Harris and Duncan 1998), we targeted areas between occupied pygmy-owl territories that contained suitable habitat and areas that contained potential suitable habitat (but were not necessarily adjacent to occupied habitat). Our study area consisted of approximately 1,612,919 acres in the Altar

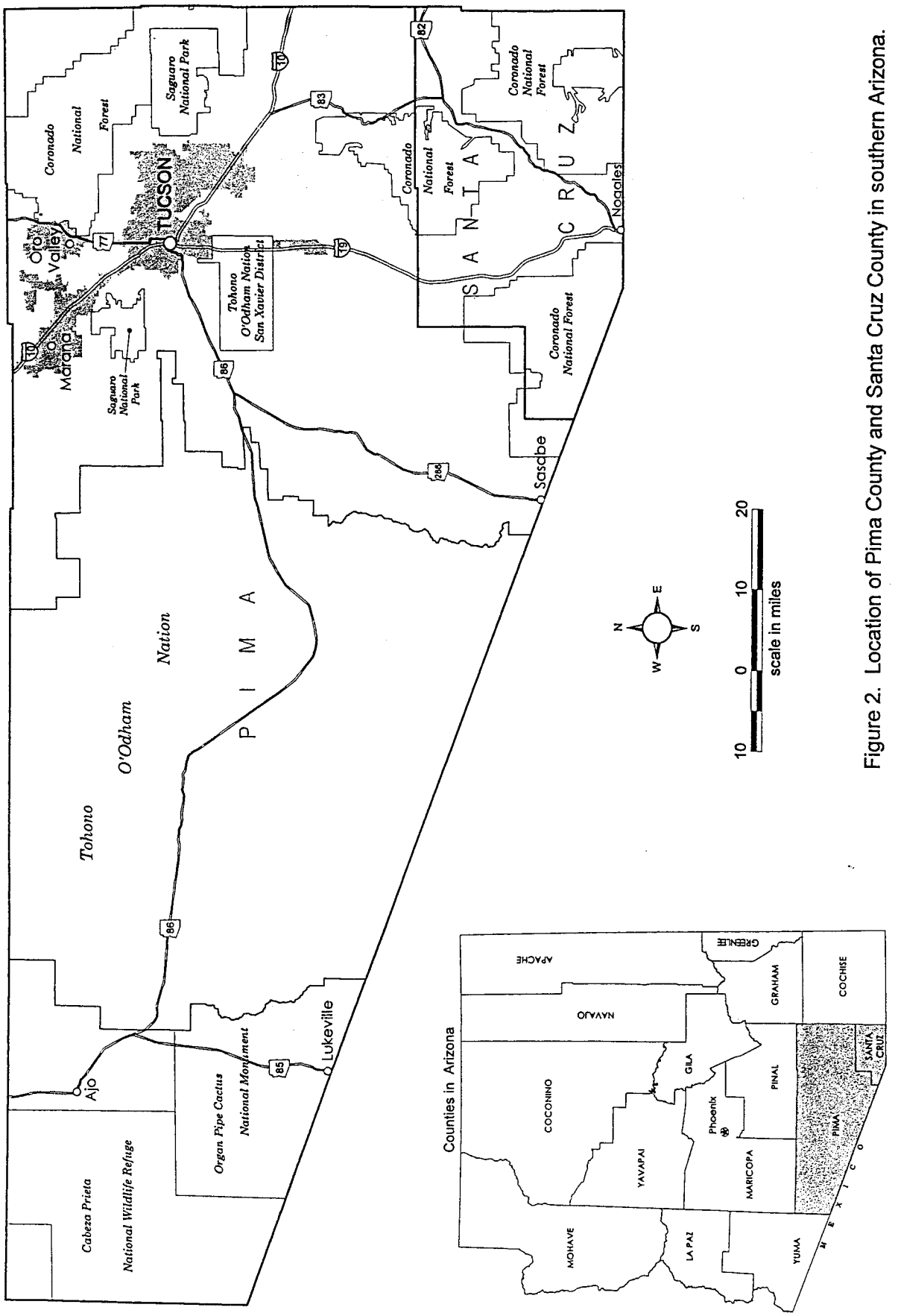

Figure 2. Location of Pima County and Santa Cruz County in southern Arizona.

Valley (excluding the BANWR), Avra Valley, Saguaro National Park (East and West units), Catalina Mountain foothills, Rincon Mountain foothills, Rincon Valley, Redington Pass, portions of Marana and Oro Valley, and along the Santa Cruz River between Continental Road and Rio Rico in Santa Cruz County (Figure 3). Portions of this area recently have been designated by the USFWS as critical habitat (Figure 4) for the species (USFWS, Federal Registrar, 12 July 1999).

These 9 areas were chosen for 3 reasons. First, the undeveloped areas of Avra Valley, Saguaro National Park (East and West Units), and portions of the Santa Cruz River contain suitable, but previously unoccupied pygmy-owl habitat in the recent past. Second, the Catalina Mountain foothills, Rincon Mountain foothills, and portions of Oro Valley, contain vegetation characteristic of pygmy-owl habitat but with higher density housing development than that found in occupied pygmy-owl territories in northwest Tucson. Third, the Altar Valley area and the Marana area between I-10 and the DoveMountain housing development contain suitable habitat and are adjacent to known occupied territories.

METHODOLOGY

Surveys were conducted mid-April through June, 1999, on federal lands managed by the Bureau of Land Management (BLM), U.S. Forest Service, and Department of Interior (National Park Service). Surveys were also conducted on Arizona State Trust lands, Pima County holdings, and private lands. Private lands surveyed included those owned by various homeowner associations and individuals property owners. Examples of homeowner association lands that were surveyed included Rancho Sin Vacas located

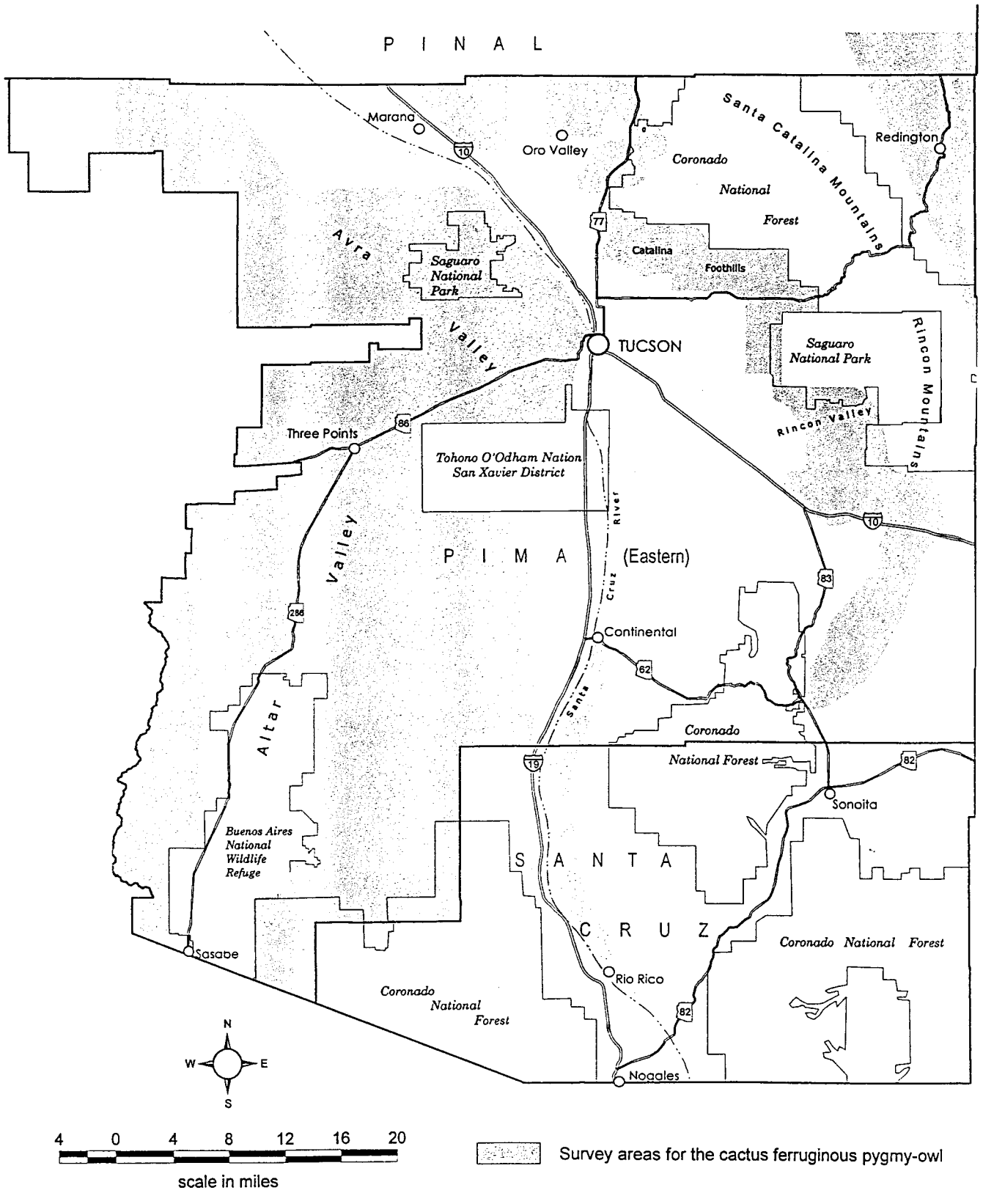

Figure 3. Location of survey areas for the cactus ferruginous pygmy-owl in eastern Pima County and western Santa Cruz County, Arizona, spring 1999.

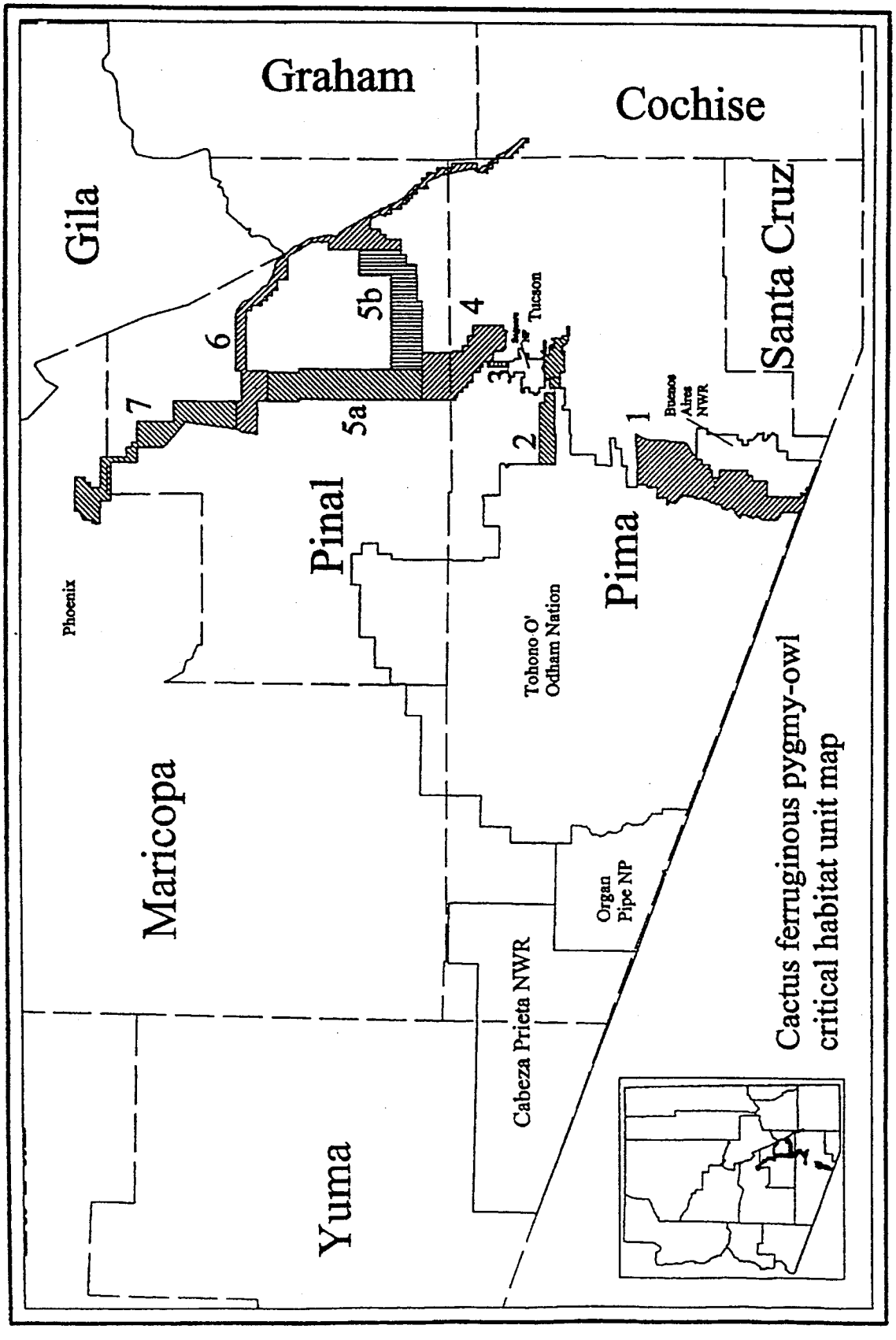

Figure 4. Designated critical habitat for the cactus ferruginous pygmy-owl in southern Arizona (From U.S. Fish and Wildlife Service (USFWS) 1999, Federal Register 64:37419-37440).

between Ina Road and the Coronado National Forest and Catalina Foothills Homeowners Association No. 7 located northeast of River Road and First Avenue. An example of an individual's property that was surveyed included Rancho Seco and the Santa Lucia Ranch owned by the Rowley family west of Amado and east of BANWR. Surveys in Santa Cruz County occurred along the Santa Cruz River between Continental and Rio Rico roads. These surveys were conducted from the riverbed. The Santa Cruz contained running water during the period of our surveys (late June).

To avoid duplication of effort and confusion, surveys were coordinated with others conducting pygmy-owl surveys in Arizona, such as the Coronado National Forests, BLM, USFWS at Buenos Aires and Cabeza Prieta National Wildlife Refuges, and AGFD. For example, in the Altar Valley, we split up the area between 2 survey efforts. The BANWR surveyed lands south of the Arivaca and Bata Mote roads intersection, and we surveyed areas north of the intersection.

To survey for the pygmy-owl, we used the preliminary survey protocol designed by AGFD (Corman 1993) with modifications recommended by Glenn A. Proudfoot (Harris and Duncan 1998). Like Corman's protocol, Proudfoot's methodology is an avian sampling technique using tape playback recordings similar to that described by Johnson et al. (1981), Forsman (1983), Proudfoot and Beasom (1996), and Stahlecker and Duncan (1996).

Because of the pygmy-owls crepuscular activity period, surveys were conducted from 1 hour before sunrise to 2 hours after sunrise or from 2 hours before sunset to 1 hour after sunset. The Corman method is currently the USFWS's accepted pygmy-owl survey protocol. That protocol suggests that surveys be conducted from September to May. The

current pygmy-owl protocol is under review by the USFWS and the proposed time period is January through June.

The Proudfoot-modified Corman technique for censusing pygmy-owls in rural settings recommends broadcasting calls at about 400 - 480 m intervals. Corman recommended 150 m intervals. The 150 m interval method is adequate in urban settings where road noise and other disturbances can limit the ability of the surveyor to hear. In areas away from urban noises, the 400 - 480 m is sufficient. In rural settings, pygmy-owls can easily be detected up to 700 m under ideal conditions (Harris and Duncan 1998). Therefore, in rural settings our calls were broadcast at 400 m or less intervals (particularly in washes with dense vegetation) and in urban settings our calls were broadcast at 150 m intervals.

A 1-minute adjustment period (silence) was observed at each broadcast station before initiating the broadcasting of conspecific calls. This allows surveyors to detect pygmy-owls calling spontaneously and gives the surveyors a chance to familiarize themselves with their surroundings (e.g., large trees or saguaros, residences, water sources, etc. that may affect owl presence or observation).

Following the adjustment period, calls were broadcast for 30 seconds and followed by a 60-second listening and observation period. The calls were broadcast in all directions. The volume was set just below the level that seemed to cause distortion of the call through the speaker. We used Johnny Stewart Bird & Animal Caller MS512 as recommended by Proudfoot and Beasom (1996) to conduct our pygmy-owl surveys in Arizona.

The calling-listening sequence was repeated for a total of 8 minutes at each broadcast station. The calling period was extended if disturbances such as dogs, air traffic or vehicles disrupted the calling-listening sequence. We continued to observe and listen for an additional 2 minutes before proceeding to the next station.

We also completed survey data forms for each route each time it was surveyed. Survey forms were modifications of those used by AGFD (Appendix A). We recorded several variables including presence/absence of pygmy-owl, date of survey, number of points surveyed, surveyor's name, time of survey, location of survey (county, general survey locality, map name using U.S. Geological Survey 7.5 minute Quadrangles, Township, Range, and Section [s]), elevation, land ownership, and habitat codes (defined in Appendix B, after Brown et al. [1979]). In addition, we provided Universal Transverse Mercator (UTM) positions for each transect beginning and end points so the transects could be relocated and the surveys repeated, if so desired, sometime in the future.

Within the undisturbed portions of the study area, we first "high-graded" habitat to determine which areas to subsequently survey. High grade habitat is hereby defined as representative of Sonoran riparian deciduous forest and woodland (e.g. cottonwood-willow, mesquite and other similar associations as defined by Brown et al. [1979]) and Sonoran Desertscrub, mostly representative of the Arizona Upland Subdivision, especially in areas with floristically and structurally diverse stands of desert riparian scrub with saguaro cacti below about 4,000 ft in elevation. This vegetation assemblage is defined as the species' preferred habitat in the final rule to list the species as endangered, and is in agreement with our experience in Arizona and Sonora, Mexico.

In developed areas, such as in the Catalina and Rincon mountain foothills, we surveyed along County-owned road right-of-ways with 150 m intervals between calling stations. We also surveyed open space along a wash in the Catalina Foothills Homeowners Association #7, northeast of the River Road and First Avenue intersection. Permission was obtained from the Association prior to surveying. The majority of the developed areas contained mid-density housing (approximately 1 home/acre or less). We did survey along roads within some foothills areas that were higher density (townhouses and a subdivision of approximately 2 homes/acre with intermittent open space).

Surveys were conducted on foot, generally by walking along drainageways, or by walking or driving roadways that passed through potentially suitable pygmy-owl habitat. Distances were estimated by counting paces or using pedometers. When driving in rural undeveloped areas, calling stations were placed every ¼-mile (approximately 400 m) using the vehicle's odometer reading. Transects were scattered throughout a given survey area by sampling differing elevations along the alluvial fan, along different reaches of a given drainageway, or along the roadway. In this way a wide variety of sites were sampled from the bases of desert mountain ranges to valley bottoms.

In accordance with the USFWS, Endangered Species Permit requirements, surveys were conducted under authority of USFWS Endangered Species Permits issued to Dr. Lisa K. Harris (PRT-828640), Russell Duncan (PRT-819531), and Dr. Linwood Smith of Dames & Moore (PRT-833688). In addition, our permits were amended (#TE828640-1) to survey for pygmy-owls through 30 June 1999 (the current survey period ended 31 May 1999). All surveyors were bona fide subpermittees under the direction of Dr. Harris, Mr. Duncan, or Dr. Smith. Each surveyor had previous

experience conducting pygmy-owl surveys or experiences with other owls, such as Mexican spotted owls *(Strix occidentalis lucida)*, a federally listed threatened species.

RESULTS AND DISCUSSION

From 6 April through 30 June 1999, we completed 329 transects throughout eastern Pima County (Figure 5 and Appendix C). No pygmy-owls were identified. The initiation of surveys began when funding became available through Pima County. It is possible that initiation of the survey so late in the season may have affected the results of the survey. The survey season is January–June, with the highest response rate typically associated with mid-January–mid-April. As with the boreal owl (*Aegolius funereus*) and other small cavity nesting owls, the pygmy-owl in Arizona seems to pare down its calling once pair bonding occurs and the female has sequestered herself away in a nest cavity to incubate eggs and brood young (Harris and Duncan 1998). However, during the 1999 field season, AGFD was detecting new individuals by broadcast calling into June (S. Richardson, AGFD, Tucson, pers. comm. 26 June 1999). Copies of the actual data sheets, field notes, and topographical maps are presented separately in Volume II of this report.

Our broadcast calls covered approximately 226,068 acres. The total number of hours devoted to conducting and supervising the fieldwork was over 1,800 with 13,400 miles driven to/from survey areas. The number of calling points for each transect varied from 1 - 16, with an average of 8. The total number of call points was 2,632. This is equivalent to nearly 654 miles of transects based on 400 m intervals. The number of call points varied depending on rural/urban location, terrain, presence of roads, and

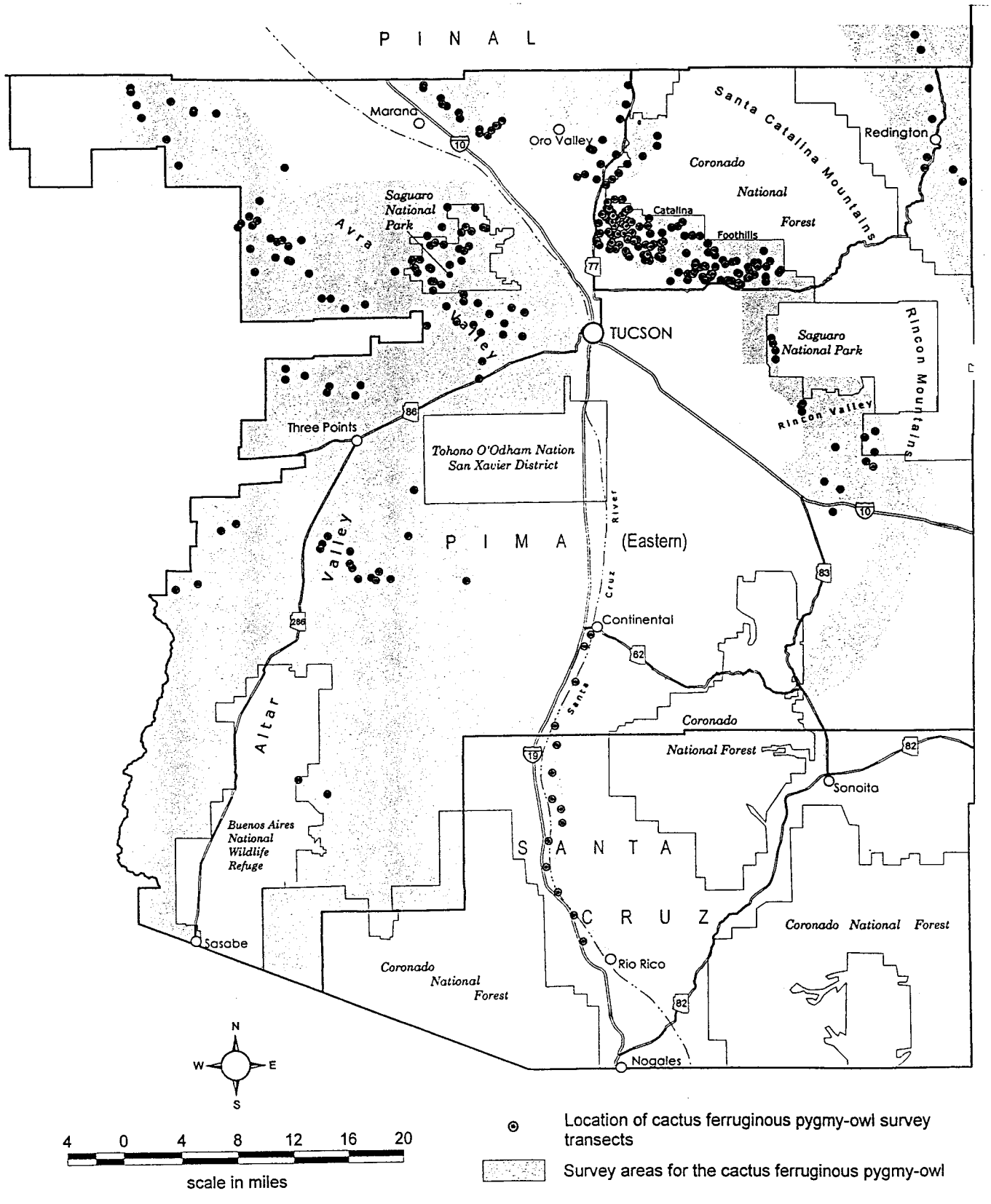

Figure 5. Location of cactus ferruginous pygmy-owl survey transects in eastern Pima County and western Santa Cruz County, Arizona, spring 1999.

surrounding bird behavior. More call points could be conducted along roads because driving time minimized the time getting from one call point to another. If small birds showed signs of "mobbing" then the distance between call points was less than the standard (150 m or 400 m depending on urban/rural setting). Mobbing was broadly defined as a defensive aggressive response to the broadcast call, such as scolding vocally and/or attacking physically (i.e. swooping in on caller).

