Supplement A: Species Accounts and Management and Monitoring Commitments for the Pima County Ecological Monitoring Program

Supplement to the Pima County Ecological Monitoring Program: Phase II Summary

September 2010

1 Introduction

This supplement highlights important characteristics of Covered Species: their current (known) distributions within Pima County and surrounding areas, and Pima County's management and monitoring commitments. This supplement is excerpted from the Pima County Multi-species Conservation Plan.

Current distribution information is important because it puts management and monitoring information in the broader context of the MSCP. Detailed natural history accounts and details of modeled habitat for each species can be found at Pima County (2001a). Each of the following accounts includes location information for all of Pima County, but because limited survey work has been conducted on the Tohono O'odham Nation, location information is often lacking for those lands.

The monitoring commitments for most species include information on the following program elements: species, habitat, and threats. If no information exists for one or more of these program elements, then Pima County is not proposing monitoring that element as it relates to that species. Most vegetation-based habitat monitoring will take place on long-term monitoring sites that will be located throughout the County Preserve System (see main section of the report for more information). Precipitation monitoring will also take place at all or most of these sites. Finally, Pima County will conduct landscape pattern monitoring by using tools produced by such programs as the National Land Cover Database, as describe in the main text of this report. These products will be used to analyze trends of these resources within each species' Priority Conservation Area (PCA) or modeled habitat (see the Pima County MSCP for more information), and therefore are not repeated for each species in this appendix.

For all species, Pima County will encourage research to gain a better understanding of species status and ecology, especially: abundance, distribution, habitat use and associations, and movement patterns; both within the County Preserve System as well as other areas of Pima County and southern Arizona. As part of our monitoring commitment, Pima County will develop a database to house incidental observations of Covered Species.

2 Plants

Pima Pineapple Cactus (Coryphantha scheeri var. robustispina)

Current Occurrence in Pima County and Vicinity

Coryphantha scheeri var. *robustispina* inhabits southeastern Arizona and north-central Sonora. In southeastern Arizona, the known range lies within Santa Cruz and Pima Counties and is generally bounded to the east by the Santa Rita Mountains, to the west by the Baboquivari Mountains and does not extend to the north past the south side of Tucson (Schmalzel 2004, WestLand Resources Inc 2004, Baker 2005, 2006, Baker 2007, Schmalzel 2008, Arizona Game and Fish Department 2009a). It is geographically restricted to valley floors between the Baboquivari Mountains on the west and the Santa Rita Mountains to the east, and in low densities in the northern areas of Sonora, Mexico (U. S. Fish and Wildlife Service 2007b). There are populations in the Vail area and just south of Interstate 10 and west of Highway 83, north of Mt. Fagan.

Management and Conservation Commitments

Pima County will pursue the following management actions and conservation commitments for the Pima pineapple cactus:

1) Work with experts to maintain and post a habitat suitability map and Priority Conservation Area map on a publically accessible website, such as the SDCP Mapguide site, to be used as a reference for where the species may be encountered.
2) Potential acquisitions in the range of the species, as defined by the PCA, will be reviewed for evidence of occupancy of the species and its habitat as part of the due diligence (pre-closing), unless precluded by the property owner.
3) Seek funds or partnerships to conduct detailed surveys in areas south of the Sierrita Mountains and west of Interstate 19, where permission is granted, in an attempt to verify whether additional locations exist, and to determine whether additional acres of acquisition may be counted as habitat mitigation.
4) Encourage studies and other scientific investigations that are designed to increase knowledge about the species. This may include but is not limited to habitat/connectivity requirements, population viability analyses, effectiveness of transplant methodologies, persistence over time in developed areas, etc.
5) Place conservation easements on fee simple lands within the PCA at Marley Ranch, Rancho Seco, King 98, Canoa, Cienega Creek Natural Preserve, and Diamond Bell Ranch. Additional future land acquisitions will also likely include areas of occupancy for the species.
6) Acquire additional high-value areas—if necessary—to offset impacts of covered activities. Acquisitions are defined as ownership of a property right that allows Pima

County to exercise control over habitat (e.g. fee ownership, conservation easements, or restrictive covenants). High value areas are areas where occupancy has been validated by survey and are of sufficient acreage to provide sustained conservation value.

7) Continue to utilize mitigation credits from County mitigation banks or other non-County operated mitigation banks to offset impacts to Covered Activities.

8) Pima County Natural Resources, Parks and Recreation Department will continue to administer mitigation banks at Madera Highlands (Altar Valley) and Elephant Head (Santa Cruz Valley) for the benefit of other County departments. The mitigation banks are protected with conservation easements.

9) Management plans and master plans for County-owned open space lands in the PCA will include measures to avoid or minimize impacts to the species on those lands that we own due to such activities as prescribed fire, and ground-disturbing activities such as new trails or ranch infrastructure.

10) For private development covered under this permit, the County will continue to apply avoidance and minimization measures through implementation, as appropriate, of rezoning Site Analysis requirements, the Native Plant Preservation Ordinance, and on-site set-asides for approved rezonings that occur within the CLS.

11) Establish or work with private landowners to establish mitigation banks that will be available for use by the private sector.

12) Participate in the recovery planning with the USFWS.

Monitoring

Species monitoring. Numbers and survival of a suite of known individuals on County-owned and maintained mitigation banks will be monitored every 2-3 years. These known individuals have been and will be tagged so that individual fates can be recorded. Additional surveys for recruitment and additional individuals will be monitored every four years. Pima County will work with USFWS to establish monitoring on other sites within the Preserve system, including those individuals found during surveys for populations that are not currently known (e.g., Altar Valley near Aravaca). These surveys will involve line transect surveys (Roller 1996) but Pima County will work the USFWS to refine the sampling protocol to possibly incorporate the use of occupancy models that account for imperfect detectability. In addition, Pima County will recommend a refinement of the spatial sampling protocol to use adaptive cluster sampling for this species. Finally, Pima County will develop a database for incidental observations of this species so that County staff and cooperators can record observations made while performing other functions.

Habitat and threats. At County mitigation banks, Pima County will note the collection and/or destruction of tagged individuals during periodic surveys. These data, along with data collected by others in the region, can be used by the USFWS to investigate the effects of collecting on this species. Loss of PCA acres due to covered activities will be reported, as noted in the MSCP. As habitat needs for this species become more refined (e.g., percent

perennial grass cover), Pima County will link these habitat needs with data collected at long-term monitoring sites within the species' PCA.

Needle-spined pineapple cactus (*Echinomastus erectocentrus* var. *erectocentrus*)

Current Occurrence in Pima County and Vicinity
Occurs primarily in Pima and Cochise counties, south and east of Tucson and in southeastern Pinal County near to the San Pedro River (Arizona Game and Fish Department 2009a). This species is scattered in a few locations, apparently disjunct from each other. Recent search efforts by Baker (Baker 2000, Baker 2005, 2006, Baker 2007) have revealed >1,000 individuals southeast of Tucson. Large areas of the potential range between known locations have never been searched adequately to find this species, so expansion of known range is likely.

Management and Conservation Commitments
Pima County will seek to pursue the following management actions and conservation commitments for the needle-spined pineapple cactus:

1) Include measures to avoid and minimize impacts to species in management and master plans in Pima County-controlled Mitigation Lands within the PCA.

2) For private development covered under this Section 10 permit, Pima County will continue to apply avoidance and minimization measures through implementation, as appropriate, of rezoning site analysis requirements, the Native Plant Protection Ordinance, and on-site set asides for approved rezoning that occur within the CLS.

3) Explore partnerships with developers and ranchers to jointly achieve conservation of this species.

Monitoring
<u>Species Monitoring</u>. Pima County will develop a database for incidental observations of this species so that County staff and cooperators can record observations made while performing other functions.