The 1999 field season was a much larger effort when compared to the 1998 range-wide survey effort. In 1998, of the 93 transects and 768 call points completed 18 March – 30 June, 34 transects and 329 call points were conducted in eastern Pima County (Harris and Duncan 1998), compared to 329 transects and 2,632 call points conducted during a shorter field season (6 April-30 June) in 1999. For the most part, the 1999 survey effort did not duplicate any of the 1998 survey transects (i.e. only 2 transects were surveyed in both 1998 and 1999 by our surveying team). Transects that were surveyed in both 1998 and 1999 were located on Stevens Mountain quad map (Stevens Wash east of 286, south of highway 86, T17S, R9E, Section 14, 13, 24 and R10E, Sections 19, 30) and Mount Fagan quad map (Davidson Canyon, I-10 crossing to about 2 miles south, T16S, R17E, Section 31 and T17S, R17E, Sections 6, 7)

In 1999, our study area focused on 9 specific districts: the Altar Valley (excluding the BANWR), Avra Valley, portions of Tucson Mountain and Saguaro National Park (Tucson Mt. Unit), portions of Marana, portions of Oro Valley, foothills of the Catalina Mountains, foothills of the Rincon Mountains and portions of Saguaro National Park (Rincon Mt. Unit), Redington Pass, and portions of the Santa Cruz River. The 2,632 call stations were conducted throughout all 9 geographic districts (Table 1).

Table 1. Number of cactus ferruginous pygmy-owl call stations conducted by survey district within eastern Pima County and western Santa Cruz County, Arizona, April – June 1999.

District	Call Stations
Altar Valley	186
Avra Valley	932
Tucson Mountain Park & Saguaro National Park (West unit)	142
Marana	117
Oro Valley	124
Catalina Foothills	855
Rincon Mountains & Saguaro National Park (East unit)	123
Redington Pass	49
Santa Cruz River	104
Total (all survey areas)	**2632**

Survey districts within eastern Pima County and western Santa Cruz County, Arizona and associated U. S. Geological Survey 7.5 minute quadrangle maps.

Altar Valley	Cerro Colorado, Las Guijas, Kitt Peak, Palo Alto Ranch, Stevens Mountain, Samaniego Peak, San Xavier Mission
Avra Valley	Silverbell East, Silverbell West, Waterman Peak, West of Avra, Avra, La Tortuga Butte, Cocoraque Butte, Gap Tank, Greene Reservoir, Three Points
Tucson Mt. Park & Saguaro Natl. Park (Tucson Mt. Unit)	Cat Mountain, Brown Mountain, Avra
Marana	Marana, Ruelas Canyon
Oro Valley	Oro Valley , Tucson North
Catalina Foothills	Tucson North, Sabino Canyon, Agua Caliente Hill
Rincon Mountain & Saguaro Natl. Park (Rincon Mt. Unit)	Vail, Rincon Peak, Tanque Verde Peak, Mount Fagan
Redington Pass	Buehman Canyon, Redington, Soza Canyon, Peppersauce Wash
Santa Cruz River	Rio Rico, Tubac, Amado, Green Valley, Esperanza Mill, Peña Blanca

The majority of the call stations were conducted within Avra Valley (932) and the foothills of the Catalina Mountains, east of Oracle Road (State Route 77), Tucson (855). The fewest number of call stations were conducted in the Redington Pass district (49), primarily because much of the land ownership is private and the area is smaller than the other districts. Call points by quad map are presented in Table 2.

Table 2: Eastern Pima County and Western Santa Cruz County Cactus Ferruginous Pygmy-Owl Survey Call Points by U.S.G.S 7.5 Minute Quadrangle Map, Spring 1999.

USGS_Quad	Call Points
Agua Caliente Hill (see Sabino Canyon)[1]	76
Amado	31
Amado & Tubac	9
Avra	170
Avra & Brown Mountain	16
Avra & West of Avra	25
Brown Mountain (see Avra)[1]	76
Buehman Canyon (see Redington)[1]	9
Cat Mountain	50
Cerro Colorado	8
Cocoraque Butte (see Three Points)[1]	58
Cocoraque Butte & West of Avra	38
Green Valley	11
Green Valley & Esperanza Mill	10
Kitt Peak	7
Kitt Peak & Palo Alto Ranch	6
La Tortuga Butte	83
Las Guijas	9
Marana	74
Marana & Ruelas Canyon	16
Mount Fagan	7
Oro Valley	120
Oro Valley & Tucson North	4
Palo Alto Ranch (see Kitt Peak & Stevens Mountain)[1]	8
Peppersauce Wash	14
Redington	6
Redington & Buehman Canyon	14
Redington & Soza	6
Rincon Peak (see Vail)[1]	27
Rio Rico & Pena Blanca Lake	9
Ruelas Canyon (see Marana)[1]	27
Sabino Canyon	189
Sabino Canyon & Agua Caliente Hill	38
Samaniego Peak	22
San Xavier Mission	8
Silverbell East	18
Silverbell West	134
Silverbell West, Gap Tank & Greene Reservoir	18
Stevens Mountain	96
Stevens Mountain & Palo Alto Ranch	22
Tanque Verde Peak	38
Tanque Verde Peak & Vail	26
Three Points & Cocoraque Butte	70
Tubac (see Amado)[1]	34
Tucson North (see Oro Valley)	552
Vail (see Tanque Verde Peak)[1]	17
Vail & Rincon Peak	8
Waterman Peak	272
Waterman Peak & West of Avra (see Avra & Cocoraque Butte)[1]	46
Total	**2,632**

1. Entries with multiple quad map names indicate transects that were conducted on more than 1 map. Call points are only counted once, parenthesis are for reference only.

If time permitted, we tried to survey areas multiple times. This occurred within the Avra Valley district where high-grade washes were surveyed twice, accounting for the high number of call points in the district. Portions of Saguaro National Park (East unit) were also surveyed twice. In total, 36 transects were surveyed twice. Transects surveyed 2 times are presented in Appendix E.

Defensive aggressive behavioral response to the broadcast call, or mobbing, was done by individuals of one species as well as mixed-species flocking and vocalizing from adjacent vegetation. Bird species that mobbed included verdin *(Auriparus flaviceps)*, black-tailed gnatcatcher *(Polioptila melanura)*, ash-throated flycatcher *(Myiarchus cinerasens)*, brown-crested flycatcher *(M. tyrannulus)*, western kingbird *(Tyrannus verticalis)*, Lucy's warbler *(Vermivoara luciae)*, lesser nighthawk *(Chordeiles acutipennis)*, pyrrhuloxia *(Cardinalis sinuatus)*, yellow-breasted chat *(Icteria virens)* and broad-billed hummingbird *(Cynanthus latrirostris)*. The 2 species of flycatcher (ash-throated and brown-crested) did not illustrate the typical mobbing behavior. Instead, the flycatchers were drawn into the area by the broadcast call and then spent an extended period (up to the duration of the broadcast) calling. The other species of birds that showed a response to the pygmy-owl broadcast demonstrated typical mobbing behavior. Mobbing and the flycatcher behavioral response occurred along 41 transects, at 348 call points. Efforts were made to investigate the mobbing behavior, either with repeated surveys, or surveys conducted at shorter (< 400 m and 150 m depending on rural/urban area) intervals between call stations. The majority of the mobbing occurred along the Santa Cruz River, in Marana, in Avra Valley, and in the Catalina foothills. Transects where mobbing occurred are presented on Figure 6 and in Appendix F.

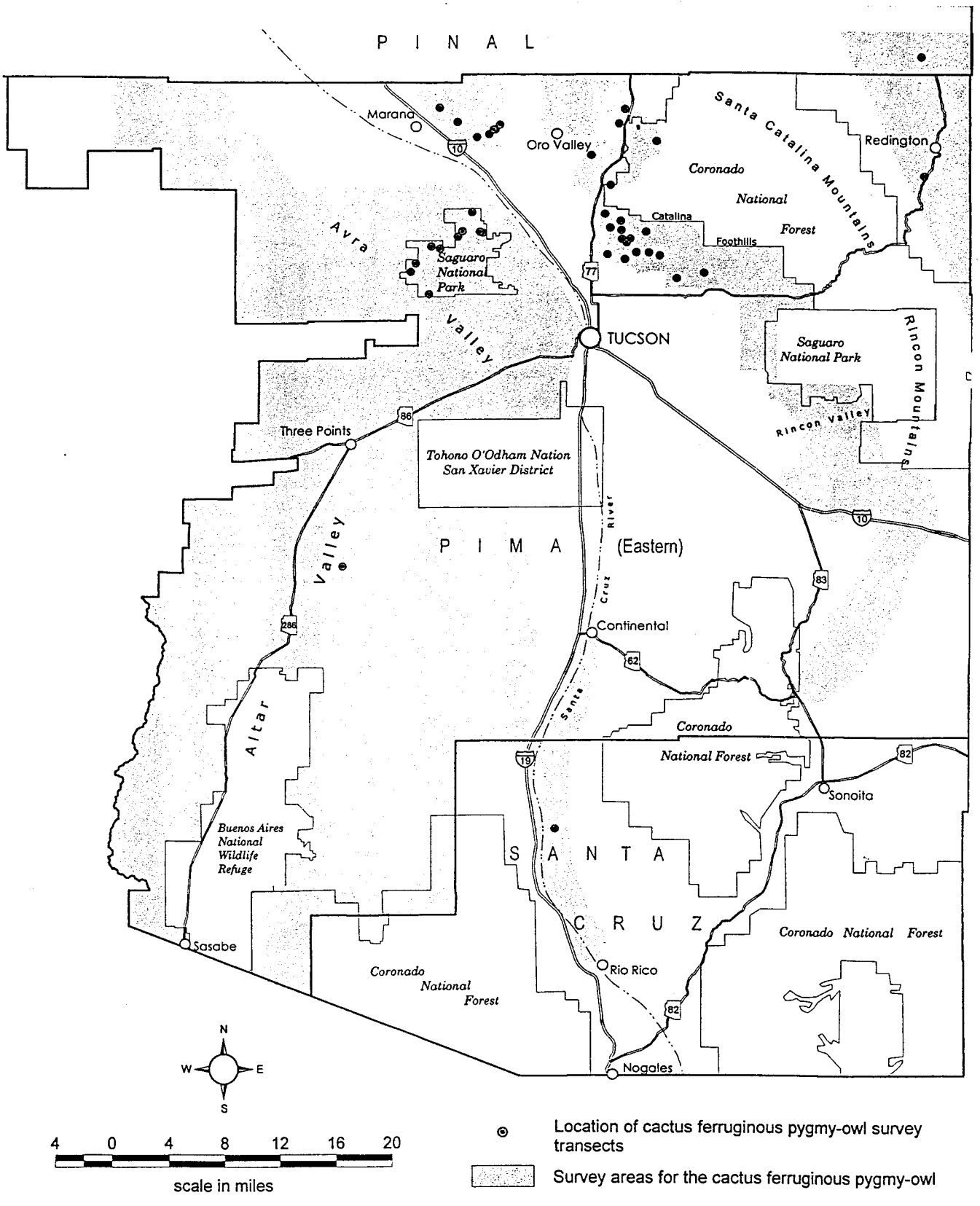

Figure 6. Location of cactus ferruginous pygmy-owl survey transects where mobbing and responses from birds to broadcast calls occurred, spring 1999.

RECOMMENDATIONS

We recommend that additional surveys be conducted, for several reasons. The survey effort was conducted towards the end of the pygmy-owl breeding season; birds may have been present but did not respond. Second, our broadcast call elicited mobbing and behavior response in several areas, indicating that the local birds may be familiar with pygmy-owls. Third, our survey efforts focused on public lands and right-of-ways, primarily within eastern Pima County. Portions of Pima County in private ownership, the Tohono O'odham Nation, southern Pinal County, and northern Mexico all contain suitable pygmy-owl habitat but have not been thoroughly surveyed.

We recommend surveying earlier in the breeding season; preferably beginning in January 2000, if funds are available. The current methodology depends on a vocal response in a resident bird. The pygmy-owl's breeding season is January – June, with territories established in the first few months (January – April). While pygmy-owls have been known to respond during other times of the year, the peak response period is during territory establishment and nest site selection. The survey effort should correlate with this period as well.

As discussed, resident birds in several areas showed both signs of mobbing and a behavior response when pygmy-owl calls were broadcast. These 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 (i.e. both flycatcher species, western kingbird, Lucy's warbler, lesser nighthawk, and broad-

billed hummingbird). We recommend that the areas where mobbing occurred be re-surveyed in future efforts.

Both of our 1998 and 1999 survey efforts concentrated within publicly owned land and right-of-ways. There are large areas within Pima County that are not publicly owned and contain suitable pygmy-owl habitat. Of interest are the areas within the Altar Valley, Redington Pass, and the Tohono O'odham Nation. The Altar Valley and the Tohono O'odham Nation may support the largest extant pygmy-owl population in Arizona. The area is located between populations known from the Tucson basin and OPCNM. Only one verifiable historic pygmy-owl account was identified from O'odham lands during an exhaustive pygmy-owl museum records and literature search by one of our team members (R. B. Duncan). However, several recent reports in the area have been identified by AGFD volunteers for the Arizona Breeding Bird Atlas during 1997 and also in 1998 (Corman 1997; T. Corman, AGFD, Phoenix, pers. comm. 1 July 1998). These records were incidental to general bird surveys and were not part of a focused survey effort for the species. The fact that so many owls were identified in this way on O'odham lands supports our belief that the area, if surveyed as thoroughly as possible, will yield far more owls than is now known elsewhere in the state. Representatives of Pima County are in communication with Altar Valley residents and tribal leaders of the Nation. We encourage the County to work with the Nation and Altar Valley landowners to conduct surveys of these valuable areas.

Several areas of potential pygmy-owl habitat within our study area were not completely surveyed. These were the Redington Pass area (particularly Bellota Ranch), Cienega Creek Preserve and the adjacent Rincon Valley and Saguaro National Park (East

unit), Santa Cruz River corridor south from Continental Road, Amado area, and the Altar Valley. Several of these areas have been designated as critical habitat for the species (USFWS 1999); the Redington Pass is part of Unit 6 and the Altar Valley is part of Unit 1 (Figure 4). Within Altar Valley, we recommend surveying in the southern portion of the valley and west of highway 286. Other surveys were conducted adjacent to BANWR, and our surveying effort in the Altar Valley focused north of the Arivaca and Bata Mote roads intersection. Because of strained relationships between the BANWR and local landowners, we suggest that within the Altar Valley surveys be conducted by non-federally sponsored contracts and that the County continues working with landowners to gain access. In addition, all survey results should be made public so that these landowners do not feel isolated.

Some areas, such as the Catalina Mountain foothills, were surveyed extensively. While potential habitat is located within the Catalina foothills area, we would not recommend re-surveying this area, except where mobbing occurred, within the next year or so because of the number of transects completed in 1999.

We recommend that surveys be conducted in Mexico, near the Arizona border. Specifically, survey areas south of Altar Valley and the Tohono O'odham Nation to determine if any population exists in Mexico that would indicate the presence of a meta-population straddling the Mexico-Arizona border. In addition, part of this survey effort in Mexico should be focused in areas where they have been historically documented, e.g., Sonoyta, Caborca, and Magdalena, between Guaymas and Empalme, Obregon, Agiobampo, Guiracoba, Alamos, and elsewhere. The first task of such a survey in Mexico is to conduct a thorough literature and museum records search similar to that

done for Arizona by one of our team members (R. B. Duncan). In this way a more accurate idea of where to conduct surveys can be derived from the results of this search. The location of areas where pygmy-owls exist near the border would be invaluable in designing and managing a wildlife corridor and/or core preserve that crosses the border.

Finally, it is also recommended that an additional survey effort be made in Pinal County beginning in the area where pygmy-owls are now known just north of the Pima County line and working north toward Maricopa County. Such a survey effort in the northern portion of the species' present range in Arizona can be further refined.

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APPENDICES

A. Cactus Ferruginous Pygmy-owl Survey Forms

B. Habitat Classification Codes

C. Cactus Ferruginous Pygmy-owl Survey Location Table

D. Location of Transects Where Surveys Were Completed Twice

E. Location of Transects Where Mobbing and Responses to Broadcast Calls Occurred

APPENDIX A

CACTUS FERRUGINOUS PYGMY-OWL SURVEY FORM

USFWS Permit No. _____ Page _____ of _____

Ferruginous Pygmy-owl Survey Form

Observer(s) _____ Date (D/M/Y) _____

General Locality Arizona, _____

_____

Land Ownership _____

Quad. Name (Attach map) _____ Town Range _____ Section _____

UTM (Begin) X _____ Y _____ UTM (End) X _____ Y _____

Slope/Aspect _____ / _____ Elevation Min. _____ Max. _____

General Geomorphic/Topographic Description _____

_____

Weather Start: Wind _____ Clouds _____ Ppt _____ T° _____ End: Wind _____ Clouds _____ Ppt _____ T° _____

Survey # _____ Complete Survey? Y N Outing # _____ Aborted? Y N Sunset (Time of) _____ Moon Phase _____

FEPO Detected Y N (If Present, Complete FEPO Detection Form) FEPO Present During Previous Survey Y N Date Last Surveyed _____

Call Point	Survey Tech.	Time			Call Tech	Moon Vis?	Raptor Response													
		Start	End	Total			A-V	Sex	Age	Spp.	Time of	Bearing		Weather				UTM Zone 12	
												1st	2nd	Wind	Clouds	Ppt	T°	X	Y

Return to Arizona Game and Fish Department, Nongame Branch, 2221 W. Greenway Road., Phoenix, AZ 85023

Ferruginous Pygmy-owl Survey Form (Continuation Sheet) Page _____ of _____

Survey Area _____

Surveyors _____ USFWS Permit No. _____

Describe Calling Route _____

Habitat (Describe general habitat using Brown (1982), include dominant vegetation type, plant species present, density, canopy cover, condition, etc. _____

Comments (Include a list of other bird species responding to FEPO tape or responding owl and describe behavior) _____

Please circle additional bird species identified in immediate survey area:

TUVU	BLVU	COHA	RTHA	HAHA	AMKE	GAQU	WWDO	MODO	INDO	GRRO	WSOW	GHOW	ELOW
COPO	BCHU	COHA	GIFL	RSFL	GIWO	LBWO	WEKI	ATFL	BCFL	CORA	LOSH	VERD	CAWR
NOMO	CBTH	BTGN	PHAI	EUST	NOCA	PYRR	CANT	BTSP	HOFI				

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Ferruginous Pygmy-owl Survey Form (Continuation Sheet) Page _____ of _____

Survey Area _____

Surveyors _____ USFWS Permit No. _____

Call Point	Survey Tech.	Time			Call Tech	Moon Vis?	Raptor Response													
		Start	End	Total			A-V	Sex	Age	Spp.	Time of	Bearing		Weather				UTM Zone 12	
												1st	2nd	Wind	Clouds	Ppt	T°	X	Y

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Ferruginous Pygmy-owl Survey Form (Continuation Sheet) Page _____ of _____

Survey Area _____

Surveyors _____ USFWS Permit No. _____

Additional Comments _____

APPENDIX B

HABITAT CLASSIFICATION CODES

HABITAT CLASSIFICATION CODES

Vegetation communities along each transect were described according to Brown et al. (1979) hierarchical classification system, with additional levels defined as needed. The following vegetation associations were found during our 1999 pygmy-owl survey in southern Arizona.

123 Warm Temperate Forests and Woodland

123.3 Madrean Evergreen Forest and Woodland

123.31 Encinal Series

123.311 Mixed *Quercus* spp.-*Prosopis velutina* Association. Often *Quercus emoryi*

143 Warm Temperate Grasslands

143.1 Scrub-Grassland ("Semidesert Grassland")

143.15 Mixed Grass-Scrub Series

143.152 Mixed grass-*Prosopis velutina* Association. Mesquite-grassland often associated with 224.521, 224.522, or 224.534

154 Tropical-Subtropical Desertlands

154.1 Sonoran Desertscrub

154.11 Creosote-Bursage ("Lower Colorado Valley") Series

154.115 *Cercidium floridum-Olneya tesota* xeric riparian Association
154.118 Mixed shrub/cactus Association. *Larea divaricata, Ambrosia* spp., *Opuntia* spp.

154.12 Paloverde-Mixed Cacti ("Arizona Upland") Series.

154.121 *Cercidium microphyllum-Ambrosia deltoidea* mixed scrub Association
154.127 Mixed shrub-*Cercidium microphyllum-Olneya tesota*-mixed scrub Association

154.13 Brittlebush-Ironwood ("Plains of Sonora") Series

223 Warm Temperate Swamp and Riparian Forests

223.2 Interior Southwestern Riparian Deciduous Forest and Woodland

223.22 Mixed Broadleaf Series

223.221 *Platinus wrighti-Fraxinus velutina-Populus fremonti*-mixed deciduous Association
223.222 *Platinus wrighti* Association
223.223 *Fraxinus velutina* Association

224 Tropical-Subtropical Swamp, Riparian and Oasis Forests

224.5 Sonoran Riparian and Oasis Forests

224.52 Mesquite Series

224.521 *Prosopis juliflora velutina* Association.
224.522 *Prosopis juliflora velutina*-mixed short tree Association
224.526 *Prosopis juliflora velutina-Celtis reticulata* Association
224.527 *Prosopis juliflora velutina-Berberis* spp.-*Quercus emoryi* Association

224.53 Cottonwood-Willow Series

224.531 *Populus fremonti-Salix gooddingi* Association
224.532 *Populus fremonti* Association
224.533 *Salix gooddingi* Association
224.534 *Fraxinus velutina* Association. Dominated by ash.
224.535 *Celtis reticulata* Association. Dominated by net-leaf hackberry.
224.536 *Fraxinus velutina-Celtis reticulata* Association. Dominated by ash and net-leaf hackberry.

240 Marshland Formation

244 Tropical-Subtropical Marshland

244.7 Sonoran Interior Marshland

254 Tropical-Subtropical Strands

254.7 Sonoran Interior Strand

254.71 Mixed Scrub Series

300 Disturbed with exotic plants

APPENDIX C

CACTUS FERRUGINOUS PYGMY-OWL SURVEY LOCATION TABLE

Appendix C. Cactus Ferruginous Pygmy-Owl Survey Location Table for Pima County CFPO Surveys, Spring 1999.

	A	B	C	D	E	F	G	H
1	CFPO?	County	USGS_Quad	Locality	Owner	Date	Township, Range, Section	Habitat
2	No	Pima	Agua Caliente Hill	Camino Ojo de Agua	Pima Co.	27-Jun-99	T13S R16E S28	154.12
3	No	Pima	Agua Caliente Hill	East along Ft. Lowell to Camino Ancho	Pima Co.	26-Jun-99	T13S R16E S29,32,28	154.12
4	No	Pima	Agua Caliente Hill	Ft. Lowell to Conestoga to Fennimore	Pima Co.	25-Jun-99	T13S R16E S30,31,29,32	154.12
5	No	Pima	Agua Caliente Hill	Mt Lemmon, Short Rd to Soldier Trail	Pima Co.	28-Jun-99	T13S R16E S18,17,19,20	154.12
6	No	Pima	Agua Caliente Hill	Prospect Lane & Soldier Trail intersection heading east along N edge of Agua Caliente/Roy P. Drachman Park	Pima Co.	15-Apr-99	T13S R16E S20	224.52
7	No	Pima	Agua Caliente Hill	Soldier Trail	Pima Co.	29-Jun-99	T13S R16E S19,20,29,30	154.12
8	No	Pima	Agua Caliente Hill	Soldier Trail to Tanque Verde Rd	Pima Co.	30-Jun-99	T13S R16E S29,30,31,32	154.12
9	No	Santa Cruz	Amado	Santa Cruz River at benchmark 3120 S of Agua Linda to Amado Rd	Various	29-Jun-99	T20S R13E S30,19,18,7	224.531
10	No	Santa Cruz	Amado	Santa Cruz River at Chavez Siding Rd, along river S	Various	29-Jun-99	T20S R13E S31,32; T21S R13E S5	224.531
11	No	Pima	Amado	Santa Cruz River at Whipple Obs./Elephant Head Rd	Various	30-Jun-99	T19S R13E S29,32	224.531
12	No	Santa Cruz	Amado	Santa Cruz River N of Tubac, just N of Chavez Siding Rd to Tubac Country Club S	Various	28-Jun-99	T20S R13E S31	224.531
13	No	Santa Cruz	Amado	Santa Cruz River, Amado Rd at River along W bank	Various	28-Jun-99	T20S R13E S7,6,5	224.52, 224.53
14	No	Santa Cruz	Amado & Tubac	Santa Cruz River E bank near Tubac	Various	25-Jun-99	T21S, R13E S5,8	224.52, 224.53
15	No	Pima	Avra	Near SNP W, west of Panther Peak	State	30-Jun-99	T12S R11E S36	154.127
16	No	Pima	Avra	North of Picture Rocks Rd, east of Sandario Rd	State	29-Jun-99	T13S R11E S2	154.127
17	No	Pima	Avra	Rudasill Road/SNP West	NPS	20-May-99	T13S R11E S9,10,11	154.12
18	No	Pima	Avra	Saguaro Natl Park West, Kinney & Sandario drainage West	NPS	10-Jun-99	T13S R11E S28,27	154.127
19	No	Pima	Avra	Saguaro Natl Park, Kinney Rd. & hohokam Rd., start at intersection	NPS	2-Jun-99	T13S R11E S27,26,23	154.127
20	No	Pima	Avra	Saguaro Natl Park West N & NE of Red Hills Visitor Center wash	NPS	8-Jun-99	T13S R11E S35	154.127
21	No	Pima	Avra	SNP W basin to the N of Picture Rocks Rd and S of Safford Peak	NPS	6-Jun-99	T13S R12E S6,7	154.127
22	No	Pima	Avra	SNP W Com-Boh picnic area	NPS	4-Jun-99	T13S R12E S7,18	154.127
23	No	Pima	Avra	SNP W Contzen Pass area	NPS	2-Jun-99	T13S R12E S5,8,9	154.12, 224.52
24	No	Pima	Avra	SNP W Golden Gate Rd	NPS	13-Jun-99	T13S R12E S19	154.127
25	No	Pima	Avra	SNP W Golden Gate Rd	NPS	15-Jun-99	T13S R12E S19	154.127
26	No	Pima	Avra	SNP W Golden Gate Rd	NPS	16-Jun-99	T13S R12E S18,19	154.127
27	No	Pima	Avra	SNP W Golden Gate Rd	NPS	17-Jun-99	T13S R12E S18,19	154.127
28	No	Pima	Avra	SNP W Golden Gate Rd	NPS	23-Jun-99	T13S R11E S24,25	154.127
29	No	Pima	Avra	SNP W near junction of picture rocks Rd and Golden Gate Rd	NPS	10-Jun-99	T13S R12E S7,18,17,20	154.127
30	No	Pima	Avra	SNP W Rudasill Rd	NPS	28-Jun-99	T13S R11E S11,13,14	154.127
31	No	Pima	Avra	SNP W Sandario Rd	NPS	27-Jun-99	T13S R11E S10,14,15	154.127
32	No	Pima	Avra	SNP W South of Rudasill Rd	NPS	25-Jun-99	T13S R11E S10,11,14	154.127
33	No	Pima	Avra	SNP W, eastern edge near Wade road	NPS	31-May-99	T13S R12E S4,5,8	224.52, 154.127
34	No	Pima	Avra	SNP W, west of Contzen Pass area	NPS	9-Jun-99	T13S R12E S7,8	154.121, 154.127
35	No	Pima	Avra	SNP West, Sandario/Kinney wash W to Near Sweatwater	NPS	24-Jun-99	T13S R11E S28,21	154.127
36	No	Pima	Avra	SNP West, Sweatwater Rd at BLM/NPS boundary to Manville Rd	NPS	18-Jun-99	T13S R11E S29,28,21	154.127
37	No	Pima	Avra	SNP West, Wash SW of Signal Hill starting W of Kinney dirt road	NPS	24-Jun-99	T13S R11E S22,21,29	154.127
38	No	Pima	Avra	Tucson Mtns, SNP West, Golden Gate Rd and Hohokam Rd	NPS	16-May-99	T13S R11E S22,23,27	154.12
39	No	Pima	Avra	Tucson Mtns., E-Flank Safford Peak, Saguaro Natl. Park	NPS	6-May-99	T12S R12E S32	154.127

Appendix C. Cactus Ferruginous Pygmy-Owl Survey Location Table for Pima County CFPO Surveys, Spring 1999.

	I	J	K	L	M	N	O	P	Q	R	S	T	U	V
1	Min_Elev	Max_Elev	Xstart_UTM	Ystart_UTM	Xend_UTM	Yend_UTM	Points	Start Time	End Time	Total Time	Surveyor	Remarks	State	Country
2	2840	2840	526900	3570280	526520	3570840	6	5:30	6:55	1:25	Perkins, M.			
3	2780	2920	525610	3569710	527180	3570750	13	4:19	7:00	2:41	Perkins, M.			
4	2641	2780	523700	3569710	525600	3569710	13	17:34	20:22	2:48	Perkins, M.		AZ	USA
5	2717	2584	524060	3573980	524720	3572160	14	4:19	7:18	2:59	Perkins, M.		AZ	USA
6	2720	2760	524760	3571730	525700	3571730	6	18:05	19:27	1:22	Perkins, M.		AZ	USA
7	2695	2717	524720	3572020	524720	3570000	13	4:20	7:18	2:58	Perkins, M.		AZ	USA
8	2645	2695	524720	3570000	524600	3568100	11	4:20	6:41	2:21	Perkins, M.		AZ	USA
9	3061	3120	496400	3503060	496200	3506940	10	17:34	19:40	2:06	Morales, S.		AZ	USA
10	3140	3190	496540	3501000	498300	3499460	7	4:56	6:44	1:48	Morales, S.		AZ	USA
11	3000	3020	497000	3512280	496340	3509980	6	5:03	6:25	1:22	Morales, S.		AZ	USA
12	3120	3140	496200	3501720	496300	3501420	2	17:34	18:04	0:30	Morales, S.		AZ	USA
13	3030	3060	495800	3507800	498000	3509440	6	18:34	19:48	1:14	Morales, S.		AZ	USA
14	3150	3200	498340	3499460	496800	3497360	9	17:34	19:55	2:21	Morales, S.	Mobbing - Hummingbirds	AZ	USA
15	2240	2340	482900	3578400	482920	3579400	8	4:24	6:37	2:13	Kirkpatrick, C.		AZ	USA
16	2280	2360	482660	3576440	481720	3576200	7	4:21	6:18	1:57	Kirkpatrick, C.		AZ	USA
17	2180	2450	482660	3575220	477840	3575220	12	17:15	20:08	2:53	Duncan, R.		AZ	USA
18	2250	2400	479440	3570380	478280	3570480	5	5:25	6:55	1:30	Morales, S.		AZ	USA
19	2400	2700	479760	3570300	481620	3571480	8	5:03	7:13	2:10	Morales, S.		AZ	USA
20	2500	2700	481560	3568620	482480	3569060	4	18:31	19:38	1:07	Morales, S.		AZ	USA
21	2360	2480	485880	3576360	484780	3576220	9	17:26	19:59	2:33	Kirkpatrick, C.	Flycatcher response	AZ	USA
22	2500	2720	484560	3575600	484920	3575560	9	4:30	6:54	2:24	Kirkpatrick, C.	Flycatcher response	AZ	USA
23	2300	2500	487680	3576400	488340	3575800	7	17:34	19:40	2:06	Kirkpatrick, C.	Flycatcher response	AZ	USA
24	2960	3180	484740	3572400	484740	3571460	2	17:42	18:12	0:30	Kirkpatrick, C.		AZ	USA
25	2960	3180	484740	3572400	484740	3571460	2	4:36	5:03	0:27	Kirkpatrick, C.		AZ	USA
26	2640	2920	484700	3572660	484220	3574300	5	4:31	5:49	1:18	Kirkpatrick, C.		AZ	USA
27	2740	2920	485100	3573740	485060	3572700	4	4:24	5:30	1:06	Kirkpatrick, C.		AZ	USA
28	2840	3200	482980	3571800	483360	3571000	7	4:27	6:19	1:52	Kirkpatrick, C.		AZ	USA
29	2620	2960	485360	3574780	486100	3572820	7	4:40	6:39	1:59	Kirkpatrick, C.		AZ	USA
30	2380	2780	481360	3575080	483400	3573000	8	4:30	6:52	2:22	Kirkpatrick, C.	Flycatcher response	AZ	USA
31	2280	2560	481700	3573200	479560	3574740	6	17:16	18:39	1:23	Kirkpatrick, C.		AZ	USA
32	2340	2540	480700	3575000	481820	3573680	6	4:46	6:25	1:39	Kirkpatrick, C.	Flycatcher response	AZ	USA
33	2300	2500	488360	3576700	486880	3575760	7	17:25	19:18	1:53	Kirkpatrick, C.	Flycatcher response	AZ	USA
34	2480	2540	485920	3576140	486240	3575360	4	17:30	18:30	1:00	Kirkpatrick, C.		AZ	USA
35	2240	2340	479360	3571060	477760	3571000	5	5:14	6:44	1:30	Morales, S.	Flycatcher response	AZ	USA
36	2200	2345	477000	3571200	479400	3572800	8	5:08	7:01	1:53	Morales, S.		AZ	USA
37	2240	2400	480100	3572260	478300	3572000	5	17:49	19:17	1:28	Morales, S.	Flycatcher response	AZ	USA
38	2350	2735	479440	3570880	481430	3571240	10	4:30	7:13	2:43	Duncan, R.		AZ	USA
39	2250	2475	486840	3579460	486320	3578160	8	4:30	7:35	3:05	Duncan, R.	Mobbing - Verdin & BTGN	AZ	USA

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	A	B	C	D	E	F	G	H
1	CFPO?	County	USGS_Quad	Locality	Owner	Date	Township, Range, Section	Habitat
40	No	Pima	Avra	Saguaro Natl Park West, Red Hills Visitor Center, drainage to SW	NPS	3-Jun-99	T13S R11E S34,35	154.127
41	No	Pima	Avra & Brown Mountain	SNP West, Kinney Rd from Mile Wide to Who-Ka-Kam	NPS	16-Jun-99	T13S R11E S35,34,27	154.127
42	No	Pima	Avra & Brown Mountain	SNP West, S boundary along Mile Wide past Kinney Rd to Sandario N	NPS	17-Jun-99	T13S R11E S35,34	154.121
43	No	Pima	Avra & West of Avra	S of intersection on Manville Rd & Sandario Rd and W	State/BLM	6-May-99	T13S R11E S32,29,30,19	154.11, 224.52
44	No	Pima	Avra & West of Avra	S of intersection on Manville Rd & Sandario Rd and W	State/BLM	31-May-99	T13S R11E S32,29,30,19	154.11, 224.52
45	No	Pima	Brown Mountain	Old Ajo Hwy drainages off road	Pima Co.	26-May-99	T15S R12E S5,8	143.152
46	No	Pima	Brown Mountain	San Joaquin Rd. Drainage near Illinois Street	Pima Co.	18-May-99	T14S R12E S32 & T15S R12E S5	154.12
47	No	Pima	Brown Mountain	Sandario Rd across from Garcia Strip	State	27-Apr-99	T14S R11E S15	224.521
48	No	Pima	Brown Mountain	TMP, Ironwood Picnic Area (Hal Gras Rd) wash to N	Pima Co.	15-Apr-99	T14S R12E S20,21	154.12
49	No	Pima	Brown Mountain	TMP, Juan Santa Cruz Wash (Picnic area)	Pima Co.	26-Apr-99	T14S R12E S6	154.12
50	No	Pima	Brown Mountain	TMP, McCain Loop Rd	Pima Co.	8-Apr-99	T14S R12E S8,17,7; T12S R11E S12,1	154.121, 224.52
51	No	Pima	Brown Mountain	TMP, McCain Loop Rd, side dirt road to well SW (off McCain Loop Rd)	Pima Co.	8-Apr-99	T14S R12E S18; T14S R11E S13	154.12, 224.52
52	No	Pima	Brown Mountain	TMP, McCain Loop Rd. W wash	Pima Co.	27-Apr-99	T14S R11E S1,11	154.12
53	No	Pima	Brown Mountain	TMP, Old Tucson wash W	Pima Co.	20-Apr-99	T14S R12E S17,18,19	154.12
54	No	Pima	Brown Mountain	TMP, wash W of Archery Range, starting just S of Brown Mtn Picnic area	Pima Co.	15-Apr-99	T14S R12E S5,8	154.12
55	No	Pima	Buehman Canyon	SW of Redington, foothills of Redington Pass, 1 1/2 mile W of Buehman Canyon in a wash running parallel to Redington Rd	State	18-May-99	T12S R18E S16	154.12, 154.11
56	No	Pima	Buehman Canyon	SW of Redington, foothills of Redington Pass, 1/2 mile W of Buehman Canyon along road	State	19-May-99	T12S R18E S4,9,16	154.12, 154.11
57	No	Pima	Cat Mountin	Gates Pass, W Tucson	State	8-Apr-99	T14S R12E S10,11	154.127
58	No	Pima	Cat Mountin	TMP, canyon running SE from Bushmaster Peak, S end of Camino de Oeste	State	26-Apr-99	T14S R12E S11,12,13,14	154.121
59	No	Pima	Cat Mountin	TMP, Starr Pass area	State	27-Apr-99	T14S R12E S23,24,25; T14S R13E S19,30	154.121, 224.52
60	No	Pima	Cat Mountin	TMP, wash east of Rifle Range	State	28-Apr-99	T14S R12E S22	154.127, 224.52
61	No	Pima	Cat Mountin	Tucson Mountain Park (TMP)	State	25-Apr-99	T14S R12E S9	154.127
62	No	Pima	Cat Mountin	Tucson Mtn Park, Gates Pass area	State	23-Apr-99	T14S R12E S15,14,23	154.121
63	No	Pima	Cerro Colorado	Las Guijas wash from Montano Ranch (as mapped) downstream to near 3400 ft contour	Private	30-Jun-99	T20S R9E S25; T20S R10E S29,30,32	224.521, 254.71
64	No	Pima	Cocoraque Butte	Between Mile Wide Rd and Cocoraque Butte (1)	BLM/State	17-Jun-99	T14S R10E S2,3,11	154.11
65	No	Pima	Cocoraque Butte	Between Mile Wide Rd and Cocoraque Butte (2)	BLM/State	25-Jun-99	T14S R10E S2,3,11	154.11
66	No	Pima	Cocoraque Butte	N of Three Points, southern edge of eastern end of Roskruge Mtns (1)	State	17-Jun-99	T15S R10E S11,10,9	154.11, 154.12, 224.52
67	No	Pima	Cocoraque Butte	N of Three Points, southern edge of eastern end of Roskruge Mtns (2)	State	26-Jun-99	T15S R10E S9,10,11	154.11, 154.12, 224.52
68	No	Pima	Cocoraque Butte	NE of Cocoraque Butte (1)	State	15-Jun-99	T14S R10E S4,9	154.115
69	No	Pima	Cocoraque Butte	NE of Cocoraque Butte (2)	State	23-Jun-99	T14S R10E S4,9	154.115
70	No	Pima	Cocoraque Butte & West of Avra	Cocoraque Ranch (1)	BLM/State	22-Jun-99	T14S R10E S8,5; T13S R10E S32	154.11, 154.12
71	No	Pima	Cocoraque Butte & West of Avra	Cocoraque Ranch (2)	BLM/State	29-Jun-99	T14S R10E S8,5; T13S R10E S32	154.11, 154.12
72	No	Pima	Cocoraque Butte & West of Avra	Cocoraque Ranch NW (1)	State	21-Jun-99	T14S R10E S7,6; T13S R10E S31,32	154.11, 154.12
73	No	Pima	Cocoraque Butte & West of Avra	Cocoraque Ranch NW (2)	State	28-Jun-99	T14S R10E S7,6; T13S R10E S31,32	154.11, 154.12
74	No	Pima	Green Valley	Santa Cruz River east of Canoa Hills Country Club	Various	28-Jun-99	San Ignacio de la Canoa Land Grant	224.52
75	No	Pima	Green Valley	Santa Cruz River south of Continental Road	Various	27-Jun-99	San Ignacio de la Canoa Land Grant	224.52
76	No	Pima	Green Valley & Esperanza Mill	Santa Cruz River floodplain	Various	30-Jun-99	San Ignacio de la Canoa Land Grant	224.52, 143.152

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	I	J	K	L	M	N	O	P	Q	R	S	T	U	V
1	Min_Elev	Max_Elev	Xstart_UTM	Ystart_UTM	Xend_UTM	Yend_UTM	Points	Start Time	End Time	Total Time	Surveyor	Remarks	State	Country
40	2340	2600	481360	3568740	480140	3569800	7	5:04	7:15	2:11	Morales, S.		AZ	USA
41	2400	2500	482460	3568180	479620	3570380	8	4:59	6:49	1:50	Morales, S.		AZ	USA
42	2300	2700	482480	3567980	479420	3568180	8	5:11	7:06	1:55	Morales, S.	Flycatcher & PYRR response	AZ	USA
43	2140	2200	477060	3568650	474800	3572600	12	4:45	7:45	3:00	Esler, J.		AZ	USA
44	2140	2200	477060	3568650	474800	3572600	13	4:32	7:41	3:09	Esler, J.	2nd Pass	AZ	USA
45	2423	2440	486400	3556400	487500	3556500	8	4:48	7:06	2:18	Morales, S.		AZ	USA
46	2400	2460	487500	3559500	487300	3558000	6	17:17	19:23	2:06	Morales, S.		AZ	USA
47	2260	2320	479500	3563400	480700	3563600	5	17:02	18:32	1:30	Morales, S.		AZ	USA
48	2483	2591	488200	3563100	486200	3561900	9	4:55	7:48	2:53	Morales, S.		AZ	USA
49	2800	3500	485700	3568000	484300	3567000	6	17:03	19:05	2:02	Morales, S.		AZ	USA
50	2522	2724	486700	3565600	483300	3567600	12	5:08	8:06	2:58	Morales, S.		AZ	USA
51	2400	2560	482800	3563300	485300	3564600	7	17:13	19:34	2:21	Morales, S.		AZ	USA
52	2420	2700	483300	3567100	482100	3564900	8	4:58	7:29	2:31	Morales, S.		AZ	USA
53	2480	2640	487700	3564200	484800	3562900	9	4:57	7:50	2:53	Morales, S.		AZ	USA
54	2660	3000	487400	3567000	486300	3565700	6	16:52	18:42	1:50	Morales, S.		AZ	USA
55	3200	3300	546025	3584360	545220	3583400	3	17:39	18:36	0:57	Rogstad, A. & Charpentier, J.	Flycatcher response	AZ	USA
56	3000	3500	545500	3584420	546365	3586220	6	4:49	7:03	2:14	Rogstad, A. & Charpentier, J.		AZ	USA
57	2900	3200	490360	3565620	492300	3565740	8	17:00	19:41	2:41	Kirkpatrick, C.		AZ	USA
58	2700	3040	494080	3565200	491960	3564990	9	17:00	19:23	2:23	Kirkpatrick, C.		AZ	USA
59	2760	2900	491880	3562700	493580	3561200	11	17:02	19:58	2:56	Kirkpatrick, C.		AZ	USA
60	2634	2700	490060	3561940	490300	3562480	3	4:47	5:32	0:45	Kirkpatrick, C.		AZ	USA
61	2700	2900	488380	3565000	488380	3564860	9	4:53	7:38	2:45	Kirkpatrick, C.		AZ	USA
62	2740	3182	489300	3564820	491460	3562540	10	4:47	7:31	2:44	Kirkpatrick, C.		AZ	USA
63	3450	3600	464420	3503400	467940	3501750	8	4:30	7:12	2:42	Duncan, R.		AZ	USA
64	2220	2260	471200	3567700	472600	3565000	7	4:25	6:13	1:48	McLeod, M.A.		AZ	USA
65	2220	2260	471200	3567700	472600	3565000	7	4:31	6:14	1:43	McLeod, M.A.	2nd Pass	AZ	USA
66	2420	2560	473000	3556020	469480	3555560	12	4:25	7:35	3:10	Esler, J.		AZ	USA
67	2420	2560	469480	3555560	473000	3556020	12	4:20	7:29	3:09	Esler, J.	2nd Pass	AZ	USA
68	2230	2320	469600	3566900	468800	3564800	10	4:21	6:52	2:31	McLeod, M.A.		AZ	USA
69	2230	2320	469600	3566900	468800	3564800	10	4:33	6:53	2:20	McLeod, M.A.	2nd Pass	AZ	USA
70	2210	2320	466900	3565700	467700	3568600	10	4:30	7:18	2:48	McLeod, M.A.		AZ	USA
71	2210	2320	466900	3565700	467700	3568600	10	4:22	7:07	2:45	McLeod, M.A.	2nd Pass	AZ	USA
72	2240	2340	465400	3565800	466800	3568600	9	4:45	7:19	2:34	McLeod, M.A.		AZ	USA
73	2240	2340	465400	3565800	466800	3568600	9	4:34	6:55	2:21	McLeod, M.A.	2nd Pass	AZ	USA
74	2880	2920	500850	3521750	500450	3521100	4	4:17	5:42	1:25	Charpentier, J.P.		AZ	USA
75	2740	2900	502150	3523840	500900	3522100	7	4:30	7:12	2:42	Charpentier, J.P.		AZ	USA
76	2900	2980	500300	3518650	498550	3514990	10	17:34	20:40	3:06	Charpentier, J.P.		AZ	USA

Appendix C. Cactus Ferruginous Pygmy-Owl Survey Location Table for Pima County CFPO Surveys, Spring 1999.