<u>Habitat</u>. Long-term monitoring will take place in known and potential locations of this species in the County Preserve System. As more information about the habitat needs for this species become more refined, Pima County will link these habitat needs with data collected at long-term monitoring sites within the species' PCA.

<u>Threats</u>. Loss of PCA acres due to covered activities will be reported. In addition, habitat fragmentation will be monitored in the species PCA through the use of remote sensing tools and prospective tools such as planned rezonings.

Huachuca water umbel (Lilaeopsis schaffneriana recurva)

Current Occurrence in Pima County and Vicinity
Three populations are thought to exist in Pima County (Arizona Game and Fish Department 2009a): (1) Empire Gulch, a tributary of Cienega Creek, which is managed by the BLM as part of the Empire-Cienega Resource Conservation Area; (2) Cienega Creek Natural Preserve; and (3) Bingham Cienega Preserve. The species was found in Cienega Creek in 2001 (Engineering and Environmental Consultants Inc. 2001), but subsequent visits failed to detect the species. Surveys at La Cebadilla Property, the species was not detected, but it was thought to be present there previously (Engineering and Environmental Consultants Inc. 2001). It may also be possible to reestablish populations in the effluent-dominated portion of the Santa Cruz River and in the portion of the San Pedro River within Pima County.

Management and Conservation Commitments
Pima County will seek to pursue the following management actions and conservation commitments for the Huachuca water umbel:

1) Implement the Pima County Riparian Protection Ordinance to minimize loss of habitat for this species.
2) Protect existing habitat in the County-controlled Mitigation Lands from invasive species and controllable desiccation.
3) Acquire and protect water rights to maintain and restore habitat.
4) Survey for this species in suitable habitat during inventories of new properties.
5) Consider establishing or re-introducing this species at aquatic sites on County-controlled Mitigation Lands; such activities would be conducted in a manner consistent with the Recovery Plan for this species, should one be initiated.
6) Aid in the development of a Recovery Plan for this species, should one be initiated.

Monitoring
Species monitoring. Presence at known locations (Cienega Creek and Bingham Cienega preserves) will be monitored every 2-3 years according to the methods used by Engineering and Environmental Consultants Inc. (2001). Additional surveys for new populations in Cienega Creek preserve will be conducted every four years. Pima County will facilitate and encourage research on this species, particularly improved methods for detection of this difficult-to-survey species.

Habitat. Long-term wet/dry mapping along Cienega Creek will continue according to the protocol by Pima Association of Governments (1998).

Threats. Loss of PCA acres from covered activities will be reported. In addition, habitat fragmentation will be monitored in the species PCA through the use of remote sensing tools and prospective tools such as planned rezonings, as noted in the MSCP.

Tumamoc globeberry (*Tumamoca macdougalii*)

Current Occurrence in Pima County and Vicinity
The species' range in Pima County covers much of the County, with the highest concentrations of the species found west of I-10 and east of the Tohono O'Odham Nation (Reichenbacher 1990, Rondeau et. al. 1996), and west to Organ Pipe Cactus National Monument (cited in Schmidt et. al. 2007). Frank Reichenbacher maintains long-term monitoring sites at Sabino Canyon, Tumamoc Hill, and Tucson Mountains. Bureau of Reclamation maintains long-term monitoring sites in the Avra Valley. Surveys for this species will likely increase its known range in Pima County.

Management and Conservation Commitments
Pima County will seek to pursue the following management actions and conservation commitments for the Tumamoc globeberry:

1) Evaluate newly discovered populations for presence of threats and protective measures to be taken.
2) Minimize impacts by participating in buffelgrass management efforts within the Sonoran desertscrub vegetation community.
3) Work with the City of Tucson and Bureau of Reclamation to conserve suitable habitat in the Avra Valley.

Monitoring
Species monitoring. Assistance with periodic monitoring of populations and individuals in the Tucson basin that were established by Frank Reichenbacher (Reichenbacher 2008) and provide assistance with periodic resurveying of populations on the Central Arizona Project preserve.

Habitat. Dominant host plants for this species (e.g., *Larrea* and *Ambrosia*) will be monitored at long-term monitoring sites. Changes in host plant abundance can be cause for further investigation.

Threats. Loss of PCA acres due to covered activities will be reported. In addition, habitat fragmentation will be monitored in the species PCA through the use of remote sensing tools and prospective tools such as planned rezonings, as noted in the MSCP. Buffelgrass is likely a threat to this species and Pima County will continue to provide information on the spatial distribution and relative abundance of this species within the County Preserve System. The Buffelgrass Coordination Center is developing standardized protocols for this work (Rogstad 2008). Javelina can be a problem for this species (via predation of roots) and the Arizona Game and Fish Department periodically monitors this species using helicopters.

3 Mammals

Lesser long-nosed bat (Leptonycteris curasoae yerbabuena)

Current Occurrence in Pima County and Vicinity

The lesser long-nosed bat forages over much of the County during the spring and summer. Most of the currently known roost sites are inactive mines. In eastern Pima County, roosts are found throughout Pima County and adjacent areas including in the Santa Catalina, Rincon, and Santa Rita mountains (Davis and Sidner 1992, Swann and Powell 2006, Arizona Game and Fish Department 2009a, WestLand Resources Inc 2009). A maternity roost of this species once occurred in Colossal Cave and efforts have been made to restore the suitability of this roost for the lesser long-nosed bat (U. S. Fish and Wildlife Service 1995). It has been recorded in a number of locations in western Arizona including Cabeza Prieta National Wildlife Refuge and Organ Pipe Cactus National Monument (Cockrum 1981, Cockrum and Petryszyn 1986, Petryszyn and Cockrum 1990). Monitoring efforts associated with the Town of Marana's and the City of Tucson's Habitat Conservation Plans indicate that the lesser long-nosed bat forages in the exurban areas of Tucson and avoids the densely populated areas (Arizona Game and Fish Department, unpublished data).

Management and Conservation Commitments

Pima County will seek to pursue the following management actions and conservation commitments for the lesser long-nosed bat:

1) Minimize recreational impacts upon the species within County-controlled Mitigation Lands.
2) Protect existing known roosts and foraging habitats of this species on County-controlled Mitigation Lands from all potentially detrimental activities.
3) Investigate the purchase of valid mining claims for mines with known roosts; look into opportunities for creating roost preserves and install bat-friendly exit gates, where appropriate and economically feasible.
4) Restrict discretionary activities within 1 kilometer of known roosts during May to September if this can be accomplished without disclosure of roost locations.
5) Evaluate known roosts of this species on County-controlled Mitigation Lands for conditions and needs for structural stabilization. Where appropriate, such stabilization will be carried out using techniques that minimize disturbance and alteration of conditions.

For private development covered under this Section 10 permit, Pima County will continue to conserve and protect important forage resources (saguaro and agave) and roost site through implementation, as appropriate, of rezoning site analysis requirements, the Native Plant

Protection Ordinance, and on-site set asides for approved rezoning that occur within the CLS.

Monitoring

Species monitoring. Pima County has determined that species-level monitoring is warranted for this species because ongoing monitoring of roost sites is being implemented and provides local information on lesser long-nosed bat use patterns and occupancy. Therefore, Pima County will: (1) participate in coordinated exit counts at sites that contain bats that use the Permit Area and in coordination with other agency personnel; (2) visit known cave, mine, and adit roost sites within the County Preserve System every 2-3 years to observe presence of this and other bat species. Exit counts will use infra-red video cameras, and Pima County will provide technical assistance to the USFWS to develop a more detailed protocol. Pima County will develop a cave visitation protocol (including what kinds of equipment to be used) to minimize disturbance to this and other species. Surveys will take place at appropriate times of year (June-August) to ensure occupancy by this species. Additional monitoring of populations through the employment to passive detectors (e.g., Duchamp et al. 2006) will be reviewed periodically to determine application of this technology to the County's needs. Presently, Pima County does not feel that these monitoring methods are well developed and appropriate for our goals. Pima County may participate in species-level monitoring for this and other bat species as part of Arizona Game and Fish Department's bat monitoring plan; that plan is not complete. Finally, with funding from the USFWS, Dr. Robert Steidl (University of Arizona) and a graduate student are developing a regional monitoring program for this species. Pima County will evaluate our potential role in that program after the plan is complete.