	A	B	C	D	E	F	G	H
1	CFPO?	County	USGS_Quad	Locality	Owner	Date	Township, Range, Section	Habitat
77	No	Pima	Kitt Peak	Altar Valley, Saucito Wash, Coyote Mtns, King Anvil Ranch	State	17-May-99	T18S R8E S27,28,33,34	143.152, 154.12
78	No	Pima	Kitt Peak	Solano Wash, foothills Coyote Mtns, Altar Valley, King Anvil Ranch	State	18-May-99	T17S R8E S31	143.1, 154.12, 224.536
79	No	Pima	Kitt Peak & Palo Alto Ranch	S Mendoza Canyon, White Rincon area, Coyote Mtns, King Anvil Ranch	State	18-May-99	T17S R8E S10,11,12	143.1, 154.1, 224.52
80	No	Pima	La Tortuga Butte	N of Three Points , S of eastern edge of Roskruge Mtns (1)	BLM/State	11-Jun-99	T14S R9E S12,1,2,36,35	154.12, 224.52
81	No	Pima	La Tortuga Butte	N of Three Points , S of eastern edge of Roskruge Mtns (2)	BLM/State	24-Jun-99	T14S R9E S12,1,2,36,35	154.12, 224.52
82	No	Pima	La Tortuga Butte	N of Three Points, Aguirre Pass, up to La Tortuga Butte (1)	BLM/State	12-Jun-99	T15S R9E S12,11,10,3,4	154.12, 224.52
83	No	Pima	La Tortuga Butte	N of Three Points, Aguirre Pass, up to La Tortuga Butte (2)	BLM/State	25-Jun-99	T15S R9E S12,11,10,3,4	154.12, 224.52
84	No	Pima	La Tortuga Butte	N of Three Points, southern edge of Roskruge Mtns, along transmission line (1)	BLM/State	16-Jun-99	T14S &T15S R9E S33,34,3,2	154.12, 224.52
85	No	Pima	La Tortuga Butte	North of Three Points, southern edge of Roskruge Mtns, along transmission line (2)	BLM/State	26-Jun-99	T14S &T15S R9E S33,34,3,2	154.12, 224.52
86	No	Pima	Las Guijas	Las Guijas Wash near Martinez Well and historic Las Guijas site	Private/FWS	29-Jun-99	T20S R9E S14,15,22,23,24	224.521, 254.71
87	No	Pima	Marana	N of Tangerine Rd along Powerline	State	11-Apr-99	T11S R11E S10,11,13,14	154.121
88	No	Pima	Marana	N of Tangerine Rd along Powerline	State	1-May-99	T11S R11E S14,23,24	154.127
89	No	Pima	Marana	N of Tangerine Rd E of I-10 along powerlines	State	19-Apr-99	T11S R11E S4,9,10	154.127
90	No	Pima	Marana	N of Tangerine Rd, E of I-10 & Marana, E 100 m N of Tangerine	State	10-May-99	T11S R12E S33,34	154.127
91	No	Pima	Marana	N of Tangerine Rd, E of I-10 and Marana	State	9-May-99	T11S R12E S33,29,32	154.127
92	No	Pima	Marana	N of Tangerine Rd, E of I-10, Marana parallel to powerlines	State	26-Apr-99	T11S R12E S30; T11S R11E S13	154.127
93	No	Pima	Marana	N of Tangerine Rd, S of Grand Valley Rd, E of Aqueduct	State	24-Apr-99	T11S R11E S4,9,10,15	154.127
94	No	Pima	Marana	N of Tangerine, E of I-10 & Marana, along boundary road	State	25-Apr-99	T11S R11E S24,23,14	154.127
95	No	Pima	Marana	Powerline Rd N of Tangerine E of I-10 and Marana	State	11-Apr-99	T11S R11E S24; T11S R12E S19,30	154.121
96	No	Pima	Marana & Ruelas Canyon	N of Tangerine Rd, powerlines along road	State	18-Apr-99	T11S R11E S33,28,29	154.127
97	No	Pima	Marana & Ruelas Canyon	Powerline Rd N of Tangerine Rd	State	10-Apr-99	T11S R12E S30,33,32,29	154.127
98	No	Pima	Mount Fagan	Davidson Canyon, from power transmission line road crossing downstream to I-10 crossing	Pima Co.	12-Apr-99	T16S R17E S31; T17S R17E S6	224.531, 224.533, 254.71
99	No	Pima	Oro Valley	Big Wash	State	16-Jun-99	T11S R14E S17,20	224.522
100	No	Pima	Oro Valley	Canada del Oro Wash from 1st Ave bridge downstream to Oro Valley Country Club	Co./State	2-Jun-99	T12S R14E S12,13	154.12
101	No	Pima	Oro Valley	Canada del Oro Wash, downstream from La Canada Drive	Pima Co./State	22-Jun-99	T12S R13E S15,22	154.12, 224.52
102	No	Pima	Oro Valley	Canada del Oro Wash, Oro Valley, downstream from Catalina State Park on Oracle Rd.	State	26-May-99	T12S R14E S5,6,7	224.521
103	No	Pima	Oro Valley	Canada del Oro Wash, upstream from La Canada Drive	Pima Co./State	21-Jun-99	T12S R13E S14	154.12, 224.52
104	No	Pima	Oro Valley	CNF, Pusch Ridge Wilderness near El Conquistador Resort	USFS	12-Jun-99	T12S R14E S17	154.121
105	No	Pima	Oro Valley	Coronado NF, Pusch Ridge Wilderness NW corner	USFS	23-Jun-99	T12S R14E S9,16,17	154.12
106	No	Pima	Oro Valley	Linda Vista Road, west of Oracle Rd	Pima Co.	24-Jun-99	T12S R13E S13,14,23,24	154.12

Appendix C. Cactus Ferruginous Pygmy-Owl Survey Location Table for Pima County CFPO Surveys, Spring 1999.

	I	J	K	L	M	N	O	P	Q	R	S	T	U	V
1	Min_Elev	Max_Elev	Xstart_UTM	Ystart_UTM	Xend_UTM	Yend_UTM	Points	Start Time	End Time	Total Time	Surveyor	Remarks	State	Country
77	3460	3650	448270	3530310	450140	3529910	4	18:30	19:57	1:27	Duncan, R.		AZ	USA
78	3840	3960	446000	3529480	446580	3529250	3	18:45	19:50	1:05	Duncan, R.		AZ	USA
79	3300	3600	451540	3537560	453220	3536580	6	5:00	7:25	2:25	Duncan, R.		AZ	USA
80	2660	2860	464620	3555620	462800	3558640	12	4:30	7:40	3:10	Esler, J.		AZ	USA
81	2660	2860	462800	3558640	464620	3555620	12	4:30	7:39	3:09	Esler, J.	2nd Pass	AZ	USA
82	2580	2720	463580	3555660	458620	3557660	16	4:33	7:28	2:55	Esler, J.		AZ	USA
83	2580	2720	458620	3557660	463580	3555660	15	4:30	7:38	3:08	Esler, J.	2nd Pass	AZ	USA
84	2600	2760	463120	3556700	459160	3559440	14	4:23	7:25	3:02	Esler, J.		AZ	USA
85	2600	2760	459160	3559440	463120	3556700	14	4:35	7:36	3:01	Esler, J.	2nd Pass	AZ	USA
86	3300	3450	460460	3505300	464000	3503700	9	17:45	20:22	2:37	Duncan, R.		AZ	USA
87	2100	2120	483080	3592540	481180	3594080	7	17:47	19:37	1:50	Kuklinski, E.		AZ	USA
88	2100	2100	481800	3593540	484000	3591000	10	17:05	19:38	2:33	Kuklinski, E.		AZ	USA
89	2080	2100	480890	3594360	478820	3595810	7	17:13	19:06	1:53	Kuklinski, E.		AZ	USA
90	2280	2400	488870	3589600	490400	3589600	10	4:43	7:22	2:39	Kuklinski, E.	Flycatcher response	AZ	USA
91	2150	2200	485950	3589590	488460	3587610	9	5:05	7:31	2:26	Kuklinski, E.	Flycatcher response	AZ	USA
92	2120	2190	483720	3591340	485610	3589830	7	17:08	19:51	2:43	Kuklinski, E.	Flycatcher response	AZ	USA
93	2060	2080	478700	3595610	480910	3593750	8	17:35	19:46	2:11	Kuklinski, E.		AZ	USA
94	2090	2100	481220	3593470	483400	3591620	8	17:44	19:57	2:13	Kuklinski, E	Mobbing - flycatchers; flycatcher response	AZ	USA
95	2120	2150	485600	3590460	483400	3592290	8	5:35	7:55	2:20	Kuklinski, E.		AZ	USA
96	2220	2130	488420	3588060	488200	3588540	7	17:30	19:42	2:12	Kuklinski, E.		AZ	USA
97	2180	2240	488500	3588060	485900	3590210	9	17:15	19:42	2:27	Kuklinski, E.		AZ	USA
98	3400	3550	533540	3538250	533680	3539870	7	16:45	19:34	2:49	Duncan, R.		AZ	USA
99	2880	3000	506600	3593100	506180	3591500	8	4:19	7:24	3:05	Charpentier, J.P.	Flycatcher response	AZ	USA
100	2450	2550	503620	3584650	502590	3584150	7	4:18	7:12	2:54	Charpentier, J.P.		AZ	USA
101	2300	2420	500400	3582950	499600	3582500	7	4:17	7:15	2:58	Charpentier, J.P.		AZ	USA
102	2640	2500	505750	3586050	504420	3585290	6	4:25	7:20	2:55	Charpentier, J.P.		AZ	USA
103	2440	2480	500400	3582700	501600	3583450	8	4:20	7:20	3:00	Charpentier, J.P.		AZ	USA
104	2800	3200	505300	3582450	505500	3583950	6	4:40	7:13	2:33	Charpentier, J.P.		AZ	USA
105	3000	3200	506000	3583900	507000	3584850	6	5:00	7:30	2:30	Charpentier, J.P.		AZ	USA
106	2560	2640	503450	3582500	501690	3582300	10	4:17	7:20	3:03	Charpentier, J.P.		AZ	USA

Appendix C. Cactus Ferruginous Pygmy-Owl Survey Location Table for Pima County CFPO Surveys, Spring 1999.

	A	B	C	D	E	F	G	H
1	CFPO?	County	USGS_Quad	Locality	Owner	Date	Township, Range, Section	Habitat
107	No	Pima	Oro Valley	N of Miravista Lane along Big Wash & into Big Wash proper	State	16-Jun-99	T11S R14E S5,8	224.521
108	No	Pima	Oro Valley	N of Rancho Vistoso Blvd., along 27 wash & along Big wash W fork	State	8-Jun-99	T11S R14E S29,20	224.521
109	No	Pima	Oro Valley	NW Oro Valley, near Cooper Creek Elem. School	State	3-Jun-99	T12S R13E S2	154.121
110	No	Pima	Oro Valley	NW Tucson, West-side of Catalina Mtns., Alamo Canyon (East of Catalina State Park)	USFS	7-May-99	T12S R14E S9, 10	143.15, 154.12, 224.52
111	No	Pima	Oro Valley	NW Tucson, West-side of Catalina Mtns., Montrose Canyon (East of Catalina State Park)	USFS	6-May-99	T12S R14E S2	143.15, 154.12, 224.52
112	No	Pima	Oro Valley	NW Tucson, West-side of Santa Catalina Mtns., Romero Canyon	USFS	11-May-99	T11S R14E S35	143.15, 154.12, 224.52
113	No	Pima	Oro Valley	Oro Valley, La Canada Rd. to La Naranja Rd.	Pima Co./State	11-Jun-99	T12S R13E S2,3,11,12,1	154.121
114	No	Pima	Oro Valley	Tangerine Rd. E of Oracle Rd to La Canada	Pima Co./State	8-Jun-99	T11S R14E S31,32; T11S R13E S36,35; T12S R13E S1,2,3	154.121
115	No	Pima	Oro Valley	W-NW slope of Pusch Ridge Wilderness starting at Linda Vista Access area	USFS	5-Jun-99	T12S R14E S19,20	154.121
116	No	Pima	Oro Valley & Tucson North	CNF, Pusch Ridge Wilderness, Western property boundary	USFS	15-Jun-99	T12S R14E S19	154.12
117	No	Pima	Palo Alto Ranch	Altar Valley area Mendoza Wash, base of s-flank Mendoza Canyon, King Anvil Ranch	State	17-May-99	T17S R8E & 9E S1,2,6	143.152, 154.12
118	No	Pinal	Peppersauce Wash	Foothills of Santa Catalina Mtns, south of the town of San Manuel, Alder Wash	State	25-Jun-99	T10S R18E S21,28,29,32	154.12
119	No	Pinal	Peppersauce Wash	Stratton Wash, foothills of Santa Catalina Mtns south of town of San Manuel	State	26-Jun-99	T10S R18E S17,19,20	154.12
120	No	Pima	Redington	SE of town of Redington about 2 miles on dirt road	State	29-May-99	T12S R18E S14,23	154.121
121	No	Pima	Redington & Buehman Canyon	Redington & Edgar Canyon	State	16-Jun-99	T11S R18E S27,28	154.12
122	No	Pima	Redington & Buehman Canyon	Redington & Peck Canyon	State	17-Jun-99	T11S R18E S9,10	154.12
123	No	Pima	Redington & Soza	Redington aren about 3 miles S of town of Redington	State	30-May-99	T12S R18E S24,25	154.121
124	No	Pima	Rincon Peak	Agua Verde Creek, Rincon Valley	State	19-Apr-99	T16S R17E S14,15,16	143.1, 154.1, 224.526
125	No	Pima	Rincon Peak	Rincon Mtns., Agua Verde Creek, Powerline road beginning at Chimney Canyon crossing to Agua Verde Crossing	State	18-Apr-99	T16S R17E S9,10,11,14,15,16	143.1, 154.1, 224.526
126	No	Pima	Rincon Peak	Rincon Mtns., Posta Quemada Canyon	USFS	16-Apr-99	T15S R17E S34, T16S R17E S2	143.1, 154.1, 224.536
127	No	Pima	Rincon Peak	Rincon Mtns., Posta Quemada Cn., Papago Wall area	USFS	17-Apr-99	T15S R17E S34, 35	143.1, 154.1, 224.536
128	No	Pima	Rincon Peak	Rincon Mtns., Shaw Canyon	USFS	17-Apr-99	T16S R17E S2, 11	143.1, 154.1, 224.536
129	No	Santa Cruz	Rio Rico & Pena Blanca Lake	Santa Cruz River @ Rio Rico (S)		25-Jun-99	Luis Maria Baca Land Grant-Float #3	224.531
130	No	Pima	Ruelas Canyon	N of Tangerine Rd, E of I-10 and Marana	State	17-May-99	T11S R12E S28,33	154.121
131	No	Pima	Ruelas Canyon	N of Tangerine Rd, E of I-10 and Marana	State	18-May-99	T11S R12E S27,33,34	154.121
132	No	Pima	Ruelas Canyon	N of Tangerine Rd, E of I-10 and Marana	State	18-May-99	T11S R12E S22,27	154.121
133	No	Pima	Sabino Canyon	Ave Silencioso north to Swan	Pima Co.	9-Jun-99	T13S R15E S8	224.52
134	No	Pima	Sabino Canyon	Avenida de la Colina to Prince to Catalina	Pima Co.	18-Jun-99	T13S R15 E S25,26	154.12
135	No	Pima	Sabino Canyon	Bonanza and Prospect	Pima Co.	17-May-99	T13S R15E S23	224.52
136	No	Pima	Sabino Canyon	Bonanza Ave to Ft Lowell to Houghton intersection	Pima Co.	16-Jun-99	T13S R15E S26,35	154.11
137	No	Pima	Sabino Canyon	Catalina Hwy/Tanque Verde Rd	Pima Co.	11-Jun-99	T13S R15E S34,35	154.12
138	No	Pima	Sabino Canyon	Cloud Rd/Larrea Lane	Pima Co.	27-May-99	T13S R15E S28	154.12
139	No	Pima	Sabino Canyon	Cloud Rd/Sabino Canyon Rd	Pima Co.	25-May-99	T13S R15E S30	224.52, 224.53
140	No	Pima	Sabino Canyon	East end of Calle Potrero	Pima Co.	27-May-99	T13S R15E S28	224.52

Appendix C. Cactus Ferruginous Pygmy-Owl Survey Location Table for Pima County CFPO Surveys, Spring 1999.

	I	J	K	L	M	N	O	P	Q	R	S	T	U	V
1	Min_Elev	Max_Elev	Xstart_UTM	Ystart_UTM	Xend_UTM	Yend_UTM	Points	Start Time	End Time	Total Time	Surveyor	Remarks	State	Country
107	3040	3100	506750	3593800	506550	3595950	8	4:22	7:09	2:47	Rogstad, A.		AZ	USA
108	2800	2900	505320	3590000	505850	3590800	10	4:30	7:30	3:00	Rogstad, A.	Mobbing - hummingbird	AZ	USA
109	2680	2800	501500	3585740	501900	3587150	7	4:17	7:12	2:55	Charpentier, J.P.		AZ	USA
110	2880	3120	508360	3585620	508740	3585200	4	17:24	19:01	1:37	Haynes, L.		AZ	USA
111	2920	3160	510720	3586600	510190	3586980	4	18:10	19:33	1:23	Haynes, L.		AZ	USA
112	2850	2970	510240	3588120	510760	3588120	4	5:42	7:34	1:52	Haynes, L.	Mobbing - hummingbirds	AZ	USA
113	2600	2800	500500	3587000	503650	3585600	8	4:17	7:12	2:55	Charpentier, J.P.	Mobbing - flycatchers, lesser nighthawk; flycatcher response	AZ	USA
114	2700	2800	506200	3588000	500500	3587250	9	4:30	7:16	2:46	Charpentier, J.P.		AZ	USA
115	2700	3400	503750	3582500	505340	3582250	8	4:17	7:26	3:09	Charpentier, J.P.	Flycatcher response	AZ	USA
116	2680	2890	503750	3582200	503750	3581100	4	17:32	19:02	1:30	Charpentier, J.P.		AZ	USA
117	3130	3210	453430	3537740	455350	3538180	8	17:30	19:55	2:25	Duncan, R.		AZ	USA
118	2720	2820	546100	3600400	544200	3598800	7	17:30	20:30	3:00	Charpentier, J.P.	Flycatcher response	AZ	USA
119	2760	2920	545000	3602350	543700	3600900	7	4:20	7:20	3:00	Charpentier, J.P.		AZ	USA
120	2900	3300	549750	3584580	548900	3582800	6	17:25	20:02	2:37	Charpentier, J.P.		AZ	USA
121	2940	3590	547600	3590100	545640	3590660	7	17:33	20:21	2:48	Charpentier, J.P.		AZ	USA
122	2800	3000	547250	3594800	545150	3594100	7	4:17	7:07	2:50	Charpentier, J.P.		AZ	USA
123	2900	3250	550800	3582880	550350	3581400	6	4:20	7:04	2:44	Charpentier, J.P.		AZ	USA
124	3575	3625	540320	3545100	537400	3544820	6	5:32	7:40	2:08	Duncan, R.		AZ	USA
125	3560	3675	539560	3545650	536330	3545620	6	17:35	19:36	2:01	Duncan, R.		AZ	USA
126	3625	3800	538180	3549200	537380	3548350	4	18:00	19:25	1:25	Duncan, R.		AZ	USA
127	3775	4000	539880	3549900	538400	3549200	5	5:45	7:50	2:05	Duncan, R.		AZ	USA
128	3675	4500	538900	3548100	539170	3545600	6	17:00	19:36	2:36	Duncan, R.		AZ	USA
129	3380	3440	500780	3481500	499740	3484410	9	4:30	7:06	2:36	Henley, C.		AZ	USA
130	2300	2460	488420	3588580	489200	3589380	10	17:20	20:14	2:54	Kuklinski, E.	Flycatcher response	AZ	USA
131	2320	2470	489200	3589980	489640	3589200	7	4:59	7:16	2:17	Kuklinski, E.	Flycatcher response	AZ	USA
132	2440	2600	490040	3589400	490440	3591080	10	17:24	20:15	2:51	Kuklinski, E.	Flycatcher response	AZ	USA
133	2760	2760	516000	3575000	516000	3575000	2	5:25	5:50	0:25	Perkins, M.		AZ	USA
134	2628	2640	521700	3569660	520580	3570460	13	4:17	7:10	2:53	Perkins, M.		AZ	USA
135	2600	2628	520600	3571700	519900	3571570	5	5:16	6:15	0:59	Perkins, M.		AZ	USA
136	2640	2680	520680	3570480	521500	3569680	11	17:32	20:20	2:48	Perkins, M.		AZ	USA
137	2640	2680	520840	3569000	519520	3569320	10	4:17	7:17	3:00	Perkins, M.		AZ	USA
138	2545	2545	517280	3570060	517450	3570060	3	6:15	6:49	0:34	Perkins, M.		AZ	USA
139	2480	2480	513160	3570100	513240	3570400	2	6:50	7:13	0:23	Perkins, M.	Mobbing - verdin	AZ	USA
140	2520	2520	517420	3569690	517420	3569690	1	5:40	5:50	0:10	Perkins, M.		AZ	USA

Appendix C. Cactus Ferruginous Pygmy-Owl Survey Location Table for Pima County CFPO Surveys, Spring 1999.

	A	B	C	D	E	F	G	H
1	CFPO?	County	USGS_Quad	Locality	Owner	Date	Township, Range, Section	Habitat
141	No	Pima	Sabino Canyon	East end of Hillwood Pl.	Pima Co.	27-May-99	T13S R15E S28	224.52
142	No	Pima	Sabino Canyon	End of Kiva Way	Pima Co.	9-Jun-99	T13S R15E S7,8	224.52
143	No	Pima	Sabino Canyon	Flintlock Tr to Glenn Rd to Tomahawk	Pima Co.	14-Jun-99	T13S R15E S35,36	224.52
144	No	Pima	Sabino Canyon	Fort Lowell Park, Tucson	Pima Co.	25-May-99	T13S R14E S36	224.52, 224.53
145	No	Pima	Sabino Canyon	Glenn St. to Avenida del Conejo to Drake Place	Pima Co.	14-Jun-99	T13S R15E S25,36	224.52
146	No	Pima	Sabino Canyon	Intersection of Cloud Rd/Elena Maria	Pima Co.	27-May-99	T13S R15E S28	154.12
147	No	Pima	Sabino Canyon	Intersection of Cloud Rd/Tonto Place	Pima Co.	26-May-99	T13S R15E S30	224.52, 224.53, 300
148	No	Pima	Sabino Canyon	Intersection of Indian Tr/Rohyans	Pima Co.	9-Jun-99	T13S R15E S8	224.52
149	No	Pima	Sabino Canyon	Intersection of Kolb Rd & Little Savanah Ln	Pima Co.	7-Jun-99	T13S R15E S20	154.12
150	No	Pima	Sabino Canyon	Intersection of N Cheyenne Tr/Bornite Way	Pima Co.	8-Jun-99	T13S R15E S21	224.52, 300
151	No	Pima	Sabino Canyon	Intersection of Ocotillo Dr/Hidden Valley	Pima Co.	8-Jun-99	T13S R15E S16	224.52
152	No	Pima	Sabino Canyon	Intersection of Rawhide Tr/Hidden Valley Rd	Pima Co.	8-Jun-99	T13S R15E S16	224.52
153	No	Pima	Sabino Canyon	Intersection of Webster/Alvin	Pima Co.	27-May-99	T13S R15E S33	224.52, 300
154	No	Pima	Sabino Canyon	Just east of Sabino Canyon Rd/Cloud Rd intersection	Pima Co.	26-May-99	T13S R15E S29	224.52, 300
155	No	Pima	Sabino Canyon	Kleindale Rd to Houghton	Pima Co.	17-Jun-99	T13S R15E S26	154.11
156	No	Pima	Sabino Canyon	Knollwood Dr/Sabino Canyon Rd	Pima Co.	27-May-99	T13S R15E S29	154.12
157	No	Pima	Sabino Canyon	Lewis C. Murphy Booster Reservoir Rd near Flaming Sky Pl.	Pima Co.	7-Jun-99	T13S R15E S29	154.12
158	No	Pima	Sabino Canyon	Melpomene Way N of Prince	Pima Co.	21-Jun-99	T13S R15E S25,24	154.12
159	No	Pima	Sabino Canyon	Melpomene Way North to Prince	Pima Co.	18-Jun-99	T13S R15E S36, 25 ; T13S R16E S30, 31	224.52
160	No	Pima	Sabino Canyon	Morril Way east towards Tomahawk Tr	Pima Co.	16-Jun-99	T13S R15E S35	154.12
161	No	Pima	Sabino Canyon	Mountain Cove Estates west end of Felicity Pl.	Pima Co.	27-May-99	T13S R15E S29	154.12, 300
162	No	Pima	Sabino Canyon	N end of Barrasca Ave going south	Pima Co.	9-Jun-99	T13S R15E S8	224.52
163	No	Pima	Sabino Canyon	N end of Pantano Rd to Calle de la Escarpa/Pantano Rd intersection	Pima Co.	28-May-99	T13S R15E S29	154.12
164	No	Pima	Sabino Canyon	N end of Stone House Pl	Pima Co.	9-Jun-99	T13S R15E S16	224.52
165	No	Pima	Sabino Canyon	N end of Wikieup Cr	Pima Co.	9-Jun-99	T13S R15E S8	224.52
166	No	Pima	Sabino Canyon	Near intersection of Calle Hondonada/Pla. Hondonada	Pima Co.	27-May-99	T13S R15E S28	224.52
167	No	Pima	Sabino Canyon	Near Manor Place, in alley	Pima Co.	26-May-99	T13S R15E S29	224.52, 300
168	No	Pima	Sabino Canyon	Paseo Tamayo	Pima Co.	10-Jun-99	T13S R14E S1,12	154.12
169	No	Pima	Sabino Canyon	Pla. La Gracias, Tucson	Pima Co.	10-Jun-99	T13S R14E S12	154.12
170	No	Pima	Sabino Canyon	Prince, Ave de la Colina to Melpomene	Pima Co.	24-Jun-99	T13S R15E S25	154.11
171	No	Pima	Sabino Canyon	Roger to Halfmoon to Calle Vaqueros to Wendell	Pima Co.	22-Jun-99	T13S R15E S24,25	154.1
172	No	Pima	Sabino Canyon	Santa Ana Ln	Pima Co.	16-Jun-99	T13S R15E S34	154.12
173	No	Pima	Sabino Canyon	South of intersection of Pantano Rd/Alvin St.	Pima Co.	26-May-99	T13S R15E S32	224.52, 224.53
174	No	Pima	Sabino Canyon	Tomahawk Tr from Tanque Verde to Ft Lowell Rd	Pima Co.	11-Jun-99	T13S R15E S35	154.12
175	No	Pima	Sabino Canyon	Tucson Country Club	Pima Co.	25-May-99	T13S R15E S31	224.52
176	No	Pima	Sabino Canyon	Tucson N of Tanque Verde & Bear Canyon Rd. intersection past apartment complex	Pima Co.	15-Apr-99	T13S R15E S34	154.12
177	No	Pima	Sabino Canyon	Tucson, Bear Canyon Rd., 2nd wash N of Collier Elementary	Pima Co.	15-Apr-99	T13S R15E S22	224.521
178	No	Pima	Sabino Canyon	Tucson, Bear Canyon Rd, in wash N of Collier Elementary	Pima Co.	15-Apr-99	T13S R15E S27	224.52
179	No	Pima	Sabino Canyon	Tucson, near intersection of Prospect and Bonanza	Pima Co.	15-Apr-99	T13S R15E S23	224.53
180	No	Pima	Sabino Canyon	Ventana trailhead parking lot	Pima Co.	17-May-99	T13S R15E S6	224.52
181	No	Pima	Sabino Canyon	W end of Buckhorn Dr	Pima Co.	9-Jun-99	T13S R15E S16	154.12
182	No	Pima	Sabino Canyon	Webster/Sabino Dr intersection	Pima Co.	9-Jun-99	T13S R15E S16	224.52
183	No	Pima	Sabino Canyon	West end of Flaming Sky Place	Pima Co.	7-Jun-99	T13S R15E S29	154.1, 300
184	No	Pima	Sabino Canyon	West end of Snyder	Pima Co.	7-Jun-99	T13S R15E S19	154.12
185	No	Pima	Sabino Canyon & Agua Caliente	Ft. Lowell to Houghton to Conestoga	Pima Co.	25-Jun-99	T13S R16E S30,31; T13S R15E S25,36	224.53

Appendix C. Cactus Ferruginous Pygmy-Owl Survey Location Table for Pima County CFPO Surveys, Spring 1999.

	I	J	K	L	M	N	O	P	Q	R	S	T	U	V
1	Min_Elev	Max_Elev	Xstart_UTM	Ystart_UTM	Xend_UTM	Yend_UTM	Points	Start Time	End Time	Total Time	Surveyor	Remarks	State	Country
141	2640	2640	518020	3571000	518020	3571000	1	7:10	7:20	0:10	Perkins, M.		AZ	USA
142	2800	2800	514000	3575000	514000	3575000	1	6:56	7:06	0:10	Perkins, M.		AZ	USA
143	2600	2600	521500	3568510	521200	3568840	10	4:17	6:55	2:38	Perkins, M.		AZ	USA
144	2460	2460	512100	3569090	512100	3569090	1	5:45	5:55	0:10	Perkins, M.		AZ	USA
145	2620	2680	522000	3568900	522320	3570090	12	17:31	20:24	2:53	Perkins, M.		AZ	USA
146	2545	2545	517650	3570060	517650	3570060	1	6:00	6:10	0:10	Perkins, M.		AZ	USA
147	2480	2480	514360	3570060	514360	3570060	1	6:11	6:21	0:10	Perkins, M.		AZ	USA
148	2760	2760	515000	3575000	515000	3575000	1	6:25	6:35	0:10	Perkins, M.		AZ	USA
149	2560	2560	515450	3571500	515450	3571500	1	6:52	7:02	0:10	Perkins, M.		AZ	USA
150	2600	2600	518000	3572480	518000	3572480	1	5:30	5:40	0:10	Perkins, M.		AZ	USA
151	2640	2800	517620	3572870	516600	3572870	5	6:20	7:21	1:01	Perkins, M.		AZ	USA
152	2600	2600	517900	3573120	517900	3573120	1	6:00	6:10	0:10	Perkins, M.		AZ	USA
153	2520	2520	517040	3569310	517040	3569660	3	4:59	5:36	0:37	Perkins, M.		AZ	USA
154	2498	2498	515100	3570070	515100	3570070	1	6:25	6:35	0:10	Perkins, M.		AZ	USA
155	2640	2640	520380	3570200	521480	3570150	7	4:17	5:58	1:41	Perkins, M.		AZ	USA
156	2520	2520	515320	3570470	515320	3570470	1	17:22	17:33	0:11	Perkins, M.		AZ	USA
157	2560	2600	515410	3571085	515585	3571225	4	5:50	6:40	0:50	Perkins, M.		AZ	USA
158	2680	2754	523120	3570200	523120	3572900	14	4:17	7:16	2:59	Perkins, M.		AZ	USA
159	2640	2720	523120	3569420	523120	3570500	7	17:33	19:10	1:37	Perkins, M.		AZ	USA
160	2620	2640	520840	3568900	521100	3568200	4	4:17	5:05	0:48	Perkins, M.		AZ	USA
161	2630	2630	516050	3570920	516050	3570920	1	17:47	17:57	0:10	Perkins, M.		AZ	USA
162	2760	2760	515000	3575000	515000	3575150	2	5:56	6:20	0:24	Perkins, M.		AZ	USA
163	2630	2640	516600	3571205	516585	3571000	2	17:23	17:46	0:23	Perkins, M.		AZ	USA
164	2725	2725	517000	3574000	517000	3574000	2	4:52	5:17	0:25	Perkins, M.		AZ	USA
165	2760	2760	515000	3575000	515000	3575000	1	6:40	6:50	0:10	Perkins, M.		AZ	USA
166	2600	2600	516745	3571010	516745	3571010	1	18:15	18:25	0:10	Perkins, M.	Flycatcher response	AZ	USA
167	2500	2500	516320	3569680	516320	3569680	1	6:42	6:52	0:10	Perkins, M.		AZ	USA
168	3040	3080	513240	3576560	512960	3575920	6	6:05	7:20	1:15	Perkins, M.		AZ	USA
169	3000	3000	512300	3575950	512270	3576180	2	5:30	5:55	0:25	Perkins, M.		AZ	USA
170	2664	2680	521750	3570500	523140	3570500	9	4:30	6:50	2:20	Perkins, M.		AZ	USA
171	2720	2720	521920	3571410	522700	3570550	11	4:18	6:50	2:32	Perkins, M.		AZ	USA
172	2600	2600	519640	3568900	519640	3569620	6	5:15	7:10	1:55	Perkins, M.		AZ	USA
173	2500	2500	516610	3569220	516610	3569220	1	7:03	7:13	0:10	Perkins, M.		AZ	USA
174	2600	2640	521100	3568100	521000	3569680	10	17:30	19:40	2:10	Perkins, M.		AZ	USA
175	2480	2480	514370	3569240	514370	3569240	1	6:20	6:30	0:10	Perkins, M.		AZ	USA
176	2560	2560	518700	3569240	518700	3569240	1	6:06	6:16	0:10	Perkins, M.		AZ	USA
177	2560	2560	519000	3571860	519000	3571860	1	6:45	6:55	0:10	Perkins, M.		AZ	USA
178	2530	2530	519300	3571340	519300	3571340	1	6:25	6:35	0:10	Perkins, M.		AZ	USA
179	2628	2628	520760	3571750	520760	3571750	1	7:27	7:37	0:10	Perkins, M.		AZ	USA
180	3000	3000	513700	3576800	513700	3576800	1	6:49	6:59	0:10	Perkins, M.		AZ	USA
181	2700	2700	517060	3574080	517060	3574080	1	4:17	4:27	0:10	Perkins, M.		AZ	USA
182	2700	2700	517060	3574000	517060	3574000	1	4:35	4:45	0:10	Perkins, M.		AZ	USA
183	2560	2560	515360	3571180	515360	3571180	1	5:30	5:40	0:10	Perkins, M.		AZ	USA
184	2760	2760	514200	3572760	514200	3572760	1	5:00	5:10	0:10	Perkins, M.		AZ	USA
185	2640	2641	521510	3569660	523380	3569600	14	4:18	7:17	2:59	Perkins, M.		AZ	USA

Appendix C. Cactus Ferruginous Pygmy-Owl Survey Location Table for Pima County CFPO Surveys, Spring 1999.

	A	B	C	D	E	F	G	H
1	CFPO?	County	USGS_Quad	Locality	Owner	Date	Township, Range, Section	Habitat
186	No	Pima	Sabino Canyon & Agua Caliente	Limberlost from Drake to Soldier Trail	Pima Co.	22-Jun-99	T13S R15E S24; T13S R16E S19	154.1
187	No	Pima	Sabino Canyon & Agua Caliente	Prince to Homestead	Pima Co.	24-Jun-99	T13S R16E S19,30	154.12
188	No	Pima	Samaniego Peak	E slope of Sierrita Mtns, Tapon Tank Wash	State	26-Apr-99	T17S R12E S31,32; T17S R11E S36	224.527, 154.12
189	No	Pima	Samaniego Peak	NW of Sierrita Mtns, Gunsight Mtn	State	26-Apr-99	T17S R11E S7,8	224.52, 154.12
190	No	Pima	San Xavier Mission	N slope of Sierrita Mtns	State	21-Apr-99	T16S R11E S20,21,28	224.522
191	No	Pima	Silverbell East	E of Silverbell, along Cocio wash (1)	BLM	22-Apr-99	T12S R9E S15,10,11,2	154.127
192	No	Pima	Silverbell East	East of Silverbell, along Cocio Wash (2)	BLM	3-Jun-99	T12S R9E S15,10,11,2	154.127
193	No	Pima	Silverbell West	Approx. 6 miles N-NW of Silverbell (1)	State/BLM	23-Apr-99	T11S R8E S10,9,16,17,20,29	154.127
194	No	Pima	Silverbell West	Approx. 6 miles N-NW of Silverbell (2)	State/BLM	1-Jun-99	T11S R8E S10,9,16,17,20,29	154.127
195	No	Pima	Silverbell West	El Tiro Wash (1)	BLM/State	16-Jun-99	T11S R7E S36; T11S R8E S29, 32, 31	154.127
196	No	Pima	Silverbell West	El Tiro Wash (2)	BLM/State	24-Jun-99	T11S R7E S36; T11S R8E S29, 32, 31	154.127
197	No	Pima	Silverbell West	Mammoth Wash (1)	BLM	20-May-99	T12S R8E S7,8	154.127
198	No	Pima	Silverbell West	Mammoth Wash (2)	BLM	10-Jun-99	T12S R8E S7,8	154.127
199	No	Pima	Silverbell West	NW of Ragged Top (1)	BLM	19-May-99	T11S R8E S15,22,23,26	154.127
200	No	Pima	Silverbell West	NW of Ragged Top (2)	BLM	11-Jun-99	T11S R8E S15,22,23,26	154.127
201	No	Pima	Silverbell West	W of Malpais Hill, NE of W Silverbell Mtns (1)	BLM	26-Apr-99	T11S R8E S7,18	154.127
202	No	Pima	Silverbell West	W of Malpais Hill, NE of W Silverbell Mtns (2)	BLM	7-Jun-99	T11S R8E S7,18	154.127
203	No	Pima	Silverbell West	W Silverbell Mtns (1)	State	27-Apr-99	T11S R7E S14,23,26	154.121
204	No	Pima	Silverbell West	West Silverbell Mtns. (2)	State	8-Jun-99	T11S R7E S14,23,25,26	154.121
205	No	Pima	Silverbell West, Gap Tank & Greene Reservoir	West of Silverbell Mtns (1)	State	28-Apr-99	T11S R7E S14,11,10,3	154.127, 154.118
206	No	Pima	Silverbell West, Gap Tank & Greene Reservoir	West of Silverbell Mtns (2)	State	9-Jun-99	T11S R7E S3,10,11,14	154.127, 154.118
207	No	Pima	Stevens Mountain	E of Stevens Mt, W of Sierra Rita Mt around base of hill w/Aguinaldo Mine site	BLM/State	7-May-99	T17S R10E S26,35	154.12, 224.52
208	No	Pima	Stevens Mountain	Hwy 286 S of 3 Points, anvil Rd turnoff, wash	State	5-May-99	T17S R10E S17,18,15,22	154.127
209	No	Pima	Stevens Mountain	N of Stevens, S of Fresnal, E of 206, W of dirt road	State	6-May-99	T17S R10E S17,18,12	224.52, 154.12
210	No	Pima	Stevens Mountain	NW of Stevens Mt E of 286 W of Sierrita Mtn	State	6-May-99	T17S R10E S27,28,29	154.12
211	No	Pima	Stevens Mountain	W slope & foothills of Stevens Mtn (of Sierrita Mtns) lower	State	7-May-99	T17S R10E S27,28,33,34	154.12, 224.52
212	No	Pima	Stevens Mountain	W slope at Stevens Mnt, road follows entire W side of Mtn	State	7-May-99	T17S R10E S27,34	154.12
213	No	Pima	Stevens Mountain	W slope of Sierrita Mtns	State	27-Apr-99	T17S R9E S12; T17S R10E S7,8,17	224.52, 154.12
214	No	Pima	Stevens Mountain	W slope of Sierrita Mtns, southern fork of upper Fresnal Wash	State/BLM	14-May-99	T17S R10E S25,26	143.1, 154.12
215	No	Pima	Stevens Mountain	W slope of Sierrita Mtns, southern fork of upper Fresnal Wash	State/BLM	7-May-99	T17S R10E S25,26	143.1, 154.12
216	No	Pima	Stevens Mountain	W slope of Sierrita Mtns, uppermost 3 miles of Stevens wash to source	State	6-May-99	T17S R10E S26,27,35,36	224.52, 154.12
217	No	Pima	Stevens Mountain & Palo Alto Ranch	W slope of Sierrita Mtns, large wash between Fresnal & Stevens washes intersecting HWY 286	State	5-May-99	T17S R9E S13, T17S R10E S18,20	224.52, 154.12
218	No	Pima	Stevens Mountain & Palo Alto Ranch	W slope of Sierrita Mtns, Stevens Wash (lower)	State	6-May-99	T17S R9E S14,13,24; T17S R10E S19,20	224.52, 154.12
219	No	Pima	Tanque Verde Peak	Loop Rd for visitors, SNP E	NPS	3-May-99	T14S R16E S29,20	154.12, 224.52
220	No	Pima	Tanque Verde Peak	Saguaro National Park E	NPS	9-May-99	T14S R16E S20,21,28,33,32	154.12, 224.52
221	No	Pima	Tanque Verde Peak	Saguaro NP E	NPS	4-May-99	T14S R16E S29,20	154.12, 224.52
222	No	Pima	Tanque Verde Peak	SNP E, Loop Road & side areas	NPS	27-Jun-99	T14S R16E S29,32,8,17,20	154.12, 224.52
223	No	Pima	Tanque Verde Peak	SNP E, Loop Road & side areas	NPS	25-Jun-99	T14S R16E S29,20,17,16,21,28,33,32	154.12, 224.52
224	No	Pima	Tanque Verde Peak & Vail	Saguaro N. Park. E./Spanish Trail & Irvington Rd E to SE to Colossal Cave junction w/Pistol Hill	Pima Co.	15-May-99	T15S R16E S5,6,7,8,15,16,22; T16S R19E S26,27-36	154.12, 224.52

Appendix C. Cactus Ferruginous Pygmy-Owl Survey Location Table for Pima County CFPO Surveys, Spring 1999.

	I	J	K	L	M	N	O	P	Q	R	S	T	U	V
1	Min_Elev	Max_Elev	Xstart_UTM	Ystart_UTM	Xend_UTM	Yend_UTM	Points	Start Time	End Time	Total Time	Surveyor	Remarks	State	Country
186	2696	2698	522620	3571500	524580	3571540	14	4:18	7:10	2:52	Perkins, M.		AZ	USA
187	2660	2693	523220	3570520	523900	3571520	10	17:34	20:00	2:26	Perkins, M.		AZ	USA
188	4040	4680	487400	3530320	482780	3530020	11	4:40	7:45	3:05	Holley, M.		AZ	USA
189	3700	3920	477120	3536700	477640	3535520	11	17:00	20:10	3:10	Holley, M.		AZ	USA
190	3190	3540	478480	3540740	477890	3543500	8	16:57	19:57	3:00	Holley, M.		AZ	USA
191	2110	2200	460000	3583200	462600	3585400	9	4:58	7:40	2:42	McLeod, M.A.		AZ	USA
192	2110	2200	460000	3583200	462600	3585400	9	4:25	6:43	2:18	McLeod, M.A.	2nd Pass	AZ	USA
193	2100	2240	451000	3593700	447800	3590000	13	5:05	7:53	2:48	McLeod, M.A.		AZ	USA
194	2100	2240	451000	3593700	447700	3589500	14	4:32	7:22	2:50	McLeod, M.A.	2nd Pass	AZ	USA
195	2160	2280	447600	3589200	444000	3587000	11	4:22	6:58	2:36	McLeod, M.A.		AZ	USA
196	2160	2280	447600	3589200	444000	3587000	11	4:22	6:48	2:26	McLeod, M.A.	2nd Pass	AZ	USA
197	2260	2520	449000	3584800	445700	3584500	8	4:35	6:35	2:00	McLeod, M.A.		AZ	USA
198	2260	2520	449000	3584800	445700	3584500	8	4:41	6:30	1:49	McLeod, M.A.	2nd Pass	AZ	USA
199	2140	2500	452000	3593500	452800	3589500	11	4:37	7:26	2:49	McLeod, M.A.		AZ	USA
200	2140	2500	452000	3593500	452800	3589500	12	4:24	7:22	2:58	McLeod, M.A.	2nd Pass	AZ	USA
201	1920	2040	446600	3592700	446200	3593400	14	5:00	8:05	3:05	McLeod, M.A.		AZ	USA
202	1920	2040	446600	3592700	446200	3593400	14	4:24	7:26	3:02	McLeod, M.A.	2nd Pass	AZ	USA
203	1900	2040	442000	3592500	441960	3592700	8	5:13	8:00	2:47	McLeod, M.A.		AZ	USA
204	1900	2080	442000	3592500	443200	3589400	10	4:52	7:19	2:27	McLeod, M.A.	2nd Pass	AZ	USA
205	1780	1890	441400	3593500	441000	3596200	9	5:23	7:57	2:34	McLeod, M.A.		AZ	USA
206	1800	1900	441600	3592700	440900	3595900	9	5:00	7:23	2:23	McLeod, M.A.	2nd Pass	AZ	USA
207	3680	3800	472380	3531020	472440	3530460	10	4:30	7:30	3:00	Gill, B.		AZ	USA
208	3145	3440	467980	3534780	471220	3533640	10	17:10	20:00	2:50	Gill, B.		AZ	USA
209	2790	3085	467530	3534900	464150	3535520	10	4:40	7:20	2:40	Gill, B.		AZ	USA
210	3200	3490	471530	3531850	468190	3532210	10	17:13	19:52	2:39	Gill, B.		AZ	USA
211	3375	3475	470820	353176	470490	3529440	8	17:09	20:17	3:08	Holley, M.		AZ	USA
212	3510	3600	4711900	3531510	478800	3529590	8	17:11	20:17	3:06	Gill, B.		AZ	USA
213	2850	3150	464810	3536810	468390	3535610	10	4:42	7:42	3:00	Holley, M.		AZ	USA
214	3550	4000	471950	3531800	475000	3531250	10	4:40	7:05	2:25	Henley, C.	2nd Pass	AZ	USA
215	3550	4000	471950	3531800	475000	3531250	10	4:32	7:28	2:56	Holley, M.		AZ	USA
216	3500	3900	471770	3531700	474330	3529100	10	17:08	20:08	3:00	Holley, M.		AZ	USA
217	2830	3120	467530	3534050	463610	3535120	11	17:07	20:07	3:00	Holley, M.		AZ	USA
218	2840	3150	467530	3532650	471560	3532580	11	4:33	7:35	3:02	Holley, M.	Mobbing - Lucy's warbler, flycatcher	AZ	USA
219	2800	3000	525240	3560560	525530	3562840	5	4:50	7:00	2:10	Welch, J.		AZ	USA
220	2800	3200	525530	3562840	525640	3559120	10	4:45	7:55	3:10	Welch, J.		AZ	USA
221	2800	3000	525240	3560560	525530	3562840	6	4:50	6:35	1:45	Welch, J.		AZ	USA
222	2800	3200	526310	3558620	525580	3559220	3	5:15	6:25	1:10	Welch, J.		AZ	USA
223	2800	3000	525350	3560880	526510	3559260	14	5:00	8:40	3:40	Welch, J.		AZ	USA
224	2900	3600	524720	3558325	534190	3545850	12	4:50	8:20	3:30	Welch, J.		AZ	USA

Appendix C. Cactus Ferruginous Pygmy-Owl Survey Location Table for Pima County CFPO Surveys, Spring 1999.