Habitat. The lesser long-nosed bat is closely tied to Palmer's agave (eastern Pima County) and saguaro cacti (western Pima County), resources that will be monitored at a host of long-term monitoring sites throughout the County Preserve System, including in the bat's known habitat. Though those particular plant species are not be targeted as separate monitoring components, Pima County anticipate that enough plots will be established to determine trends in these important plant species. Pima County will also monitor the condition of potential roost sites throughout the County Preserve System every 2-3 years. Condition parameters will begin with initial characterization of cave conditions (e.g., size and dimensions, geological features, and evidence of recent human use), to be followed by assessments of condition, especially evidence of collapse and vandalism.

Threats. Pima County will periodically quantify the loss and fragmentation of habitat in the species' PCA.

Mexican Long-tongued Bat (*Choeronycteris mexicana*)

Current Occurrence in Pima County and Vicinity

The Mexican long-tongued bat is found throughout Pima County, particularly in the eastern portion (Hoffmeister 1986). Roost sites have been found in the Santa Catalina, Rincon, Baboquivari, and Santa Rita mountains (Don Carter, unpublished data; Cryan and Bogan 2003, Arizona Game and Fish Department 2009a, WestLand Resources Inc 2009). Individuals have been netted at Rincon Creek (Swann and Powell 2006) and in Organ Pipe Cactus National Monument (Organ Pipe Cactus National Monument 1999, 2006). Work by Wolf and Shaw (unpublished data) at hummingbird feeders in and around Tucson found Mexican long-tongued bats throughout the Tucson Basin, particularly along the Pantano, Rillito, and Agua Caliente washes and Tanque Verde Creek. Ronnie Sidner has studied the species extensively at the Fort Huachuca Military Reservation (Cochise County; unpublished data).

Management and Conservation Commitments

Pima County will seek to pursue the following management actions and conservation commitments for the Mexican long-tongued bat:

1) Minimize recreational impacts upon the species within Mitigation Lands.
2) Evaluate known roosts of this species on County-controlled Mitigation Lands for conditions and needs for structural stabilization. Where appropriate, such stabilization will be carried out using techniques that will minimize disturbance and alteration of conditions. Install bat-friendly exit gates, where appropriate and feasible.
3) Emphasize management for this species within Cienega Creek Natural Preserve and Colossal Cave Mountain Park.
4) For private development covered under this Section 10 permit, Pima County will continue to conserve and protect important forage resources (saguaro and agave) and roost site through implementation, as appropriate, of rezoning site analysis requirements, the Native Plant Protection Ordinance, and on-site set asides for approved rezoning that occur within the CLS.
5) Support the installation of new lighting within the cave tour portion of Colossal Cave Mountain Park to reduce stress on bats and to promote higher abundance and occupancy.

Monitoring

<u>Species monitoring</u>. Pima County will monitor the presence of this species while conducting surveys of known cave, mine, and adit roost sites in the County Preserve System, as well as periodic checks of habitat improvement (stabilization) projects, such as along Cienega Creek. Pima County will develop a cave visitation protocol (including what kinds of equipment to be

used) to minimize disturbance to this and other bat species. This is particularly important for this species because it is very sensitive to disturbance. As a result, population estimation at roost sites may not be appropriate. Surveys will take place at appropriate times of year (June-August) to ensure occupancy by this species. Additional monitoring of populations through the employment to passive detectors (e.g., Duchamp et al. 2006) will be reviewed periodically to determine application of this technology to the County's needs. Presently, Pima County does not feel that these monitoring methods are well developed and appropriate for our goals. Pima County may participate in species-level monitoring for this and other bat species as part of Arizona Game and Fish Department's bat monitoring plan; that plan has not yet been released.

Habitat. This pollen-loving bat cues into floristic, rather than structural features of vegetation, and is therefore closely tied to agave and cacti (particularly saguaro), resources. These resources will be monitored at a host of long-term monitoring sites throughout the County Preserve System, including with the bat's known habitat. Though those particular plant species are not be targeted as separate monitoring components, we anticipate that enough plots will be established to determine trends in these important plant species. In addition to it food resources, Pima County will monitor the condition of potential roost sites throughout the County Preserve System every 2-3 years. Condition parameters will begin with initial characterization of cave conditions (e.g., size and dimensions, geological features, and evidence of recent human use), to be followed by assessments of condition, especially evidence of collapse and vandalism.

Threats. Pima County will periodically quantify the loss and fragmentation of habitat in the species' PCA and note any vandalism activities at roost sites.

Allen's big-eared bat (*Idionycteris phyllotis*)

Current Occurrence in Pima County and Vicinity

This species has not been confirmed in Pima County (Petryszyn 1989, Arizona Game and Fish Department 2009a). Davis and Sidner (1992) indicated that it has been found in the Galiuro Mountains (Graham County) and Cockrum and Musgrove (1964) also note that it was caught in Graham and Cochise counties, but always >5,000 feet in elevation. The species has been captured in Portal, AZ (Western Bat Working Group, unpublished data, 1995), but is more common north of the Mogillon Rim (Siders and Jolley 2009, Solvesky and Chambers 2009). If it does occur in Pima County, it would likely be found along the San Pedro River and mine tunnels along the east side of the Catalina Mountains. In northern Arizona and in other areas of its range it is found in ponderosa pine, pinyon-juniper, Mexican woodland and riparian areas with sycamores, cottonwoods, and willows at elevations ranging from 2,600 feet to 9,800 feet (Hoffmeister 1986).

Management and Conservation Commitments
Pima County will seek to pursue the following management actions and conservation commitments for the Allen's big-eared bat.

1) Minimize recreational impacts upon the species within the County-controlled Mitigation Lands.
2) Protect any roosts that occur or are discovered on County-controlled Mitigation Lands from all potentially detrimental activities. Install bat-friendly exit gates, where appropriate and feasible.
3) Support the installation of new lighting within the cave tour portion of Colossal Cave Mountain Park to reduce stress on bats and to promote occupancy.

Monitoring
Species monitoring. Pima County will monitor the presence of this species while conducting surveys of known cave, mine, and adit roost sites in the County Preserve System (see Habitat, below). Pima County will develop a cave visitation protocol (including what kinds of equipment to be used) to minimize disturbance to this and other species. This is particularly important for this species because it is very sensitive to disturbance (Arizona Game and Fish Department 2003). As a result, population estimation may not be appropriate without causing significant disturbance. Surveys will take place at appropriate times of year to ensure greatest chance for occupancy by this species. Additional monitoring of populations through the employment to passive detectors (e.g., Duchamp et al. 2006) will be reviewed periodically to determine application of this technology to the County's needs. Presently, Pima County does not feel that these monitoring methods are well developed and appropriate for our goals. Pima County may participate in species-level monitoring for this and other bat species as part of Arizona Game and Fish Department's bat monitoring plan; that plan has not yet been released.

Habitat. Habitat features that are important for this species are 1) caves, mines, and adits for roosting, 2) water resources for foraging, 3) cavities for temporary roosting, and 4) vegetation structure and composition, particularly along stream courses. Pima County will monitor the condition of potential roost sites throughout the County Preserve System every 2-3 years. Condition parameters will begin with initial characterization of cave conditions (e.g., size and dimensions, geological features, and evidence of recent human use), to be followed by assessments of condition, especially evidence of collapse and vandalism. Habitat outside of potential roost sites is unknown, but is likely riparian areas, which will be monitored at long-term monitoring plots and possibly using remote sensing tools such as LiDAR.