	A	B	C	D	E	F	G	H
1	CFPO?	County	USGS_Quad	Locality	Owner	Date	Township, Range, Section	Habitat
225	No	Pima	Tanque Verde Peak & Vail	Spanish Trail Rd, from SNP E to Colossal Cave & La Posta Quemada Rd	State/Pima Co.	26-Jun-99	T14S R16E S30; T15S R16E S5,6,7,8,16,17,22,23,26,27; T16S R17E S5,6,7,8	154.12, 224.5
226	No	Pima	Three Points & Cocoraque Butte	N of Three Points, S edge of eastern end Roskruge Mtns (1)	BLM/State	10-Jun-99	T15S R10E S16,17,8,7,6	154.12, 224.52
227	No	Pima	Three Points & Cocoraque Butte	N of Three Points, S edge of eastern end Roskruge Mtns (2)	BLM/State	23-Jun-99	T15S R10E S16,17,8,7,6	154.12, 224.52
228	No	Pima	Three Points & Cocoraque Butte	N of Three Points, S of eastern end of Roskruge Mtns (1)	State	8-Jun-99	T15S R10E S16,15,14	154.12, 224.52
229	No	Pima	Three Points & Cocoraque Butte	N of Three Points, S of eastern end of Roskruge Mtns (2)	State	21-Jun-99	T15S R10E S16,15,14	154.12, 224.52
230	No	Pima	Three Points & Cocoraque Butte	North of Three Points, S of eastern end of Roskruge Mtns (1)	State	9-Jun-99	T15S R10E & R9E S16,17,18,12,7	154.12, 224.52
231	No	Pima	Three Points & Cocoraque Butte	North of Three Points, S of eastern end of Roskruge Mtns (2)	State	22-Jun-99	T15S R10E & R9E S16,17,18,12,7	154.12, 224.52
232	No	Santa Cruz	Tubac	Santa Cruz River	Various	28-Jun-99	Luis Maria Baca Land Grant-Float #3	224.531
233	No	Santa Cruz	Tubac	Santa Cruz River	Various	29-Jun-99	Luis Maria Baca Land Grant-Float #3	224.531
234	No	Santa Cruz	Tubac	Santa Cruz River, Carmen to Tubac	Various	30-Jun-99	Luis Maria Baca Land Grant-Float #3	224.531
235	No	Santa Cruz	Tubac	Santa Cruz River, Palo Parado N	Various	29-Jun-99	Luis Maria Baca Land Grant-Float #3	224.531
236	No	Pima	Tucson North	Avenida de Cazador N of River Rd between Swan & Craycroft	Pima Co.	3-Jun-99	T13S R14E S23	154.12
237	No	Pima	Tucson North	Calle Barril/Bosque, S of Sunrise Dr between Swan & Craycroft	Pima Co.	4-Jun-99	T13S R14E S14	154.12
238	No	Pima	Tucson North	Calle de la Culebra, S of Orange Grove, E of First Ave.	Pima Co.	16-Jun-99	T13S R14E S7	154.12
239	No	Pima	Tucson North	Calle La Cima N of River between First & Campbell	Pima Co.	7-Jun-99	T13S R14E S17,18	154.12
240	No	Pima	Tucson North	Calle Laredo N of River Rd W of Campbell	Pima Co.	17-Jun-99	T13S R14E S17	154.12
241	No	Pima	Tucson North	Calle Los Altos, N of Skyline, W of Campbell	Pima Co.	23-Jun-99	T13S R14E S5	154.121
242	No	Pima	Tucson North	Camino Arenosa N of Sunrise between Swan & Craycroft	Pima Co.	4-Jun-99	T13S R14E S11	154.12
243	No	Pima	Tucson North	Camino Arturo, E of First Ave between Orange Grove & Via Entrada	Pima Co.	19-May-99	T13S R14E S7	154.121
244	No	Pima	Tucson North	Camino de Fray Marcos SE of Ina & First Ave	Pima Co.	14-Jun-99	T13S R14E S6	154.12
245	No	Pima	Tucson North	Camino de Michael SE of Orange Grove & First Ave	Pima Co.	11-Jun-99	T13S R14E S7	154.12
246	No	Pima	Tucson North	Camino Katrina N of Orange Grove just W of Skyline	Pima Co.	16-Jun-99	T13S R14E S6	154.12
247	No	Pima	Tucson North	Camino Padre Isidoro S of Orange Grove between First & Campbell	Pima Co.	8-Jun-99	T13S R14E S7,8	154.12
248	No	Pima	Tucson North	Camino Real/La Lomita, N of River, just E of Campbell	Pima Co.	11-Jun-99	T13S R14E S17,20	154.12
249	No	Pima	Tucson North	Casas Adobes Neighborhood E of Oracle between Ina & Orange Grove	Pima Co.	15-May-99	T13S R13E S1	154.121, 300
250	No	Pima	Tucson North	Christie Dr. N of 1st Ave. & Euclid intersection	Pima Co.	8-Apr-99	T12S R14E S31,30	154.12
251	No	Pima	Tucson North	Chula Vista wash, Skyline & Chula Vista	Pima Co.	19-Jun-99	T13S R14E S6,31	154.12
252	No	Pima	Tucson North	Coronado Dr N of Skyline between Alvernon & Swan	Pima Co.	24-May-99	T13S R14E S3	154.12
253	No	Pima	Tucson North	Evans Mountain Road, N of Skyline between Campbell & Alvernon	Pima Co.	20-May-99	T13S R14E S4	154.12
254	No	Pima	Tucson North	First Ave wash just S of Ina	Pima Co.	19-Jun-99	T13S R14E S6; T13S R13E S1	154.12
255	No	Pima	Tucson North	Flecha & Saranac Dr., Catalina Foothills N of River Rd W of Swan	Pima Co.	2-Jun-99	T13S R14E S22	154.12, 300

Appendix C. Cactus Ferruginous Pygmy-Owl Survey Location Table for Pima County CFPO Surveys, Spring 1999.

	I	J	K	L	M	N	O	P	Q	R	S	T	U	V
1	Min_Elev	Max_Elev	Xstart_UTM	Ystart_UTM	Xend_UTM	Yend_UTM	Points	Start Time	End Time	Total Time	Surveyor	Remarks	State	Country
225	2800	3600	524540	3559800	534190	3545850	14	5:00	8:10	3:10	Welch, J.		AZ	USA
226	2510	2640	468580	3554360	465420	3557040	12	4:30	7:40	3:10	Esler, J.		AZ	USA
227	2510	2640	468580	3554360	465420	3557040	12	4:36	7:48	3:12	Esler, J.	2nd Pass	AZ	USA
228	2420	2510	468760	3554200	472250	3554740	11	4:14	7:14	3:00	Esler, J.		AZ	USA
229	2420	2510	468760	3554200	472250	3554740	11	4:25	7:25	3:00	Esler, J.	2nd Pass	AZ	USA
230	2410	2620	468760	3554200	464600	3555600	12	4:28	7:40	3:12	Esler, J.		AZ	USA
231	2410	2620	468760	3554200	464600	3555600	12	4:25	7:38	3:13	Esler, J.	2nd Pass	AZ	USA
232	3325	3380	499570	3484840	498470	3487880	9	4:30	7:10	2:40	Henley, C.		AZ	USA
233	3220	3270	495500	3490970	495340	3494330	9	17:40	20:17	2:37	Henley, C.		AZ	USA
234	3160	3210	495360	3494800	496130	3497300	7	4:45	6:49	2:04	Henley, C.		AZ	USA
235	3270	3310	498280	3488270	495590	3490500	9	4:30	7:08	2:38	Henley, C.		AZ	USA
236	2520	2720	510650	3571340	511460	3572700	13	17:30	20:18	2:48	Henley, C.		AZ	USA
237	2660	2780	510510	3572950	511460	3573500	12	4:30	7:03	2:33	Henley, C.	Mobbing - Verdin	AZ	USA
238	2520	2580	504480	3574600	505040	3575580	11	17:35	19:55	2:20	Henley, C.		AZ	USA
239	2460	2560	505000	3573440	505900	3574240	13	17:30	20:16	2:46	Henley, C.		AZ	USA
240	2460	2570	504010	3572800	505900	3573810	12	17:35	20:08	2:33	Henley, C.		AZ	USA
241	2740	2780	505560	3576720	506350	3576260	12	4:40	7:13	2:33	Henley, C.	Flycatcher response	AZ	USA
242	2840	2980	510870	3574750	511211	3575990	13	17:30	20:18	2:48	Henley, C.		AZ	USA
243	2460	2600	503850	3574470	504840	3575980	13	4:30	7:17	2:47	Henley, C.		AZ	USA
244	2580	2680	503930	3576600	504180	3577560	11	17:35	19:55	2:20	Henley, C.		AZ	USA
245	2500	2580	503870	3575240	504300	3575820	7	18:20	19:48	1:28	Henley, C.		AZ	USA
246	2610	2680	504970	3576020	504750	3576600	12	4:30	7:00	2:30	Henley, C.		AZ	USA
247	2520	2640	504950	3574690	505600	3575820	13	17:30	20:16	2:46	Henley, C.		AZ	USA
248	2320	2560	506040	3572100	506830	3573250	11	5:00	7:20	2:20	Henley, C.	Mobbing - Lucy's warbler	AZ	USA
249	2520	2600	502360	3576540	503240	3576845	13	4:45	7:24	2:39	Henley, C.		AZ	USA
250	2660	2920	503760	3577790	503960	3579460	13	17:02	19:35	2:33	Perkins, M.	Mobbing - verdin	AZ	USA
251	2720	2720	505130	3577220	505160	3577260	2	17:35	17:58	0:23	Henley, C.		AZ	USA
252	2880	3080	508580	3577280	510130	3577230	13	4:30	7:14	2:44	Henley, C.		AZ	USA
253	2760	2880	507700	3576140	508445	3576220	13	4:30	7:16	2:46	Henley, C.		AZ	USA
254	2640	2640	503700	3577420	503750	3577460	2	18:40	19:03	0:23	Henley, C.		AZ	USA
255	2510	2600	509270	3571710	509430	3572500	13	4:30	7:16	2:46	Henley, C.		AZ	USA

Appendix C. Cactus Ferruginous Pygmy-Owl Survey Location Table for Pima County CFPO Surveys, Spring 1999.

	A	B	C	D	E	F	G	H
1	CFPO?	County	USGS_Quad	Locality	Owner	Date	Township, Range, Section	Habitat
256	No	Pima	Tucson North	Genematas Dr, E of Oracle, between Rudasill & River	Pima Co.	17-May-99	T13S R13E S12,13	154.121, 300
257	No	Pima	Tucson North	Hacienda del Sol S of Sunrise between Campbell & Swan	Pima Co.	1-Jun-99	T13S R14E S16	154.121
258	No	Pima	Tucson North	Just W of Flecha Dr. & Saranac Dr. intersection in wash	Pima Co.	20-Apr-99	T13S R14E S22	224.53, 224.52
259	No	Pima	Tucson North	Manzanita Ave N of Skyline, W of Campbell	Pima Co.	24-Jun-99	T13S R14E S5	154.121
260	No	Pima	Tucson North	Mesa View Rd N of Skyline, E of Alvernon	Pima Co.	21-Jun-99	T13S R14E S3	154.121
261	No	Pima	Tucson North	Mina Vista St, S of Skyline Dr between First Ave & Campbell	Pima Co.	20-May-99	T13S R14E S8,5	154.121
262	No	Pima	Tucson North	Mountain Shadows N of Ina Rd E of First Ave	Pima Co.	18-Jun-99	T12S R14E S31	154.12
263	No	Pima	Tucson North	N end of Vista Valverde along edge of La Paloma	Pima Co.	19-Apr-99	T13S R14E S9	154.121
264	No	Pima	Tucson North	NW Metropolitan Tucson, Christie Rd. between McGee & Ina Rd.	Pima Co.	7-Jun-99	T12S R14E S30,31	154.121
265	No	Pima	Tucson North	NW of River & Campbell Rds., foothills area, Camino Escuela starting near Camino Escuela & River Rd intersection	Pima Co.	8-Apr-99	T13S R14E S20,17,9,8	154.12
266	No	Pima	Tucson North	Old Ina Rd (Campbell to Skyline)	Pima Co.	18-May-99	T12S R14E S31,32; T13S R14E S5	154.121
267	No	Pima	Tucson North	Paseo Del Bac E of Swan, N of River	Pima Co.	22-Jun-99	T13S R14E S23	154.121
268	No	Pima	Tucson North	Piedra Seca S of Skyline E of Campbell	Pima Co.	15-Jun-99	T13S R14E S8	154.12
269	No	Pima	Tucson North	Pima Canyon area, S slope of Pusch Ridge, within Pusch Ridge Wilderness Area	USFS	25-May-99	T12S R14E S29,30	154.121
270	No	Pima	Tucson North	Pima Canyon, S slope of Pusch Ridge, trailhead at W end of Magee Rd.	USFS	24-May-99	T12S R14E S29,30	154.12, 224.52
271	No	Pima	Tucson North	Pima Co. roads W of Oracle (Hwy 77), N of Magee Rd, W of CNF	Pima Co.	24-May-99	T12S R14E S30 - T12S R13E S25	154.12, 154.11
272	No	Pima	Tucson North	Pima wash at Ina Rd	Pima Co.	19-Jun-99	T13S R13E S1; T12S R13E S36	154.12
273	No	Pima	Tucson North	Pontatoc Dr W of Swan between Skyline & Sunrise	Pima Co.	24-May-99	T13S R14E S10	154.12
274	No	Pima	Tucson North	Racetrack wash (Ridgeline), E of First Ave between Via Soledad & River	Pima Co.	18-May-99	T13S R14E S18	154.121
275	No	Pima	Tucson North	Racetrack wash E of First Ave, between Via Soledad & River	Pima Co.	17-May-99	T13S R14E S18,19	154.121
276	No	Pima	Tucson North	Rudasill Road S of Orange Grove between Oracle & First	Pima Co.	3-Jun-99	T13S R13E S12	154.12
277	No	Pima	Tucson North	Salida del Sol, S of Sunrise, E of Swan	Pima Co.	22-Jun-99	T13S R14E S14	154.121
278	No	Pima	Tucson North	Sin Vacas gated community E of Pima Canyon Dr. between Ina & Coronado Natl Forest	Private	28-May-99	T12S R14E S32	154.121
279	No	Pima	Tucson North	Sin Vacas gated community E of Pima Canyon Dr. between Ina & Coronado Natl Forest	Private	28-May-99	T12S R14E S32	154.121
280	No	Pima	Tucson North	Skyline Dr between Orange Grove & Campbell	Pima Co.	5-Jun-99	T13S R14E S5	154.12
281	No	Pima	Tucson North	Skyway Drive, E of First Ave. between Ina & Orange Grove	Pima Co.	15-May-99	T13S R14E S6	154.121, 300
282	No	Pima	Tucson North	Skyway wash, Ina W of Skyway	Pima Co.	19-Jun-99	T13S R14E S6,31	154.12
283	No	Pima	Tucson North	Sundown Dr. S of Swan, W of Craycroft	Pima Co.	22-Jun-99	T13S R14E S14	154.121
284	No	Pima	Tucson North	Table Mountain Rd N of Skyline, E of Campbell	Pima Co.	21-Jun-99	T13S R14E S4	154.121
285	No	Pima	Tucson North	Tucson, Bujia Segunda in wash	Pima Co.	20-Apr-99	T13S R14E S15	224.52, 300
286	No	Pima	Tucson North	Tucson, by Tucson Water Valley view booster station on E side of Valley view by Catalina High School	Pima Co.	20-Apr-99	T13S R14E S15	224.52

Appendix C. Cactus Ferruginous Pygmy-Owl Survey Location Table for Pima County CFPO Surveys, Spring 1999.

	I	J	K	L	M	N	O	P	Q	R	S	T	U	V
1	Min_Elev	Max_Elev	Xstart_UTM	Ystart_UTM	Xend_UTM	Yend_UTM	Points	Start Time	End Time	Total Time	Surveyor	Remarks	State	Country
256	2350	2480	502145	3573580	503020	3575120	13	4:40	7:25	2:45	Henley, C.		AZ	USA
257	2530	2660	507470	3572870	508350	3574300	13	17:25	20:17	2:52	Henley, C.	Mobbing - Lucy's Warbler, Western Kingbird	AZ	USA
258	2480	2480	509400	3571740	509400	3571740	1	7:45	7:55	0:10	Perkins, M.		AZ	USA
259	2740	2820	506130	3577160	506870	3576810	9	17:35	19:29	1:54	Henley, C.		AZ	USA
260	2800	2900	509060	3576070	509310	3576550	12	4:30	7:03	2:33	Henley, C.	Mobbing - Lucy's Warbler	AZ	USA
261	2580	2720	505830	3574580	506270	3576050	11	17:25	19:45	2:20	Henley, C.	Mobbing - Black-tailed Gnatcatcher	AZ	USA
262	2600	2800	504060	3577820	505080	3578230	12	4:35	7:08	2:33	Henley, C.		AZ	USA
263	2700	2700	507120	3575380	507120	3575380	1	6:12	6:22	0:10	Perkins, M.	Mobbing - Black-tailed Gnatcatcher	AZ	USA
264	2600	2900	504600	3579500	503750	3577650	11	17:28	20:34	3:06	Charpentier, J.P.		AZ	USA
265	2280	2560	505580	3572160	506910	3573860	10	6:01	8:05	2:04	Perkins, M.		AZ	USA
266	2760	2920	506780	3577480	504990	3577900	14	17:25	20:23	2:58	Henley, C.	Mobbing - Verdins	AZ	USA
267	2580	2680	510270	3572090	510820	3572480	12	4:40	7:13	2:33	Henley, C.		AZ	USA
268	2580	2710	506560	3574170	506710	3575620	11	4:35	6:55	2:20	Henley, C.	Mobbing - Lucy's Warblers	AZ	USA
269	3050	3400	505050	3579750	504700	3579750	4	17:57	19:37	1:40	Charpentier, J.P.		AZ	USA
270	2800	3200	505400	3579500	506330	3580050	6	17:20	19:48	2:28	Charpentier, J.P.		AZ	USA
271	2600	3000	505400	3579500	502550	3579250	11	17:20	20:12	2:52	Rogstad, A.		AZ	USA
272	2640	2640	503560	3577600	503600	3577640	2	19:08	19:31	0:23	Henley, C.		AZ	USA
273	2710	2810	509250	3574530	509760	3575980	12	17:30	20:10	2:40	Henley, C.		AZ	USA
274	2360	2440	504280	3573680	504060	3572880	10	4:30	7:32	3:02	Henley, C.	Mobbing - Verdin	AZ	USA
275	2360	2440	504480	3574950	504200	3572800	10	17:30	20:23	2:53	Henley, C.		AZ	USA
276	2440	2510	503360	3575500	502550	3575240	8	5:00	6:41	1:41	Henley, C.		AZ	USA
277	2720	2820	510870	3573800	510800	3574330	6	19:05	20:20	1:15	Henley, C.		AZ	USA
278	2760	2960	506020	3577620	506510	3578730	12	4:30	6:57	2:27	Henley, C.		AZ	USA
279	2920	2920	506690	3578450	506690	3578450	1	7:05	7:15	0:10	Henley, C.		AZ	USA
280	2720	2780	506900	3576280	505880	3576320	10	4:30	6:57	2:27	Henley, C.		AZ	USA
281	2600	2720	504280	3576020	504780	3577580	13	17:25	20:10	2:45	Henley, C.	Mobbing - Bells Vireo	AZ	USA
282	2720	2720	504660	3577600	504680	3577630	2	18:05	18:28	0:23	Henley, C.		AZ	USA
283	2820	2860	511100	3574100	511350	3574400	6	17:35	18:50	1:15	Henley, C.		AZ	USA
284	2810	2940	507005	3576620	507000	3576930	12	17:35	20:08	2:33	Henley, C.		AZ	USA
285	2600	2600	508900	3573820	508900	3573820	1	6:48	6:58	0:10	Perkins, M.		AZ	USA
286	2680	2680	509920	3573900	509920	3573900	1	7:10	7:20	0:10	Perkins, M.		AZ	USA

Appendix C. Cactus Ferruginous Pygmy-Owl Survey Location Table for Pima County CFPO Surveys, Spring 1999.

	A	B	C	D	E	F	G	H
1	CFPO?	County	USGS_Quad	Locality	Owner	Date	Township, Range, Section	Habitat
287	No	Pima	Tucson North	Tucson, Camino de la Bajada at wash & road crossing	Pima Co.	20-Apr-99	T13S R14E S22	154.12, 224.52
288	No	Pima	Tucson North	Tucson, Camino Juan Paisano between Camino Mirval & Piedra Seca in wash	Pima Co.	19-Apr-99	T13S R14E S8	154.12
289	No	Pima	Tucson North	Tucson, Camino Llanoso in wash	Pima Co.	20-Apr-99	T13S R14E S22	154.12
290	No	Pima	Tucson North	Tucson, End of Via Elena (N) on dirt portion	Pima Co.	19-Apr-99	T13S R14E S9	154.12
291	No	Pima	Tucson North	Tucson, intersection of Alvernon & La Espalda	Pima Co.	20-Apr-99	T13S R14E S22	154.12, 224.53
292	No	Pima	Tucson North	Tucson, intersection of Hacienda Del Sol going N	Pima Co.	9-Apr-99	T13S R14E S 20,21	154.12
293	No	Pima	Tucson North	Tucson, intersection of La Cadena & La Espalda	Pima Co.	20-Apr-99	T13S R14E S22	154.12
294	No	Pima	Tucson North	Valley View Dr. S of Sunrise just W of Swan Rd	Pima Co.	30-May-99	T13S R14E S15	154.121
295	No	Pima	Tucson North	Via Alcalde E of Campbell, S of Sunrise	Pima Co.	28-Jun-99	T13S R14E S9,16,17	154.121
296	No	Pima	Tucson North	Via Entrada N of River Rd E of First Ave	Pima Co.	17-Jun-99	T13S R14E S 18	154.12
297	No	Pima	Tucson North	Village Ave; NE of Inn & Oracle (Catalina Foothills)	Pima Co.	13-May-99	T12S R13E S36	154.121, 300
298	No	Pima	Tucson North	Yvon Dr N of River Rd between Oracle & First	Pima Co.	10-Jun-99	T13S R13E S13	154.12
299	No	Pima	Vail	Camino Alta Loma Rd.	State	17-May-99	T15S R16E S22,23,14,15	154.12, 224.52
300	No	Pima	Vail	Cienega Cr., from Agua Verde confluence upstream to near confluence of Davidson Canyon	Pima Co.	11-Apr-99	T16S R16E S24; T16S R17E S19	224.531, 254.71
301	No	Pima	Vail	Colossal Cave Park, Pistol H. Rd/Spanish Trail Rd	State	17-May-99	T16S R17E S8,5,6 - T15S R17E S31	154.12, 224.52
302	No	Pima	Vail & Rincon Peak	Cienega Cr., from confluence of Davidson Canyon upstream for about 1.5 mi.	Pima Co.	12-Apr-99	T16S R17E S19,29,30	224.531, 224.533, 254.71
303	No	Pima	Waterman Peak	Agua Dulce ranch Rd, N of Dos Titios Roskruge Mtns, S of Waterman Mtns. (1)	State/BLM	1-May-99	T13S R9&8E S9,8,17,18,19,13,24	224.52, 154.127
304	No	Pima	Waterman Peak	Agua Dulce Ranch Rd, N of Dos Titos (Roskruge Mtns) S of Waterman Mtns (2)	State/BLM	29-May-99	T13S R9&8E S9,8,17,18,19,13,24	224.52, 154.127
305	No	Pima	Waterman Peak	El Cerrito de Represso Area am (1)	BLM	19-Apr-99	T13S R9E S24,23,26,27,22	154.127, 154.118
306	No	Pima	Waterman Peak	El Cerrito de Represso Area am (2)	BLM	18-May-99	T13S R9E S24,23,26,27,22	154.127, 154.118
307	No	Pima	Waterman Peak	El Cerrito de Represso Area pm (1)	BLM	19-Apr-99	T13S R9E S14,23,22,21,28	154.118, 154.127
308	No	Pima	Waterman Peak	El Cerrito de Represso Area pm (2)	BLM	18-May-99	T13S R9E S14,23,22,21,28	154.118, 154.127
309	No	Pima	Waterman Peak	N of Ruskruge Mtns, East of Waterman Peak (1)	BLM/State	25-Apr-99	T13S & T12S R9,5,32,31	154.12, 224.52
310	No	Pima	Waterman Peak	N. of Roskruge Mtns, E. of Waterman Peak (2)	BLM/State	26-May-99	T13S & T12S R31,32,5,9	154.12, 224.52
311	No	Pima	Waterman Peak	Near end of Dos Titios, Northern edge of Roskuge Mtns (1)	State	1-May-99	T13S R9E S17,20,29,32,31	154.127, 224.52
312	No	Pima	Waterman Peak	Near end of Dos Titios, Northern edge of Roskuge Mtns. (2)	State	30-May-99	T13S R9E S17,20,29,32,31	154.127, 224.52
313	No	Pima	Waterman Peak	S & W of Pan Quemado, N of Roskruge Mtns, S & E of Waterman Mtns (1)	BLM/State	24-Apr-99	T13S R9E S14,15,10,9	154.12, 224.52
314	No	Pima	Waterman Peak	S & W of Pan Quemado, N of Roskruge Mtns, S & E of Waterman Mtns (2)	BLM/State	25-May-99	T13S R9E S14,15,10,9	154.12, 224.52
315	No	Pima	Waterman Peak	S Avra Valley Rd, W & S of Pan Quemado (1)	BLM	3-May-99	T13S R9E S9,10,15,4	224.52, 154.12
316	No	Pima	Waterman Peak	S Avra Valley Rd, W & S of Pan Quemado (2)	BLM	5-May-99	T13S R9E S15,14	224.52, 154.12
317	No	Pima	Waterman Peak	S Avra Valley Rd, W & s of Pan Quemado (3)	BLM	1-Jun-99	T13S R9E S9,10,15,14,4	224.52, 154.12
318	No	Pima	Waterman Peak	S of Avra Valley Rd, N & E of Waterman Peak (1)	BLM/State	26-Apr-99	T12S R9E S32,29,20,21	154.12, 224.52
319	No	Pima	Waterman Peak	S of Avra Valley Rd, N & E of Waterman Peak (2)	BLM/State	26-May-99	T12S R9E S21,20,29,32	154.12, 224.52
320	No	Pima	Waterman Peak	S of Avra Valley Rd., near Waterman Peak along eastern toe of Waterman Mtns (1)	BLM/State	27-Apr-99	T12S R9E S32,31	154.127
321	No	Pima	Waterman Peak	S of Avra Valley Rd., near Waterman Peak along eastern toe of Waterman Mtns (2)	BLM/State	30-Apr-99	T12S R9E S31,32,6; T13S R8E S1	154.127
322	No	Pima	Waterman Peak	S of Avra Valley Rd., near Waterman Peak along eastern toe of Waterman Mtns (3)	BLM/State	27-May-99	T12S R9E S31,32,6; T13S R8E S1	154.127
323	No	Pima	Waterman Peak	W & S of El Cerrito de Represso, NE of Dos Titos (1)	BLM	21-Apr-99	T13S R9E S14,15,22,21	154.12

Appendix C. Cactus Ferruginous Pygmy-Owl Survey Location Table for Pima County CFPO Surveys, Spring 1999.