Threats. Pima County will periodically quantify the loss and fragmentation of habitat in the species' PCA and note any vandalism activities at roost sites. If white-nosed syndrome is found in Arizona (high likelihood), the Allen's big-eared bat may be particularly susceptible

because it hibernates. Pima County will work with state and federal officials to initiate a more rigorous, state-wide monitoring program.

Western red bat (Lasiurus blossevillii)

Current Occurrence in Pima County and Vicinity
Found throughout Pima County including the Santa Rita Experimental Range, Empire Gulch, SE of the Boboquivari Mountains, Santa Catalina Mountains including Sabino Canyon (Arizona Game and Fish Department 2009a), Rincon Creek (Swann and Powell 2006), and Colossal Cave Mountain Park. Primarily associated with broadleaf riparian deciduous forests and woodlands.

Management and Conservation Commitment
Pima County will seek to implement the Pima County Riparian Protection Ordinance to minimize loss of habitat for this species.

Monitoring
Species monitoring. There are no plans to directly monitor this species. However, population monitoring through the employment to passive detectors (e.g., Duchamp et al. 2006) will be reviewed periodically to determine application of this technology to the County's needs. Presently, Pima County does not feel that these monitoring methods are well developed and appropriate for our goals. Pima County may participate in species-level monitoring for this and other bat species as part of Arizona Game and Fish Department's bat monitoring plan; that plan has not yet been released.

Habitat. Habitat features that are important for this species are 1) many types of water resources for foraging, and 2) structure and composition of vegetation (especially overstory and midstory) for daytime roosts in vegetation, particularly along stream courses. Pima County will monitor mesic riparian vegetation using via long-term monitoring plots that will be located within the species PCA, with particular emphasis on monitoring condition and size classes of mesic trees.

Threats. Pima County will periodically quantify the loss and fragmentation of habitat in the species' PCA. Pima County may also monitor groundwater levels in select sites in eastern Pima County (e.g., Tanque Verde Creek and Cienega Creek Preserve) according to the protocol recommendations in Supplement G; groundwater levels too low will threaten the broadleaf riparian vegetation that is so important to this species.

Southern yellow bat (*Lasiurus ega*)

Current Occurrence in Pima County and Vicinity
Most known records of southern yellow bats from Arizona are from urban Tucson and Phoenix, where they are associated with planted fan palms (Arizona Game and Fish

Department 2009a). Also has been found in recent years in Sasabe, Sabino Canyon, and the Galiuro Mountains (Graham County).

Management and Conservation Commitments
Pima County will seek to pursue the following management actions and conservation commitments for the southern yellow bat:

1) Implement the Pima County Riparian Protection Ordinance to minimize loss of habitat.
2) Because this species is thought to be associated with untrimmed palm trees within the urban environment, Pima County will support public education about the importance of leaving palm trees untrimmed and may support a small project to map the location of palm tree resources.

Monitoring
Species monitoring. There are no plans to directly monitor this species. However, population monitoring through the employment to passive detectors (e.g., Duchamp et al. 2006) will be reviewed periodically to determine application of this technology to the County's needs. Presently, Pima County does not feel that these monitoring methods are well developed and appropriate for our goals. Pima County may participate in species-level monitoring for this and other bat species as part of Arizona Game and Fish Department's bat monitoring plan; that plan has not yet been released.

Habitat. Habitat features that are important for this species are 1) many types of water resources for foraging, and 2) structure and composition of vegetation (especially overstory) for daytime roosts in vegetation, particularly palm trees and cottonwood trees along stream courses. Pima County will monitor mesic riparian vegetation using long-term monitoring plots that will be located within the County Preserve System. Particular emphasis will be placed on monitoring condition and size classes of mesic trees. It should be noted that few plots will be located within the species' urban habitat, and therefore a different approach to monitoring important features for this species may be investigated. This might include use of citizen scientists to monitor condition of palm trees (e.g., proportion of palms with untrimmed "skirts" that are so important for this species).

Threats. Pima County will periodically quantify the loss and fragmentation of habitat in the species' PCA. Pima County may also monitor groundwater levels in select sites in eastern Pima County (e.g., Tanque Verde Creek and Cienega Creek Preserve) using the protocol recommendations in Supplement G; groundwater levels too low will threaten the broadleaf riparian vegetation that is so important to this species.

California leaf-nosed bat (*Macrotus californicus)*

Current Occurrence in Pima County and Vicinity
A common species of caves, mines, and rock shelters throughout the County, especially low elevation ranges including in Organ Pipe Cactus National Monument (Cockrum 1981, Cockrum and Petryszyn 1986, Petryszyn and Cockrum 1990) and mountain ranges near Tucson including the Tucson Mountains (Swann and Powell 2007), and Waterman, Silverbell, Santa Catalina, Rincon, Sierrita, and Baboquivari mountains (Arizona Game and Fish Department 2009a).

Management and Conservation Commitments
Pima County will seek to pursue the following management actions and conservation commitments for the California leaf-nosed bat.

1) Protect existing known roosts and foraging habitats of this species in County-controlled Mitigation Lands from all potentially detrimental activities.
2) Investigate the purchase of valid mining claims for mines with known roosts; look into opportunities for creating roost preserves. Each roost will be considered for gating, and where appropriate, proper gates will be installed.
3) On County-controlled Mitigation Lands, restrict discretionary activities within 1 kilometer of known roosts during May to September if this can be accomplished without disclosure of roost locations.
4) Evaluate known roosts of this species on County-controlled Mitigation Lands for conditions and needs for structural stabilization. Where appropriate, such stabilization will be carried out using techniques that minimize disturbance and alteration of conditions.
5) Support the installation of new lighting within the cave tour portion of Colossal Cave Mountain Park to reduce stress on bats and to promote higher abundance and occupancy.

Monitoring
Species monitoring. Pima County will monitor the presence of this species while conducting surveys of known cave, mine, and adit roost sites in the County Preserve System (see Habitat, below). Pima County will develop a cave visitation protocol (including what kinds of equipment to be used) to minimize disturbance to this and other species. Additional monitoring of populations through the employment to passive detectors (e.g., Duchamp et al. 2006) will be reviewed periodically to determine application of this technology to the County's needs. Presently, Pima County does not feel that these monitoring methods are well developed and appropriate for our goals. Pima County may participate in species-level

monitoring for this and other bat species as part of Arizona Game and Fish Department's bat monitoring plan; that plan has not yet been released.

Habitat and Threats. Habitat features that are of known important for this species are caves, mines, and adits for roosting, which will be monitored every 2-3 years for changes in condition. Condition parameters will begin with initial characterization of cave conditions (e.g., size and dimensions, geological features, and evidence of recent human use), to be followed by assessments of condition, especially evidence of collapse and vandalism. Pima County will periodically quantify the loss and fragmentation of habitat in the species' PCA.

Pale Townsend's big-eared bat (*Plecotus townsendii pallescens*)

Current Occurrence in Pima County and Vicinity

In Pima County, this species is frequently found in small groups in inactive mines and caves, and occasionally in buildings. It has been found across a wide elevational range in Pima County (Arizona Game and Fish Department 2009a). This species has been observed at Colossal Cave Mountain Park, Rincon Mountains (Davis and Sidner 1992, Swann and Powell 2006), Tucson Mountains (Swann and Powell 2007), Sierrita Mountains (Snow et. al. 1996), Baboquivari Mountains (Hoffmeister 1986), Santa Rita Mountains (Snow et al. 1996, WestLand Resources Inc 2009), and Organ Pipe Cactus National Monument (Cockrum 1981, Cockrum and Petryszyn 1986). There are likely roosts that are not currently identified in the Tortolita, Tucson, and Silverbell mountains.