	I	J	K	L	M	N	O	P	Q	R	S	T	U	V
1	Min_Elev	Max_Elev	Xstart_UTM	Ystart_UTM	Xend_UTM	Yend_UTM	Points	Start Time	End Time	Total Time	Surveyor	Remarks	State	Country
287	2500	2500	508800	3571830	508800	3571830	1	5:38	5:48	0:10	Perkins, M.		AZ	USA
288	2600	2600	506500	3574520	506500	3574520	1	6:34	6:44	0:10	Perkins, M.		AZ	USA
289	2520	2520	508720	3572320	508720	3572320	1	5:58	6:08	0:10	Perkins, M.		AZ	USA
290	2640	2640	507750	3574480	507750	3574480	1	7:07	7:17	0:10	Perkins, M.		AZ	USA
291	2520	2520	508600	3572480	508600	3572480	1	6:13	6:23	0:10	Perkins, M.		AZ	USA
292	2280	2470	506420	3571910	507020	3572620	8	5:50	7:50	2:00	Perkins, M.		AZ	USA
293	2520	2520	509130	3572580	509130	3572580	1	6:30	6:40	0:10	Perkins, M.		AZ	USA
294	2600	2720	509080	3572920	510030	3574230	11	4:30	6:50	2:20	Henley, C.	Mobbing - Lucy's Warbler	AZ	USA
295	2560	2680	506890	3573790	507750	3574750	10	17:40	19:47	2:07	Henley, C.		AZ	USA
296	2480	2540	503950	3574280	505030	3574000	11	4:30	7:12	2:42	Henley, C.		AZ	USA
297	2580	2720	502780	3576650	503720	3579020	14	4:30	7:16	2:46	Henley, C.		AZ	USA
298	2520	2400	502240	3573570	503500	3574080	13	4:30	7:16	2:46	Henley, C.		AZ	USA
299	2800	3000	529565	3553840	529565	3552465	5	18:30	19:45	1:15	Welch, J.		AZ	USA
300	3250	3325	531560	3543500	533360	3542520	8	16:45	19:45	3:00	Duncan, R.		AZ	USA
301	2900	3680	534400	3545867	533520	3549105	4	16:45	18:30	1:45	Welch, J.		AZ	USA
302	3350	3400	533800	3542300	535360	3541750	8	5:00	7:51	2:51	Duncan, R.		AZ	USA
303	2300	2400	458550	3575460	454800	3572100	13	4:42	7:42	3:00	Esler, J.		AZ	USA
304	2300	2400	458550	3575460	454800	3572100	14	4:25	7:30	3:05	Esler, J.	2nd Pass	AZ	USA
305	2160	2340	463600	3572460	460380	3571740	13	5:00	7:50	2:50	Esler, J.		AZ	USA
306	2160	2340	463600	3572460	460380	3571740	14	4:25	7:27	3:02	Esler, J.	2nd Pass	AZ	USA
307	2160	2320	463360	3573100	459900	3571340	10	17:00	20:00	3:00	Esler, J.		AZ	USA
308	2160	2320	463360	3573100	459900	3571340	11	17:05	20:05	3:00	Esler, J.	2nd Pass	AZ	USA
309	2290	2600	458550	3575900	456700	3578900	12	5:00	7:45	2:45	Esler, J.		AZ	USA
310	2290	2600	456700	3578900	458550	3575900	14	17:10	20:12	3:02	Esler, J.	2nd Pass	AZ	USA
311	2300	2600	457600	3573300	456850	3568160	12	17:00	19:50	2:50	Esler, J.		AZ	USA
312	2300	2600	457600	3573300	456850	3568160	14	4:31	7:41	3:10	Esler, J.	2nd Pass	AZ	USA
313	2180	2300	461850	3573840	458550	3575450	12	5:00	7:54	2:54	Esler, J.		AZ	USA
314	2180	2300	461850	3573840	458550	3575450	13	4:24	7:31	3:07	Esler, J.	2nd Pass	AZ	USA
315	2180	2300	458550	3575910	460160	3574300	6	5:00	6:35	1:35	Esler, J.		AZ	USA
316	2140	2180	460160	3574300	463200	3573800	7	4:47	6:40	1:53	Esler, J.		AZ	USA
317	2140	2300	458550	3575910	463200	3573800	11	4:30	7:30	3:00	Esler, J.	2nd Pass	AZ	USA
318	2260	2500	457020	3578450	458900	3581500	10	5:10	7:40	2:30	Esler, J.		AZ	USA
319	2260	2500	458900	3581500	457020	3578450	11	4:26	6:46	2:20	Esler, J.	2nd Pass	AZ	USA
320	2500	2600	457000	3578450	456150	3577500	4	17:00	17:49	0:49	Esler, J.		AZ	USA
321	2360	2500	456120	3577450	454000	3575700	13	4:45	7:42	2:57	Esler, J.		AZ	USA
322	2360	2600	457000	3578450	454000	3575700	14	4:24	7:26	3:02	Esler, J.	2nd Pass	AZ	USA
323	2180	2380	461850	3573840	458100	3571360	11	5:00	8:10	3:10	Esler, J.		AZ	USA

Appendix C. Cactus Ferruginous Pygmy-Owl Survey Location Table for Pima County CFPO Surveys, Spring 1999.

	A	B	C	D	E	F	G	H
1	CFPO?	County	USGS_Quad	Locality	Owner	Date	Township, Range, Section	Habitat
324	No	Pima	Waterman Peak	W & S of El Carrito de Represso, NE of Dos Titos (2)	BLM	20-May-99	T13S R9E S14,15,22,21	154.12
325	No	Pima	Waterman Peak	W of Main Agua Dulce Ranch Rd, S & E of Waterman Peak (1)	BLM	4-May-99	T13S R9E S5,6	154.127, 224.52
326	No	Pima	Waterman Peak	W of Main Agua Dulce Ranch Rd, S & E of Waterman Peak (2)	BLM	28-May-99	T13S R9E S5,6	154.127, 224.52
327	No	Pima	Waterman Peak & West of Avra	El Carrito de Represso Area (1)	BLM	20-Apr-99	T13S R10E & R9E S19,24,25,36,35	154.12, 224.52
328	No	Pima	Waterman Peak & West of Avra	El Carrito de Represso Area (2)	BLM	19-May-99	T13S R10E & R9E S19,24,25,36,35	154.12, 224.52
329	No	Pima	Waterman Peak & West of Avra	W & N of El Carrito de Represso, E of Pan Quemado (1)	BLM	23-Apr-99	T13S R9E S14,11,12	224.52, 154.12
330	No	Pima	Waterman Peak & West of Avra	W & N of El Carrito de Represso, E of Pan Quemado (2)	BLM	19-May-99	T13S R9E S12,11,14	224.52, 154.12
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Appendix C. Cactus Ferruginous Pygmy-Owl Survey Location Table for Pima County CFPO Surveys, Spring 1999.

	I	J	K	L	M	N	O	P	Q	R	S	T	U	V
1	Min_Elev	Max_Elev	Xstart_UTM	Ystart_UTM	Xend_UTM	Yend_UTM	Points	Start Time	End Time	Total Time	Surveyor	Remarks	State	Country
324	2180	2380	461850	3573840	458100	3571360	11	4:25	7:27	3:02	Esler, J.	2nd Pass	AZ	USA
325	2280	2500	458580	3576070	455400	3577520	11	4:52	7:52	3:00	Esler, J.		AZ	USA
326	2280	2500	458580	3576070	455400	3577520	11	4:27	7:26	2:59	Esler, J.	2nd Pass	AZ	USA
327	2130	2260	465660	3572600	463140	3568360	12	5:00	8:08	3:08	Esler, J.		AZ	USA
328	2130	2260	465660	3572600	463140	3568360	12	4:25	7:27	3:02	Esler, J.	2nd Pass	AZ	USA
329	2120	2180	461850	3573840	465000	3575840	11	5:00	8:02	3:02	Esler, J.		AZ	USA
330	2120	2180	465000	3575840	461850	3573840	11	17:25	20:26	3:01	Esler, J.	2nd Pass	AZ	USA
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APPENDIX D

LOCATION OF TRANSECTS WHERE SURVEYS WERE COMPLETED TWICE

Appendix D. Location of Transects Where Surveys Were Completed Twice During the Pima County CFPO Survey, Spring 1999.

	A	B	C	D	E	F	G	H
1	CFPO?	County	USGS_Quad	Locality	Owner	Date	Township, Range, Section	Habitat
2	No	Pima	Avra & West of Avra	S of intersection on Manville Rd & Sandario Rd and W	State/BLM	6-May-99	T13S R11E S32,29,30,19	154.11, 224.52
3	No	Pima	Avra & West of Avra	S of intersection on Manville Rd & Sandario Rd and W	State/BLM	31-May-99	T13S R11E S32,29,30,19	154.11, 224.52
4	No	Pima	Cocoraque Butte	Between Mile Wide Rd and Cocoraque Butte (1)	BLM/State	17-Jun-99	T14S R10E S2,3,11	154.11
5	No	Pima	Cocoraque Butte	Between Mile Wide Rd and Cocoraque Butte (2)	BLM/State	25-Jun-99	T14S R10E S2,3,11	154.11
6	No	Pima	Cocoraque Butte	N of Three Points, southern edge of eastern end of Roskruge Mtns (1)	State	17-Jun-99	T15S R10E S11,10,9	154.11, 154.12, 224.52
7	No	Pima	Cocoraque Butte	N of Three Points, southern edge of eastern end of Roskruge Mtns (2)	State	26-Jun-99	T15S R10E S9,10,11	154.11, 154.12, 224.52
8	No	Pima	Cocoraque Butte	NE of Cocoraque Butte (1)	State	15-Jun-99	T14S R10E S4,9	154.115
9	No	Pima	Cocoraque Butte	NE of Cocoraque Butte (2)	State	23-Jun-99	T14S R10E S4,9	154.115
10	No	Pima	Cocoraque Butte & West of Avra	Cocoraque Ranch (1)	BLM/State	22-Jun-99	T14S R10E S8,5; T13S R10E S32	154.11, 154.12
11	No	Pima	Cocoraque Butte & West of Avra	Cocoraque Ranch (2)	BLM/State	29-Jun-99	T14S R10E S8,5; T13S R10E S32	154.11, 154.12
12	No	Pima	Cocoraque Butte & West of Avra	Cocoraque Ranch NW (1)	State	21-Jun-99	T14S R10E S7,6; T13S R10E S31,32	154.11, 154.12
13	No	Pima	Cocoraque Butte & West of Avra	Cocornque Ranch NW (2)	State	28-Jun-99	T14S R10E S7,6; T13S R10E S31,32	154.11, 154.12
14	No	Pima	La Tortuga Butte	N of Three Points , S of eastern edge of Roskruge Mtns (1)	BLM/State	11-Jun-99	T14S R9E S12,1,2,36,35	154.12, 224.52
15	No	Pima	La Tortuga Butte	N of Three Points , S of eastern edge of Roskruge Mtns (2)	BLM/State	24-Jun-99	T14S R9E S12,1,2,36,35	154.12, 224.52
16	No	Pima	La Tortuga Butte	N of Three Points, Aguirre Pass, up to La Tortuga Butte (1)	BLM/State	12-Jun-99	T15S R9E S12,11,10,3,4	154.12, 224.52
17	No	Pima	La Tortuga Butte	N of Three Points, Aguirre Pass, up to La Tortuga Butte (2)	BLM/State	25-Jun-99	T15S R9E S12,11,10,3,4	154.12, 224.52
18	No	Pima	La Tortuga Butte	N of Three Points, southern edge of Roskruge Mtns, along transmission line (1)	BLM/State	16-Jun-99	T14S &T15S R9E S33,34,3,2	154.12, 224.52
19	No	Pima	La Tortuga Butte	North of Three Points, sothern edge of Roskruge Mtns, along transmission line (2)	BLM/State	26-Jun-99	T14S &T15S R9E S33,34,3,2	154.12, 224.52
20	No	Pima	Silverbell East	E of Silverbell, along Cocio wash (1)	BLM	22-Apr-99	T12S R9E S15,10,11,2	154.127
21	No	Pima	Silverbell East	East of Silverbell,along Cocio Wash (2)	BLM	3-Jun-99	T12S R9E S15,10,11,2	154.127
22	No	Pima	Silverbell West	Approx. 6 miles N-NW of Silverbell (1)	State/BLM	23-Apr-99	T11S R8E S10,9,16,17,20,29	154.127
23	No	Pima	Silverbell West	Approx. 6 miles N-NW of Silverbell (2)	State/BLM	1-Jun-99	T11S R8E S10,9,16,17,20,29	154.127
24	No	Pima	Silverbell West	El Tiro Wash (1)	BLM/State	16-Jun-99	T11S R7E S36; T11S R8E S29, 32, 31	154.127
25	No	Pima	Silverbell West	El Tiro Wash (2)	BLM/State	24-Jun-99	T11S R7E S36; T11S R8E S29, 32, 31	154.127
26	No	Pima	Silverbell West	Mammoth Wash (1)	BLM	20-May-99	T12S R8E S7,8	154.127
27	No	Pima	Silverbell West	Mammoth Wash (2)	BLM	10-Jun-99	T12S R8E S7,8	154.127
28	No	Pima	Silverbell West	NW of Ragged Top (1)	BLM	19-May-99	T11S R8E S15,22,23,26	154.127
29	No	Pima	Silverbell West	NW of Ragged Top (2)	BLM	11-Jun-99	T11S R8E S15,22,23,26	154.127
30	No	Pima	Silverbell West	W of Malpais Hill, NE of W Silverbell Mtns (1)	BLM	26-Apr-99	T11S R8E S7,18	154.127
31	No	Pima	Silverbell West	W of Malpais Hill, NE of W Silverbell Mtns (2)	BLM	7-Jun-99	T11S R8E S7,18	154.127
32	No	Pima	Silverbell West	W Silverbell Mtns (1)	State	27-Apr-99	T11S R7E S14,23,26	154.121
33	No	Pima	Silverbell West	West Silverbell Mtns. (2)	State	8-Jun-99	T11S R7E S14,23,25,26	154.121
34	No	Pima	Silverbell West, Gap Tank & Greene Reservoir	West of Silverbell Mtns (1)	State	28-Apr-99	T11S R7E S14,11,10,3	154.127, 154.118
35	No	Pima	Silverbell West, Gap Tank & Greene Reservoir	West of Silverbell Mtns (2)	State	9-Jun-99	T11S R7E S3,10,11,14	154.127, 154.118
36	No	Pima	Stevens Mountain	W slope of Sierrita Mtns	State	27-Apr-99	T17S R9E S12; T17S R10E S7,8,17	224.52, 154.12
37	No	Pima	Stevens Mountain	W slope of Sierrita Mtns, southern fork of upper Fresnal Wash	State/BLM	14-May-99	T17S R10E S25,26	143.1, 154.12
38	No	Pima	Three Points & Cocoraque Butte	N of Three Points, S edge of eastern end Roskruge Mtns (1)	BLM/State	10-Jun-99	T15S R10E S16,17,8,7,6	154.12, 224.52
39	No	Pima	Three Points & Cocoraque Butte	N of Three Points, S edge of eastern end Roskruge Mtns (2)	BLM/State	23-Jun-99	T15S R10E S16,17,8,7,6	154.12, 224.52
40	No	Pima	Three Points & Cocoraque Butte	N of Three Points, S of eastern end of Roskruge Mtns (1)	State	8-Jun-99	T15S R10E S16,15,14	154.12, 224.52
41	No	Pima	Three Points & Cocoraque Butte	N of Three Points, S of eastern end of Roskruge Mtns (2)	State	21-Jun-99	T15S R10E S16,15,14	154.12, 224.52
42	No	Pima	Three Points & Cocoraque Butte	North of Three Points, S of eastern end of Roskruge Mtns (1)	State	9-Jun-99	T15S R10E & R9E S16,17,18,12,7	154.12, 224.52
43	No	Pima	Three Points & Cocoraque Butte	North of Three Points, S of eastern end of Roskruge Mtns (2)	State	22-Jun-99	T15S R10E & R9E S16,17,18,12,7	154.12, 224.52
44	No	Pima	Waterman Peak	Agua Dulce ranch Rd, N of Dos Titios Roskruge Mtns, S of Waterman Mtns. (1)	State/BLM	1-May-99	T13S R9&8E S9,8,17,18,19,13,24	224.52, 154.127
45	No	Pima	Waterman Peak	Agua Dulce Ranch Rd, N of Dos Titos (Roskruge Mtns) S of Waterman Mtns (2)	State/BLM	29-May-99	T13S R9&8E S9,8,17,18,19,13,24	224.52, 154.127
46	No	Pima	Waterman Peak	El Cerrito de Represso Area am (1)	BLM	19-Apr-99	T13S R9E S24,23,26,27,22	154.127, 154.118
47	No	Pima	Waterman Peak	El Cerrito de Represso Area am (2)	BLM	18-May-99	T13S R9E S24,23,26,27,22	154.127, 154.118
48	No	Pima	Waterman Peak	El Cerrito de Represso Area pm (1)	BLM	19-Apr-99	T13S R9E S14,23,22,21,28	154.118, 154.127

Appendix D. Location of Transects Where Surveys Were Completed Twice During the Pima County CFPO Survey, Spring 1999.

	I	J	K	L	M	N	O	P	Q	R	S	T	U	V
1	Min_Elev	Max_Elev	Xstart_UTM	Ystart_UTM	Xend_UTM	Yend_UTM	Points	Start Time	End Time	Total Time	Surveyor	Remarks	State	Country
2	2140	2200	477060	3568650	474800	3572600	12	4:45	7:45	3:00	Esler, J.		AZ	USA
3	2140	2200	477060	3568650	474800	3572600	13	4:32	7:41	3:09	Esler, J.	2nd Pass	AZ	USA
4	2220	2260	471200	3567700	472600	3565000	7	4:25	6:13	1:48	McLeod, M.A.		AZ	USA
5	2220	2260	471200	3567700	472600	3565000	7	4:31	6:14	1:43	McLeod, M.A.	2nd Pass	AZ	USA
6	2420	2560	473000	3556020	469480	3555560	12	4:25	7:35	3:10	Esler, J.		AZ	USA
7	2420	2560	469480	3555560	473000	3556020	12	4:20	7:29	3:09	Esler, J.	2nd Pass	AZ	USA
8	2230	2320	469600	3566900	468800	3564800	10	4:21	6:52	2:31	McLeod, M.A.		AZ	USA
9	2230	2320	469600	3566900	468800	3564800	10	4:33	6:53	2:20	McLeod, M.A.	2nd Pass	AZ	USA
10	2210	2320	466900	3565700	467700	3568600	10	4:30	7:18	2:48	McLeod, M.A.		AZ	USA
11	2210	2320	466900	3565700	467700	3568600	10	4:22	7:07	2:45	McLeod, M.A.	2nd Pass	AZ	USA
12	2240	2340	465400	3565800	466800	3568600	9	4:45	7:19	2:34	McLeod, M.A.		AZ	USA
13	2240	2340	465400	3565800	466800	3568600	9	4:34	6:55	2:21	McLeod, M.A.	2nd Pass	AZ	USA
14	2660	2860	464620	3555620	462800	3558640	12	4:30	7:40	3:10	Esler, J.		AZ	USA
15	2660	2860	462800	3558640	464620	3555620	12	4:30	7:39	3:09	Esler, J.	2nd Pass	AZ	USA
16	2580	2720	463580	3555660	458620	3557660	16	4:33	7:28	2:55	Esler, J.		AZ	USA
17	2580	2720	458620	3557660	463580	3555660	15	4:30	7:38	3:08	Esler, J.	2nd Pass	AZ	USA
18	2600	2760	463120	3556700	459160	3559440	14	4:23	7:25	3:02	Esler, J.		AZ	USA
19	2600	2760	459160	3559440	463120	3556700	14	4:35	7:36	3:01	Esler, J.	2nd Pass	AZ	USA
20	2110	2200	460000	3583200	462600	3585400	9	4:58	7:40	2:42	McLeod, M.A.		AZ	USA
21	2110	2200	460000	3583200	462600	3585400	9	4:25	6:43	2:18	McLeod, M.A.	2nd Pass	AZ	USA
22	2100	2240	451000	3593700	447800	3590000	13	5:05	7:53	2:48	McLeod, M.A.		AZ	USA
23	2100	2240	451000	3593700	447700	3589500	14	4:32	7:22	2:50	McLeod, M.A.	2nd Pass	AZ	USA
24	2160	2280	447600	3589200	444000	3587000	11	4:22	6:58	2:36	McLeod, M.A.		AZ	USA
25	2160	2280	447600	3589200	444000	3587000	11	4:22	6:48	2:26	McLeod, M.A.	2nd Pass	AZ	USA
26	2260	2520	449000	3584800	445700	3584500	8	4:35	6:35	2:00	McLeod, M.A.		AZ	USA
27	2260	2520	449000	3584800	445700	3584500	8	4:41	6:30	1:49	McLeod, M.A.	2nd Pass	AZ	USA
28	2140	2500	452000	3593500	452800	3589500	11	4:37	7:26	2:49	McLeod, M.A.		AZ	USA
29	2140	2500	452000	3593500	452800	3589500	12	4:24	7:22	2:58	McLeod, M.A.	2nd Pass	AZ	USA
30	1920	2040	446600	3592700	446200	3593400	14	5:00	8:05	3:05	McLeod, M.A.		AZ	USA
31	1920	2040	446600	3592700	446200	3593400	14	4:24	7:26	3:02	McLeod, M.A.	2nd Pass	AZ	USA
32	1900	2040	442000	3592500	441960	3592700	8	5:13	8:00	2:47	McLeod, M.A.		AZ	USA
33	1900	2080	442000	3592500	443200	3589400	10	4:52	7:19	2:27	McLeod, M.A.	2nd Pass	AZ	USA
34	1780	1890	441400	3593500	441000	3596200	9	5:23	7:57	2:34	McLeod, M.A.		AZ	USA
35	1800	1900	441600	3592700	440900	3595900	9	5:00	7:23	2:23	McLeod, M.A.	2nd Pass	AZ	USA
36	2850	3150	464810	3536810	468390	3535610	10	4:42	7:42	3:00	Holley, M.		AZ	USA
37	3550	4000	471950	3531800	475000	3531250	10	4:40	7:05	2:25	Henley, C.	2nd Pass	AZ	USA
38	2510	2640	468580	3554360	465420	3557040	12	4:30	7:40	3:10	Esler, J.		AZ	USA
39	2510	2640	468580	3554360	465420	3557040	12	4:36	7:48	3:12	Esler, J.	2nd Pass	AZ	USA
40	2420	2510	468760	3554200	472250	3554740	11	4:14	7:14	3:00	Esler, J.		AZ	USA
41	2420	2510	468760	3554200	472250	3554740	11	4:25	7:25	3:00	Esler, J.	2nd Pass	AZ	USA
42	2410	2620	468760	3554200	464600	3555600	12	4:28	7:40	3:12	Esler, J.		AZ	USA
43	2410	2620	468760	3554200	464600	3555600	12	4:25	7:38	3:13	Esler, J.	2nd Pass	AZ	USA
44	2300	2400	458550	3575460	454800	3572100	13	4:42	7:42	3:00	Esler, J.		AZ	USA
45	2300	2400	458550	3575460	454800	3572100	14	4:25	7:30	3:05	Esler, J.	2nd Pass	AZ	USA
46	2160	2340	463600	3572460	460380	3571740	13	5:00	7:50	2:50	Esler, J.		AZ	USA
47	2160	2340	463600	3572460	460380	3571740	14	4:25	7:27	3:02	Esler, J.	2nd Pass	AZ	USA
48	2160	2320	463360	3573100	459900	3571340	10	17:00	20:00	3:00	Esler, J.		AZ	USA

Appendix D. Location of Transects Where Surveys Were Completed Twice During the Pima County CFPO Survey, Spring 1999.