Management and Conservation Commitments

Pima County will seek to pursue the following management actions and conservation commitments for the pale Townsend's big-eared bat:

1) Protect existing known roosts and foraging habitats of this species in County-controlled Mitigation Lands from all potentially detrimental activities. Investigate the purchase of valid mining claims for mines with known roosts; look into opportunities for creating roost preserves. Each roost will be considered for gating, and where appropriate and financially feasible, proper gates will be installed.
2) On County-controlled Mitigation Lands restrict discretionary activities within 1 kilometer of known roosts during May to September if this can be accomplished without disclosure of roost locations.
3) Evaluate known roosts of this species on County-controlled Mitigation Lands for conditions and needs for structural stabilization. Where appropriate, such stabilization will be carried out using techniques that minimize disturbance and alteration of conditions.
4) Support the installation of new lighting within the cave tour portion of Colossal Cave Mountain Park to reduce stress on bats and to promote higher abundance and occupancy.

Monitoring

Species monitoring. Pima County will monitor the presence of this species while conducting surveys of known cave, mine, and adit roost sites in the County Preserve System (see Habitat, below). Pima County will develop a cave visitation protocol (including what kinds of equipment to be used) to minimize disturbance to this and other species. This is particularly important for this species because it is very sensitive to disturbance, particularly maternity colonies (Arizona Game and Fish Department 2003). As a result, population estimation may not appropriate unless feasible by not causing significant disturbance. Additional monitoring of populations through the employment to passive detectors (e.g., Duchamp et al. 2006) will be reviewed periodically to determine application of this technology to the County's needs. Presently, Pima County does not feel that these monitoring methods are well developed and appropriate for our goals. Pima County may participate in species-level monitoring for this and other bat species as part of Arizona Game and Fish Department's bat monitoring plan; that plan has not yet been released.

Habitat. Known habitat features that are important for this species are 1) caves, mines, and adits for roosting, 2) water resources for foraging, 3) trees and buildings for temporary night roosts. Habitat monitoring for this species will take place at caves, mines and adits within the Preserve System, with visits taking place every 2-3 years. Water resources, such as presence of water in select locations (e.g., Cienega Creek Preserve), will be monitored at least once per year. Though there is no link to specific vegetation features, vegetation monitoring will take place at long-term monitoring sites throughout the species' PCA. As more information is known about the habitat requirements of this species, Pima County will link this information back to the data that will be collected at these plots.

Threats. All caves, mines, and adits will be visited every 2-3 years to document changes to conditions, especially vandalism or modification. Pima County will periodically quantify the loss and fragmentation of habitat in the species' PCA. If white-nosed syndrome is found in Arizona (high likelihood), the Pale Townsend's big-eared bat may be particularly susceptible because hibernates. Pima County will work with state and federal officials to initiate a more rigorous, state-wide monitoring program and adhere to cave-visiting protocols so as not to transmit the disease.

Merriam's mouse (Peromyscus merriami)

Current Occurrence in Pima County and Vicinity

Merriam's mouse was once common along larger washes and rivers in Pima County (e.g., Arnold 1940). It now occurs in isolated pockets throughout the County, including at Organ Pipe Cactus National Monument (Petryszyn and Russ 1996) and in a number of sites in eastern Pima County including the Tucson Mountains, Cienega Creek, the northwest foothills of the Santa Rita Mountains, and the Altar Valley (Kingsley 2006). Hoffmeister (1986) reports the species from historical Ft. Lowell, Sabino Canyon, Baboquivari Mountains, and near Arivaca.

Management and Conservation Commitments
Pima County will seek to pursue the following management actions and conservation commitments for the Merriam's mouse.

1) Implement the Pima County Riparian Protection Ordinance to minimize loss of habitat.
2) Restore mesquite bosque communities, where feasible.
3) Where feasible, incorporate wildlife crossings into transportation project design in appropriate locations to benefit the species.

Monitoring
Habitat. Habitat features that are important for this species are: 1) course woody debris, 2) vegetation structure and composition in all three height categories. This species is particularly associated with bottomland mesquite forests, which will be included in the monitoring program using long-term monitoring plots, a few of which will be located within the species' PCA. Course woody debris is a parameter that will be monitored at all long-term monitoring sites. Pima County will investigate trends in the density and cover of key plant species (mesquite) for this mammal and will research observed declines in this important resources.

Threats. Pima County will periodically quantify the loss and fragmentation of habitat in the species' PCA.

4 Birds

Burrowing owl (Athene cunicularia hypugaea)

Current Occurrence in Pima County and Vicinity
In western Pima County they breed on and near to the Barry M. Goldwater Range (Corman and Wise-Gervais 2005) and have been observed at Organ Pipe Cactus National Monument (Groschupf et. al. 1988). Burrowing owls have been well studied in eastern Pima County (Brown and Mannan 2002). They are found primarily in three areas of the County: (1) in the Altar Valley north to the Santa Cruz River in Marana; (2) along the Santa Cruz River, primarily south of downtown Tucson to the Santa Cruz County line, and (3) in and around the Davis-Monthan Air Force Base (Estabrook 1998, Alanen 2003, Corman and Wise-Gervais 2005, Garcia and Conway 2007, Arizona Game and Fish Department 2009b, Town of Marana 2009, Tucson Bird Count 2009).

Management and Conservation Commitments
Pima County will seek to pursue the following management actions and conservation commitments for the burrowing owl:

1) For private development covered under this Section 10 permit, Pima County will apply avoidance and minimization measures through implementation, as appropriate, of

rezoning site analysis requirements, the Native Plant Protection Ordinance, and on-site set asides for approved rezoning that occur within the CLS.

2) Clearance surveys prior to construction of CIP projects
3) Collaborate with the Town of Marana and City of Tucson HCPs and management strategies, in order to protect this species.
4) Collaborate with federal partners and conservation groups (e.g., Tucson Audubon Society) to monitor sites where artificial burrows have been installed and/or new colonies have established.
5) On County preserve lands, enact a 100-m buffer "restricted activity zone" around known nests during the nesting period. Allow only short duration "pass through" activities.
6) Investigate the adoption of burrowing owl management area (BOMA) approach to conservation for this species.

Monitoring

Species Monitoring. Pima County will conduct surveys prior to CIP ground-disturbing activities within the species' PCA and likely habitat to determine nest site occupancy. For this, we will employ the protocol by (Conway and Simon 2003), which uses a combination of visual encounter surveys and call-broadcasts. A minimum of three surveys will be conducted prior to ground-breaking activities in natural areas. Pima County will also develop a database for incidental observations made of this conspicuous species while Pima County staff performs other functions.

Habitat. Habitat features that are important for this species are: 1) alluvial soils with existing burrows, usually located along river banks or in abandoned agricultural fields or other areas cleared of vegetation, 2) lack of vegetation in all height categories. Pima County will monitor these resources at long-term monitoring sites within the species PCA that are located within the County's Preserve System.

Threats. Buffelgrass is likely a threat to this species and Pima County will continue to collect information on the spatial distribution and relative abundance of this species within the County' Preserve System and provide this information to the Buffelgrass Coordination Center, which is standardizing the protocol for buffelgrass mapping and abundance estimates (Rogstad 2008). Pima County will periodically quantify the loss and fragmentation of habitat in the species' PCA.

Cactus ferruginous pygmy-owl (*Glaucidium brasilianum cactorum*)

Current Occurrence in Pima County and Vicinity

The current distribution and abundance in Pima County is unknown and the population in southern Arizona and northern Sonora, Mexico has been declining for approximately 10 years. In 1999 a total of 78 individual owls were detected in Arizona in the Organ Pipe Cactus National Monument, Tohono O'odham Nation, Altar Valley, northwest Tucson and

the Tortolita Mountains, and the Roskruge Mountains (Richardson et. al. 2000). The owls are thought to currently persist in three areas of Pima County: the Tohono O'odham Nation, the Altar Valley, and in Organ Pipe Cactus National Monument. Monitoring has taken place in the Altar Valley of Sonora, Mexico since 2000 where a documented decline in occupancy and abundance has been noted in most years (Flesch and Steidl 2006, Flesch 2008b, Flesch 2008c).

Management and Conservation Commitments

Pima County has spent considerable resources on this species by funding surveys, research (genetic work), and telemetry and habitat analysis studies. Pima County will continue this commitment by working with the USFWS to develop a set of Permit coverage conditions for this species. Pima County will seek to pursue additional management actions and conservation commitments for the cactus ferruginous pygmy owl:

1) For private development covered under this Section 10 permit, Pima County will continue to apply avoidance, minimization, and conservation measures through implementation, as appropriate, of rezoning site analysis requirements and on-site set asides for approved rezoning that occur within the CLS. Maintaining permeability will be the first priority for on-site CLS set asides on private development covered under this Section 10 permit that occur within key Special Species Management Areas.
2) For private development, Pima County will continue to conserve and protect important nest resources (saguaros) through implementation, as appropriate, of rezoning site analysis requirements, the Native Plant Protection Ordinance, and on-site set asides for approved rezoning that occur within the CLS.
3) Continue to prioritize protection and acquisition of high-quality habitat.
4) Support and participate in research experiments and other scientific efforts to benefit and increase knowledge of this species in collaboration with the USFWS, AGFD, and other partners.
5) Implement the Pima County Riparian Protection Ordinance to minimize loss of habitat for this species.
6) Facilitate the release of captive-bred birds on Pima County lands.
7) Work with citizen's group to build and install nest boxes on County owned or managed properties that the USFWS deems appropriate for such use.
8) Enact a 250 m buffer "restricted activity zone" around known nests during the nesting period. Allow only short duration "pass through" activities.

Monitoring

<u>Species Monitoring</u>. Pima County will assist with the delineation and mapping of high-quality habitat within the Permit Area and Pima County. Once that map is complete, Pima County will conduct surveys at a subset of those lands within the County Preserve System

according to a survey protocol that is acceptable to the USFWS, but which incorporates survey recommendations by Flesch and Steidl (2007). The number of monitoring sites and revisit pattern will be determined after the habitat model has been developed.

Habitat. Habitat features that are important for this species are: 1) cavities for nesting, 2) vegetation in all height categories particularly tree canopy in woodlands including such species as ash, mesquite, and ironwood. Pima County will monitor these vegetation resources at long-term monitoring sites within the species' PCA and Special Species Management Areas that are located within the County's Preserve System. Pima County is also investigating the use of LiDAR to monitor vegetation structure, which is very important for this species.

Threats. Pima County will periodically quantify the loss and fragmentation of habitat in the species' PCA using methods outlined in the MSCP.

Rufous-winged sparrow (*Aimophila carpalis*)

Current Occurrence in Pima County and Vicinity

The rufous-winged sparrow is a year-round resident in the eastern two-thirds of Pima County including the Santa Cruz and Avra valleys, and the foothills of the major mountain ranges of eastern Pima County (Phillips et. al. 1964, Lowther et. al. 1999, Corman and Wise-Gervais 2005, Powell 2006, 2007, Tucson Bird Count 2009).

Management and Conservation Commitments

Pima County will seek to pursue the following management actions and conservation commitments for the rufous-winged sparrow:

1) For private development covered under this permit, Pima County will continue to apply avoidance and minimization measures through implementation, as appropriate, of rezoning site analysis requirements, the Native Plant Protection Ordinance, and on-site set asides for approved rezoning that occur within the CLS. Reducing fragmentation of grasslands and Arizona uplands will be the first priority for on-site set asides.
2) Continue to prioritize protection and acquisition of high-quality habitat.
3) Monitor grazing on Pima County lease lands for range health and avoid over-grazing on all County-controlled Mitigation Lands.

Monitoring

Species monitoring. Pima County will collect information about the species from other sources (e.g., reports and program results such as from the Tucson Bird Count) and use these data to populate the Covered Species Information Database. Pima County will also develop a database for incidental observations of this species while Pima County staff performs other functions.

Habitat. Habitat features that are important for this species are primarily vegetation in the overstory, midstory, and understory. Plant species associated with nesting and foraging habitat include mesquite and palo verde trees, hackberry, greythorn, and the species seems to be associated with the presence of some understory grasses. Pima County will monitor these vegetation resources at long-term monitoring sites within the species' PCA located within the County's Preserve System. Changes in understory composition, especially the increase in buffelgrass, may impact this species. Pima County is also investigating the use of LiDAR to monitor vegetation structure, which will be very useful for this species.

Threats. Pima County will periodically quantify loss and fragmentation of habitat in the species' PCA. As noted in the habitat section (above), Pima County will continue to collect information on the spatial distribution and relative abundance of buffelgrass within the County' Preserve System and provide this information to the Buffelgrass Coordination Center, which is standardizing the protocol for buffelgrass mapping and abundance estimates (Rogstad 2008).

Swainson's hawk (*Buteo swainsoni*)

Current Occurrence in Pima County and Vicinity

The Swainson's hawk is a common breeder in semi-desert grasslands of southeastern Arizona, particularly east of Pima County (Corman and Wise-Gervais 2005). In Pima County it is an uncommon breeder in the Altar Valley and other isolated pockets of semi-desert grasslands such as in the foothills of the Santa Rita, Santa Catalina and Las Guijas Mountains and near the Pantano Wash (Nishida et. al. 2001, Hobbs 2004, Corman and Wise-Gervais 2005, Arizona Game and Fish Department 2009b).

Management and Conservation Commitments

Pima County will seek to pursue the following management actions and conservation commitments for the Swainson's hawk:

1) For private development covered under this permit, Pima County will continue to apply avoidance and minimization measures through implementation, as appropriate, of rezoning site analysis requirements, the Native Plant Protection Ordinance, and on-site set asides for approved rezoning that occur within the CLS. Reducing fragmentation of grasslands will be the first priority for on-site set asides.
2) Continue to prioritize protection and acquisition of high-quality habitat;
3) Where feasible, restore semi-desert grasslands by introducing wildlife fire and other methods to reduce shrub cover.
4) Enact a 400 m buffer "restricted activity zone" around known nests during the nesting period. Allow only short duration "pass through" activities.

Monitoring

Species Monitoring. Pima County will develop a database for incidental observations of this species so that County staff and cooperators can record observations made while performing other functions.

Habitat. Habitat features that are important for this species are primarily vegetation in understory (perennial grasses and general lack of shrubs) and lack of vegetation in the overstory and midstory, except for the importance of nesting trees along washes bordering semi-desert grasslands. Pima County will monitor these key vegetation resources at long-term monitoring sites, many of which will be the species' PCA and within the County's Preserve System. Particular attention will be paid to the increase in shrubs in semi-desert grassland areas within the County Preserve System. Data from long-term monitoring plots will help inform management efforts to restore grasslands. In addition to the plot-based measures at long-term monitoring plots, Pima County is also investigating the use of LiDAR to monitor vegetation structure, which (as noted earlier) is very important for this species.

Threats. Pima County will periodically quantify loss and fragmentation of habitat in the species' PCA using the methods outlined in the MSCP.

Western yellow-billed cuckoo (Coccyzus americanus occidentalis)

Current Occurrence in Pima County and Vicinity

The Neotropical yellow-billed cuckoo breeds in eastern Pima County in cottonwood/willow forests. It has been found nesting at Cienega Creek (Empire Ranch, Davidson Canyon confluence, and Upper Cienega Creek), Arivaca Creek and several sites in the Altar Valley (Corman and Magill 2000, Arizona Game and Fish Department 2009b) including confirmed nesting in Brown Canyon (B. Powell, unpublished data). There was a high density of nesting pairs along the Santa Cruz River in Santa Cruz County in 2000 (Powell 2000). Yellow-billed cuckoos have been recorded in the pecan groves in Green Valley and Sahuarita (Kingsley 1989). They have been recorded as rare transients in the Rincon Mountain District of Saguaro National Park, but no breeding has been reported in Rincon Creek, the most likely habitat for the species in the park (Powell 2004, 2006). Recent unconfirmed breeding in eastern Pima County includes along the Santa Cruz River north of Tucson in 2005 (Crawford 2005) and 2002 (Sage Landscape Architecture and Environmental Inc 2003) and along Tanque Verde Creek in 2002 (Sage Landscape Architecture and Environmental Inc 2003).