	A	B	C	D	E	F	G	H
49	No	Pima	Waterman Peak	El Cerrito de Represso Area pm (2)	BLM	18-May-99	T13S R9E S14,23,22,21,28	154.118, 154.127
50	No	Pima	Waterman Peak	N of Ruskruge Mtns, East of Waterman Peak (1)	BLM/State	25-Apr-99	T13S & T12S R9,5,32,31	154.12, 224.52
51	No	Pima	Waterman Peak	N. of Roskruge Mtns, E. of Waterman Peak (2)	BLM/State	26-May-99	T13S & T12S R31,32,5,9	154.12, 224.52
52	No	Pima	Waterman Peak	Near end of Dos Titios, Northern edge of Roskuge Mtns (1)	State	1-May-99	T13S R9E S17,20,29,32,31	154.127, 224.52
53	No	Pima	Waterman Peak	Near end of Dos Titios, Northern edge of Roskuge Mtns. (2)	State	30-May-99	T13S R9E S17,20,29,32,31	154.127, 224.52
54	No	Pima	Waterman Peak	S & W of Pan Quemado, N of Roskruge Mtns, S & E of Waterman Mtns (1)	BLM/State	24-Apr-99	T13S R9E S14,15,10,9	154.12, 224.52
55	No	Pima	Waterman Peak	S & W of Pan Quemado, N of Roskruge Mtns, S & E of Waterman Mtns (2)	BLM/State	25-May-99	T13S R9E S14,15,10,9	154.12, 224.52
56	No	Pima	Waterman Peak	S Avra Valley Rd, W & S of Pan Quemado (1)	BLM	3-May-99	T13S R9E S9,10,15,4	224.52, 154.12
57	No	Pima	Waterman Peak	S Avra Valley Rd, W & S of Pan Quemado (2)	BLM	5-May-99	T13S R9E S15,14	224.52, 154.12
58	No	Pima	Waterman Peak	S Avra Valley Rd, W & s of Pan Quemado (3)	BLM	1-Jun-99	T13S R9E S9,10,15,14,4	224.52, 154.12
59	No	Pima	Waterman Peak	S of Avra Valley Rd, N & E of Waterman Peak (1)	BLM/State	26-Apr-99	T12S R9E S32,29,20,21	154.12, 224.52
60	No	Pima	Waterman Peak	S of Avra Valley Rd, N & E of Waterman Peak (2)	BLM/State	26-May-99	T12S R9E S21,20,29,32	154.12, 224.52
61	No	Pima	Waterman Peak	S of Avra Valley Rd., near Waterman Peak along eastern toe of Waterman Mtns (1)	BLM/State	27-Apr-99	T12S R9E S32,31	154.127
62	No	Pima	Waterman Peak	S of Avra Valley Rd., near Waterman Peak along eastern toe of Waterman Mtns (2)	BLM/State	30-Apr-99	T12S R9E S31,32,6; T13S R8E S1	154.127
63	No	Pima	Waterman Peak	S of Avra Valley Rd., near Waterman Peak along eastern toe of Waterman Mtns (3)	BLM/State	27-May-99	T12S R9E S31,32,6; T13S R8E S1	154.127
64	No	Pima	Waterman Peak	W & S of El Cerrito de Represso, NE of Dos Titos (1)	BLM	21-Apr-99	T13S R9E S14,15,22,21	154.12
65	No	Pima	Waterman Peak	W & S of El Cerrito de Represso, NE of Dos Titos (2)	BLM	20-May-99	T13S R9E S14,15,22,21	154.12
66	No	Pima	Waterman Peak	W of Main Agua Dulce Ranch Rd, S & E of Waterman Peak (1)	BLM	4-May-99	T13S R9E S5,6	154.127, 224.52
67	No	Pima	Waterman Peak	W of Main Agua Dulce Ranch Rd, S & E of Waterman Peak (2)	BLM	28-May-99	T13S R9E S5,6	154.127, 224.52
68	No	Pima	Waterman Peak & West of Avra	El Cerrito de Represso Area (1)	BLM	20-Apr-99	T13S R10E & R9E S19,24,25,36,35	154.12, 224.52
69	No	Pima	Waterman Peak & West of Avra	El Cerrito de Represso Area (2)	BLM	19-May-99	T13S R10E & R9E S19,24,25,36,35	154.12, 224.52
70	No	Pima	Waterman Peak & West of Avra	W & N of El Cerrito de Represso, E of Pan Quemado (1)	BLM	23-Apr-99	T13S R9E S14,11,12	224.52, 154.12
71	No	Pima	Waterman Peak & West of Avra	W & N of El Cerrito de Represso, E of Pan Quemado (2)	BLM	19-May-99	T13S R9E S12,11,14	224.52, 154.12
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Appendix D. Location of Transects Where Surveys Were Completed Twice During the Pima County CFPO Survey, Spring 1999.

	I	J	K	L	M	N	O	P	Q	R	S	T	U	V
49	2160	2320	463360	3573100	459900	3571340	11	17:05	20:05	3:00	Esler, J.	2nd Pass	AZ	USA
50	2290	2600	458550	3575900	456700	3578900	12	5:00	7:45	2:45	Esler, J.		AZ	USA
51	2290	2600	456700	3578900	458550	3575900	14	17:10	20:12	3:02	Esler, J.	2nd Pass	AZ	USA
52	2300	2600	457600	3573300	456850	3568160	12	17:00	19:50	2:50	Esler, J.		AZ	USA
53	2300	2600	457600	3573300	456850	3568160	14	4:31	7:41	3:10	Esler, J.	2nd Pass	AZ	USA
54	2180	2300	461850	3573840	458550	3575450	12	5:00	7:54	2:54	Esler, J.		AZ	USA
55	2180	2300	461850	3573840	458550	3575450	13	4:24	7:31	3:07	Esler, J.	2nd Pass	AZ	USA
56	2180	2300	458550	3676040	460160	3574300	6	5:00	6:35	1:35	Esler, J.		AZ	USA
57	2140	2180	460160	3574300	463200	3573800	7	4:47	6:40	1:53	Esler, J.		AZ	USA
58	2140	2300	458550	3676040	463200	3573800	11	4:30	7:30	3:00	Esler, J.	2nd Pass	AZ	USA
59	2260	2500	457020	3578450	458900	3581500	10	5:10	7:40	2:30	Esler, J.		AZ	USA
60	2260	2500	458900	3581500	457020	3578450	11	4:26	6:46	2:20	Esler, J.	2nd Pass	AZ	USA
61	2500	2600	457000	3578450	456150	3577500	4	17:00	17:49	0:49	Esler, J.		AZ	USA
62	2360	2500	456120	3577450	454000	3575700	13	4:45	7:42	2:57	Esler, J.		AZ	USA
63	2360	2600	457000	3578450	454000	3575700	14	4:24	7:26	3:02	Esler, J.	2nd Pass	AZ	USA
64	2180	2380	461850	3573840	458100	3571360	11	5:00	8:10	3:10	Esler, J.		AZ	USA
65	2180	2380	461850	3573840	458100	3571360	11	4:25	7:27	3:02	Esler, J.	2nd Pass	AZ	USA
66	2280	2500	458580	3576070	455400	3577520	11	4:52	7:52	3:00	Esler, J.		AZ	USA
67	2280	2500	458580	3576070	455400	3577520	11	4:27	7:26	2:59	Esler, J.	2nd Pass	AZ	USA
68	2130	2260	465660	3572600	463140	3568360	12	5:00	8:08	3:08	Esler, J.		AZ	USA
69	2130	2260	465660	3572600	463140	3568360	12	4:25	7:27	3:02	Esler, J.	2nd Pass	AZ	USA
70	2120	2180	461850	3573840	465000	3575840	11	5:00	8:02	3:02	Esler, J.		AZ	USA
71	2120	2180	465000	3575840	461850	3573840	11	17:25	20:26	3:01	Esler, J.	2nd Pass	AZ	USA
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APPENDIX E

LOCATION OF TRANSECTS WHERE MOBBING AND RESPONSES TO BROADCAST CALLS OCCURRED

Appendix E. Location of Transects Where Mobbing and Responses to Broadcast Calls Occurred During the Pima County CFPO Survey, Spring 1999.

	A	B	C	D	E	F	G	H
1	CFPO?	County	USGS_Quad	Locality	Owner	Date	Township, Range, Section	Habitat
2	No	Santa Cruz	Amado & Tubac	Santa Cruz River E bank near Tubac	Various	25-Jun-99	T21S, R13E S5,8	224.52, 224.53
3	No	Pima	Avra	SNP W basin to the N of Picture Rocks Rd and S of Safford Peak	NPS	6-Jun-99	T13S R12E S6,7	154.127
4	No	Pima	Avra	SNP W Com-Boh picnic area	NPS	4-Jun-99	T13S R12E S7,18	154.127
5	No	Pima	Avra	SNP W Contzen Pass area	NPS	2-Jun-99	T13S R12E S5,8,9	154.12, 224.52
6	No	Pima	Avra	SNP W Rudasill Rd	NPS	28-Jun-99	T13S R11E S11,13,14	154.127
7	No	Pima	Avra	SNP W South of Rudasill Rd	NPS	25-Jun-99	T13S R11E S10,11,14	154.127
8	No	Pima	Avra	SNP W, eastern edge near Wade road	NPS	31-May-99	T13S R12E S4,5,8	224.52, 154.127
9	No	Pima	Avra	SNP West, Sandario/Kinney wash W to Near Sweatwater	NPS	24-Jun-99	T13S R11E S28,21	154.127
10	No	Pima	Avra	SNP West, Wash SW of Signal Hill starting W of Kinney dirt road	NPS	24-Jun-99	T13S R11E S22,21,29	154.127
11	No	Pima	Avra	Tucson Mtns., E-Flank Safford Peak, Saguaro Natl. Park	NPS	6-May-99	T12S R12E S32	154.127
12	No	Pima	Avra & Brown Mountain	SNP West, S boundary along Mile Wide past Kinney Rd to Sandario N	NPS	17-Jun-99	T13S R11E S35,34	154.121
13	No	Pima	Buehman Canyon	SW of Redington, foothills of Redington Pass, 1 1/2 mile W of Buehman Canyon in a wash running parallel to Redington Rd	State	18-May-99	T12S R18E S16	154.12, 154.11
14	No	Pima	Marana	N of Tangerine Rd, E of I-10 & Marana, E 100 m N of Tangerine	State	10-May-99	T11S R12E S33,34	154.127
15	No	Pima	Marana	N of Tangerine Rd, E of I-10 and Marana	State	9-May-99	T11S R12E S33,29,32	154.127
16	No	Pima	Marana	N of Tangerine Rd, E of I-10, Marana parallel to powerlines	State	26-Apr-99	T11S R12E S30; T11S R11E S13	154.127
17	No	Pima	Marana	N of Tangerine, E of I-10 & Marana, along boundary road	State	25-Apr-99	T11S R11E S24,23,14	154.127
18	No	Pima	Oro Valley	Big Wash	State	16-Jun-99	T11S R14E S17,20	224.522
19	No	Pima	Oro Valley	N of Rancho Vistoso Blvd., along 27 wash & along Big wash W fork	State	8-Jun-99	T11S R14E S29,20	224.521
20	No	Pima	Oro Valley	NW Tucson, West-side of Santa Catalina Mtns., Romero Canyon	USFS	11-May-99	T11S R14E S35	143.15, 154.12, 224.52
21	No	Pima	Oro Valley	Oro Valley, La Canada Rd. to La Naranja Rd.	Pima Co./State	11-Jun-99	T12S R13E S2,3,11,12,1	154.121
22	No	Pima	Oro Valley	W-NW slope of Pusch Ridge Wilderness starting at Linda Vista Access area	USFS	5-Jun-99	T12S R14E S19,20	154.121
23	No	Pinal	Peppersauce Wash	Foothills of Santa Catalina Mtns, south of the town of San Manuel, Alder Wash	State	25-Jun-99	T10S R18E S21,28,29,32	154.12
24	No	Pima	Ruelas Canyon	N of Tangerine Rd, E of I-10 and Marana	State	17-May-99	T11S R12E S28,33	154.121
25	No	Pima	Ruelas Canyon	N of Tangerine Rd, E of I-10 and Marana	State	18-May-99	T11S R12E S27,33,34	154.121
26	No	Pima	Ruelas Canyon	N of Tangerine Rd, E of I-10 and Marana	State	18-May-99	T11S R12E S22,27	154.121
27	No	Pima	Sabino Canyon	Cloud Rd/Sabino Canyon Rd	Pima Co.	25-May-99	T13S R15E S30	224.52, 224.53
28	No	Pima	Sabino Canyon	Near intersection of Calle Hondonada/Pla. Hondonada	Pima Co.	27-May-99	T13S R15E S28	224.52
29	No	Pima	Stevens Mountain & Palo Alto Ranch	W slope of Sierrita Mtns, Stevens Wash (lower)	State	6-May-99	T17S R9E S14,13,24; T17S R10E S19,20	224.52, 154.12
30	No	Pima	Tucson North	Calle Barril/Bosque, S of Sunrise Dr between Swan & Craycroft	Pima Co.	4-Jun-99	T13S R14E S14	154.12
31	No	Pima	Tucson North	Calle Los Altos, N of Skyline, W of Campbell	Pima Co.	23-Jun-99	T13S R14E S5	154.121

Appendix E. Location of Transects Where Mobbing and Responses to Broadcast Calls Occurred During the Pima County CFPO Survey, Spring 1999.

	I	J	K	L	M	N	O	P	Q	R	S	T	U	V
1	Min_Elev	Max_Elev	Xstart_UTM	Ystart_UTM	Xend_UTM	Yend_UTM	Points	Start Time	End Time	Total Time	Surveyor	Remarks	State	Country
2	3150	3200	498340	3499460	496800	3497360	9	17:34	19:55	2:21	Morales, S.	Mobbing - Hummingbirds	AZ	USA
3	2360	2480	485880	3576360	484780	3576220	9	17:26	19:59	2:33	Kirkpatrick, C.	Flycatcher response	AZ	USA
4	2500	2720	484560	3575600	484920	3575560	9	4:30	6:54	2:24	Kirkpatrick, C.	Flycatcher response	AZ	USA
5	2300	2500	487680	3576400	488340	3575800	7	17:34	19:40	2:06	Kirkpatrick, C.	Flycatcher response	AZ	USA
6	2380	2780	481360	3575080	483400	3573000	8	4:30	6:52	2:22	Kirkpatrick, C.	Flycatcher response	AZ	USA
7	2340	2540	480700	3575000	481820	3573680	6	4:46	6:25	1:39	Kirkpatrick, C.	Flycatcher response	AZ	USA
8	2300	2500	488360	3576700	486880	3575760	7	17:25	19:18	1:53	Kirkpatrick, C.	Flycatcher response	AZ	USA
9	2240	2340	479360	3571060	477760	3571000	5	5:14	6:44	1:30	Morales, S.	Flycatcher response	AZ	USA
10	2240	2400	480100	3572260	478300	3572000	5	17:49	19:17	1:28	Morales, S.	Flycatcher response	AZ	USA
11	2250	2475	486840	3579460	486320	3578160	8	4:30	7:35	3:05	Duncan, R.	Mobbing - Verdin & BTGN	AZ	USA
12	2300	2700	482480	3567980	479420	3568180	8	5:11	7:06	1:55	Morales, S.	Flycatcher & PYRR response	AZ	USA
13	3200	3300	546025	3584360	545220	3583400	3	17:39	18:36	0:57	Rogstad, A. & Charpentier, J.	Flycatcher response	AZ	USA
14	2280	2400	488870	3589600	490400	3589600	10	4:43	7:22	2:39	Kuklinski, E.	Flycatcher response	AZ	USA
15	2150	2200	485950	3589590	488460	3587610	9	5:05	7:31	2:26	Kuklinski, E.	Flycatcher response	AZ	USA
16	2120	2190	483720	3591340	485610	3589830	7	17:08	19:51	2:43	Kuklinski, E.	Flycatcher response	AZ	USA
17	2090	2100	481220	3593470	483400	3591620	8	17:44	19:57	2:13	Kuklinski, E	Mobbing - flycatchers; flycatcher response	AZ	USA
18	2880	3000	506600	3593100	506180	3591500	8	4:19	7:24	3:05	Charpentier, J.P.	Flycatcher response	AZ	USA
19	2800	2900	505320	3590000	505850	3590800	10	4:30	7:30	3:00	Rogstad, A.	Mobbing - hummingbird	AZ	USA
20	2850	2970	510240	3588120	510760	3588120	4	5:42	7:34	1:52	Haynes, L.	Mobbing - hummingbirds	AZ	USA
21	2600	2800	500500	3587000	503650	3585600	8	4:17	7:12	2:55	Charpentier, J.P.	Mobbing - flycatchers, lesser nighthawk; flycatcher response	AZ	USA
22	2700	3400	503750	3582500	505340	3582250	8	4:17	7:26	3:09	Charpentier, J.P.	Flycatcher response	AZ	USA
23	2720	2820	546100	3600400	544200	3598800	7	17:30	20:30	3:00	Charpentier, J.P.	Flycatcher response	AZ	USA
24	2300	2460	488420	3588580	489200	3589380	10	17:20	20:14	2:54	Kuklinski, E.	Flycatcher response	AZ	USA
25	2320	2470	489200	3589980	489640	3589200	7	4:59	7:16	2:17	Kuklinski, E.	Flycatcher response	AZ	USA
26	2440	2600	490040	3589400	490440	3591080	10	17:24	20:15	2:51	Kuklinski, E.	Flycatcher response	AZ	USA
27	2480	2480	513160	3570100	513240	3570400	2	6:50	7:13	0:23	Perkins, M.	Mobbing - verdin	AZ	USA
28	2600	2600	516745	3571010	516745	3571010	1	18:15	18:25	0:10	Perkins, M.	Flycatcher response	AZ	USA
29	2840	3150	467530	3532650	471560	3532580	11	4:33	7:35	3:02	Holley, M.	Mobbing - Lucy's warbler, flycatcher	AZ	USA
30	2660	2780	510510	3572950	511460	3573500	12	4:30	7:03	2:33	Henley, C.	Mobbing - Verdin	AZ	USA
31	2740	2780	505560	3576720	506350	3576260	12	4:40	7:13	2:33	Henley, C.	Flycatcher response	AZ	USA

Appendix E. Location of Transects Where Mobbing and Responses to Broadcast Calls Occurred During the Pima County CFPO Survey, Spring 1999.

	A	B	C	D	E	F	G	H
1	CFPO?	County	USGS_Quad	Locality	Owner	Date	Township, Range, Section	Habitat
32	No	Pima	Tucson North	Camino Real/La Lomita, N of River, just E of Campbell	Pima Co.	11-Jun-99	T13S R14E S17,20	154.12
33	No	Pima	Tucson North	Christie Dr. N of 1st Ave. & Euclid intersection	Pima Co.	8-Apr-99	T12S R14E S31,30	154.12
34	No	Pima	Tucson North	Hacienda del Sol S of Sunrise between Campbell & Swan	Pima Co.	1-Jun-99	T13S R14E S16	154.121
35	No	Pima	Tucson North	Mesa View Rd N of Skyline, E of Alvernon	Pima Co.	21-Jun-99	T13S R14E S3	154.121
36	No	Pima	Tucson North	Mina Vista St, S of Skyline Dr between First Ave & Campbell	Pima Co.	20-May-99	T13S R14E S8,5	154.121
37	No	Pima	Tucson North	N end of Vista Valverde along edge of La Paloma	Pima Co.	19-Apr-99	T13S R14E S9	154.121
38	No	Pima	Tucson North	Old Ina Rd (Campbell to Skyline)	Pima Co.	18-May-99	T12S R14E S31,32; T13S R14E S5	154.121
39	No	Pima	Tucson North	Piedra Seca S of Skyline E of Campbell	Pima Co.	15-Jun-99	T13S R14E S8	154.12
40	No	Pima	Tucson North	Racetrack wash (Ridgeline), E of First Ave between Via Soledad & River	Pima Co.	18-May-99	T13S R14E S18	154.121
41	No	Pima	Tucson North	Skyway Drive, E of First Ave. between Ina & Orange Grove	Pima Co.	15-May-99	T13S R14E S6	154.121, 300
42	No	Pima	Tucson North	Valley View Dr. S of Sunrise just W of Swan Rd	Pima Co.	30-May-99	T13S R14E S15	154.121
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Appendix E. Location of Transects Where Mobbing and Responses to Broadcast Calls Occurred During the Pima County CFPO Survey, Spring 1999.

	I	J	K	L	M	N	O	P	Q	R	S	T	U	V
1	Min_Elev	Max_Elev	Xstart_UTM	Ystart_UTM	Xend_UTM	Yend_UTM	Points	Start Time	End Time	Total Time	Surveyor	Remarks	State	Country
32	2320	2560	506040	3572100	506830	3573250	11	5:00	7:20	2:20	Henley, C.	Mobbing - Lucy's warbler	AZ	USA
33	2660	2920	503760	3577790	503960	3579460	13	17:02	19:35	2:33	Perkins, M.	Mobbing - verdin	AZ	USA
34	2530	2660	507470	3572870	508350	3574300	13	17:25	20:17	2:52	Henley, C.	Mobbing - Lucy's Warbler, Western Kingbird	AZ	USA
35	2800	2900	509060	3576070	509310	3576550	12	4:30	7:03	2:33	Henley, C.	Mobbing - Lucy's Warbler	AZ	USA
36	2580	2720	505830	3574580	506270	3576050	11	17:25	19:45	2:20	Henley, C.	Mobbing - Black-tailed Gnatcatcher	AZ	USA
37	2700	2700	507120	3575380	507120	3575380	1	6:12	6:22	0:10	Perkins, M.	Mobbing - Black-tailed Gnatcatcher	AZ	USA
38	2760	2920	506780	3577480	504990	3577900	14	17:25	20:23	2:58	Henley, C.	Mobbing - Verdins	AZ	USA
39	2580	2710	506560	3574170	506710	3575620	11	4:35	6:55	2:20	Henley, C.	Mobbing - Lucy's Warblers	AZ	USA
40	2360	2440	504280	3573680	504060	3572880	10	4:30	7:32	3:02	Henley, C.	Mobbing - Verdin	AZ	USA
41	2600	2720	504280	3576020	504780	3577580	13	17:25	20:10	2:45	Henley, C.	Mobbing - Bells Vireo	AZ	USA
42	2600	2720	509080	3572920	510030	3574230	11	4:30	6:50	2:20	Henley, C.	Mobbing - Lucy's Warbler	AZ	USA
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