Management and Conservation Commitments

Pima County will seek to pursue the following management actions and conservation commitments for the yellow-billed cuckoo:

1) Implement the Pima County Riparian Protection Ordinance to minimize loss of habitat for this species.
2) Seek to protect washes/creeks from OHV/paintball/target shooting, or similar wildlife disturbing activity intrusions.

3) For County-controlled Mitigation Lands, enact a 250 m buffer "restricted activity zone" around known nests during the nesting period. Allow only short duration "pass through" activities.

Monitoring

Species Monitoring. Pima County will monitor occupancy and abundance of this species at Cienega Creek Preserve using a standardized protocol (Wiggins 2005) that uses a broadcasted call of the species to elicit a response (Johnson et. al. 1981). Pima County will survey suitable habitat within the Preserve at least twice per year during June.

Habitat. Habitat features that are important for this species are primarily mesic and hydro-riparian trees and large mesquite trees adjacent to these areas. Because of the importance of these resources for this and many other species, Pima County will place particular emphasis on monitoring these key vegetation resources at long-term monitoring sites, many of which will be the species' PCA and within the County's Preserve System. Pima County is also investigating the use of LiDAR to monitor vegetation structure, which is very important for this species.

Threats. Pima County will periodically quantify loss and fragmentation of habitat in the species' PCA. Pima County may also monitor groundwater levels in select sites in eastern Pima County (e.g., Tanque Verde Creek and Cienega Creek Preserve) using the protocol recommendations in Supplement G; groundwater levels too low will threaten the broadleaf riparian vegetation that is so important to this species.

Abert's towhee (*Pipilo aberti*)

Current Occurrence in Pima County and Vicinity

This year-round resident is found along many of the major washes and rivers of eastern Pima County including the Santa Cruz River, Brawley Wash, Rillito River, Pantano Wash; and Rincon, Cienega, and Arivaca creeks (Tweit and Tweit 1986, Powell 2004, Corman and Wise-Gervais 2005, Powell 2006, Tucson Bird Count 2009).

Management and Conservation Commitments

Pima County will seek to pursue the following management actions and conservation commitments for the Abert's towhee:

1) Implement the Pima County Riparian Protection Ordinance to minimize loss of habitat.
2) Identify and pursue opportunities for restoration of mesquite bosques on appropriate portions of the County-controlled Mitigation Lands.

Monitoring

Species monitoring. Pima County will collect information about the species from other sources (e.g., reports and program results such as from the Tucson Bird Count) and use these data to populate the Covered Species Information Database. Pima County will also develop

a database for incidental observations of this conspicuous species that are made while County staff and cooperators performs other functions.

Habitat. Habitat features that are important for this species are primarily meso-riparian and xeric-riparian small trees and shrubs and vegetation structure in the understory and midstory. These features will be monitored at long-term monitoring sites in riparian areas within the species' PCA in the County's Preserve System. Pima County is also investigating the use of LiDAR to monitor vegetation structure, which is very important for this species. Changes in dense vegetation volume in the understory and midstory will be of concern for this species.

Threats. Pima County will periodically quantify loss and fragmentation of habitat in the species' PCA.

Bell's vireo (Vireo bellii arizonae)

Current Occurrence in Pima County and Vicinity

The Bell's vireo is a common Neotropical migrant that nests in heavily wooded xeric riparian locations, particularly in eastern Pima County. Locations include foothills of the Santa Catalina, Rincon, Santa Rita, and Baboquivari mountains (Lloyd et. al. 1998, Powell and Steidl 2000, 2002, Corman and Wise-Gervais 2005, Powell 2006, Arizona Game and Fish Department 2009b, Tucson Bird Count 2009); large rivers, creeks, and washes of eastern Pima County including the Santa Cruz River, Rillito River, Pantano and Brawley washes, and Rincon and Cienega creeks (Mills et. al. 1989, Powell 2004, Kirkpatrick et. al. 2007, Tucson Bird Count 2009). In western Pima County they nest in xeroriparian washes such as at the Organ Pipe Cactus National Monument and Barry M. Goldwater Range (Groschupf et al. 1988, Hardy et. al. 2004, Organ Pipe Cactus National Monument 2006, Schmidt et al. 2007, Arizona Game and Fish Department 2009b).

Management and Conservation Commitments

Pima County will seek to pursue the following management actions and conservation commitments for the Bell's vireo:

1) Implement the Pima County Riparian Protection Ordinance to minimize loss of habitat for this species.
2) Indentify and pursue opportunities for restoration of mesquite bosques and xeroriparian vegetation communities on appropriate County-controlled Mitigation Lands.

Monitoring

Species monitoring. Pima County will collect information about the species from other sources (e.g., reports and program results such as from the Tucson Bird Count) and use these data to populate the Covered Species Information Database.

Habitat and threats. Pima County will monitor Bell's vireo nesting habitat, which is characterized by dense stands of xero-riparian and meso-riparian vegetation, particularly in the understory and midstory. Vegetation species of importance include hackberry, mesquite, and *Baccharis*. Pima County will monitor dominant perennial vegetation species (especially hackberry and mesquite) and vegetation density and volume as part of the habitat-based monitoring element of the PCEMP. Because of the importance of riparian systems to this and other Covered Species, Pima County will ensure that an adequate number of long-term monitoring sites and/or other monitoring (e.g., use of remote sensing tools) are within the riparian stratum. Pima County will also periodically quantify the loss and fragmentation of habitat in the Bell's vireo's PCA, as described in the MSCP.

Southwestern willow flycatcher (*Empidonax trallii extimus*)

Current Occurrence in Pima County and Vicinity

The Neotropical migrant southwestern willow flycatcher has some of the highest breeding densities in Arizona along the San Pedro River at the confluence with the Gila River (Pinal County) (Ellis et. al. 2008), and it has been documented breeding at Reddington, along the San Pedro in Pima County in 1998 (Arizona Game and Fish Department 2009b). Has also been documented as a breeder along Cienega Creek in Pima County, though only sporadic records exist (Arizona Game and Fish Department 2009b). Surveys along the Santa Cruz River in recent years have not found any breeding individuals (Scott Wilbor, in personal communication to the Town of Marana, 2009.

Management and Conservation Commitments

Pima County will seek to pursue the following management actions and conservation commitments for the southwestern willow flycatcher:

1) Implement the Pima County Riparian Protection Ordinance to minimize loss of habitat for this species.
2) Protect Binghamton Cienega from OHV/paintball/target shooting, or similar wildlife disturbing activity intrusions.
3) For County-controlled Mitigation Lands, enact a 100 m buffer "restricted activity zone" around known nests during the nesting period. Allow only short duration "pass through" activities will be allowed.
4) Develop management guidelines for County-controlled Mitigation Lands that include efforts to reduce impacts from feral pets (e.g., cats and dogs) in the vicinity of occupied habitat.
5) Protect all known and potentially suitable habitats for this species on County-controlled Mitigation Lands.
6) Acquire and protect water rights to maintain and restore habitat, where appropriate.

Monitoring

Species Monitoring. Pima County will monitor abundance of this species at Cienega Creek Preserve and at the A7 Ranch along the San Pedro River. Pima County will use the survey method in Tibbitts (1994), which calls for three surveys per year during the nesting season. The survey uses broadcast calls of the species to elicit a response.

Habitat. Habitat features that are important for this species are primarily mesic and hydro-riparian shrubs and trees. Because of the importance of these resources for this and many other species, Pima County will place particular emphasis on monitoring these key vegetation resources at long-term monitoring sites, some of which will be the species' PCA and within the County's Preserve System. Pima County is also investigating the use of LiDAR to monitor vegetation structure, which is very important for this species.

Threats. Pima County will periodically quantify loss and fragmentation of habitat in the species' PCA. Pima County may also monitor groundwater levels in select sites in eastern Pima County (e.g., Cienega Creek Preserve and the San Pedro River at A7 ranch) using the protocol recommendations in Supplement G; groundwater levels too low will threaten the riparian vegetation that is so important to this species.

5 Fishes

Longfin Dace (Agosia chrysogaster)

Current Occurrence in Pima County and Vicinity

Known populations of the longfin dace in Pima County occur in: (1) Cienega Creek Natural Preserve and further upstream in Las Cienegas National Conservation Area (Rosen and Schwalbe 1988, Simms et. al. 2006, Bodner et al. 2007, Arizona Game and Fish Department 2009b); (2) Buehman Canyon south-southeast of Cocklebur Tank; (3) upper reaches of the Canada del Oro; and in Arivaca Creek (Arizona Game and Fish Department 2009b). There are populations upstream of Pima County in the Santa Cruz River (Voeltz and Bettaso 2003, Powell et. al. 2005) and following significant floods, individuals may establish in Pima County.

Management and Conservation Commitments

Pima County will seek to pursue the following management actions and conservation commitments for the longfin dace:

1) Implement the Pima County Riparian Protection Ordinance to minimize loss of habitat for this species:
2) Attempt to purchase lands adjacent to Buehman Canyon identified as habitat protection priorities. If purchased, AGFD will be provided access for fish management activities.

Monitoring

Species Monitoring. Pima County will monitor abundance and/or relative abundance of this species using seine nets and employing depletion sampling at the same sites and using the same methods as for Gila topminnow at the Cienega Creek Preserve. Monitoring will occur every two years. At the Cienega Creek Preserve, monitoring will take place at $\geq$ 10 pools that are randomly chosen from the all potential pools. The number of monitoring sites at other locations will be determined prior to permit issuance.

Habitat. Presence of water will continue to be monitored at the Cienega Creek Preserve as part of the wet/dry mapping by Pima Association of Governments (Pima Association of Governments 1998). Water availability will also be monitored during fish sampling. Water quality (especially dissolved oxygen and water temperature) are regulated, in part, by vegetation, both hydro-riparian emergent vegetation and trees, sometimes to the detriment of the species (Bodner et al. 2007). Trees adjacent to the creek will be monitored at long-term monitoring plots (or by using LiDAR), which will be located within the habitat of this species.

Threats. Pima County has been—and will continue to—monitor groundwater levels at the Cienega Creek Preserve (Pima Association of Governments 1998) and is considering implementing the protocol recommendations in Supplement G; groundwater levels too low will threaten the presence of water and associated vegetation. In addition, fish surveys will also target invasive species such as fish and crayfish. Finally, Pima County will monitor land-use change and development within the Cienega Creek watershed.

Desert pupfish (Cyprinodon macularius macularius)

Current Occurrence in Pima County and Vicinity

There are no natural populations of this subspecies in Pima County. The Quitobaquito subspecies (*C. m. eremus*) is found at Organ Pipe Cactus National Monument (Kynard 1976, Pearson and Conner 2000, Organ Pipe Cactus National Monument 2006). Other populations of desert pupfish occur throughout the County in constructed ponds.

Management and Conservation Commitments

Pima County will seek to pursue the following management actions and conservation commitments for the desert pupfish if established in Pima County:

1) Implement the Pima County Riparian Protection Ordinance to minimize loss of potential habitat for this species.
2) Use this species for mosquito control if suitable agreements can be made with AGFD and USFWS.
3) Prohibit the use *Gambusia* for mosquito control in pupfish reintroduction sites.

Monitoring
No monitoring is planned for this species unless it is reintroduced into the County Preserve System. If that occurs, Pima County will work with the USFWS to develop an appropriate protocol.

Gila chub (Gila intermedia)

Current Occurrence in Pima County and Vicinity
Present: The Gila chub is currently known to occupy a small number stream segments in Arizona and New Mexico (Weedman et. al. 1996), including Sabino Creek (Dudley and Matter 2000), and Cienega Creek in Pima County (Jeff Simms, unpublished data).

Management and Conservation Commitments
Pima County will seek to pursue the following management actions and conservation commitments for the Gila chub:

1) Implement the Pima County Riparian Protection Ordinance to minimize loss of habitat for this species.
2) Prohibit the use *Gambusia* for mosquito control in reintroduction sites.

Monitoring
Species Monitoring. Pima County will monitor abundance and/or relative abundance of this species using backpack shocker and/or passive sampling at the Cienega Creek Preserve. Monitoring will take place within pools and runs, and multiple-pass depletion sampling will be used for deeper pools. Monitoring will take place every other year, as recommended by (Bodner et. al. 2007) when monitored in combination with other species for which different methods are used (e.g., seine netting; Gila topminnow). By alternating seining and electroshocking (for Gila chub) each year, Pima County minimizes sampling impacts to the species and maximizes opportunities for finding invasive species. The location of monitoring sites will be chosen using simple random sampling.

Habitat. Presence of water will continue to be monitored at Cienega Creek preserve as part of the wet/dry mapping by Pima Association of Governments (Pima Association of Governments 1998). Water availability will also be monitored during fish sampling. Water quality (especially dissolved oxygen and water temperature) are regulated, in part, by vegetation, both hydro-riparian emergent vegetation and trees, sometimes to the detriment of the species (Bodner et al. 2007). Trees adjacent to the creek will be monitored at long-term monitoring plots (or using LiDAR), which will be located along Cienega Creek.

Threats. Pima County has been (and will continue to) monitor groundwater levels at the Cienega Creek Preserve (Pima Association of Governments 1998) and is considering implementing the protocol recommendations in Supplement G; groundwater levels too low will threaten the presence of water and associated vegetation. In addition, annual fish

surveys will also target invasive species such as fish and crayfish. Finally, Pima County will monitor land-use change and development within the Cienega Creek watershed.

Gila topminnow (Poeciliopsis occidentalis occidentalis)

Current Occurrence in Pima County and Vicinity

The only stable populations of the Gila topminnow in Pima County are along stretches of Cienega Creek including the Cienega Creek Natural Preserve (Weedman and Young 1997, Voeltz and Bettaso 2003, Simms et al. 2006, Bodner et al. 2007). Numerous reintroductions have occurred for this species in Pima County, but these efforts have had limited success (Constantz 1979, Weedman and Young 1997). There are populations upstream of Pima County in the Santa Cruz River (Voeltz and Bettaso 2003, Powell et al. 2005) and following floods, individuals may establish in Pima County's portion of the river. Captive-bred populations can be found throughout the County.

Management and Conservation Commitments

Pima County will seek to pursue the following management actions and conservation commitments for the Gila topminnow:

1) Implement the Pima County Riparian Protection Ordinance to minimize loss of habitat for this species.
2) Use as mosquito control if suitable agreements can be reached with AGFD and USFWS.
3) Prohibit the use *Gambusia* for mosquito control in reintroduction sites.

Monitoring

Species Monitoring. P Pima County will monitor abundance of this species at Cienega Creek Preserve using seine nets and employing depletion sampling. Monitoring will take place every other year, as recommended by (Bodner et al. 2007) when monitored in combination with other species for which different methods are used (e.g., electroshocking; Gila chub). By alternating seining and electroshocking (for Gila chub) each year, Pima County minimizes sampling impacts to the species and maximizes opportunities for finding invasive species. Monitoring will take place at $\geq$ 10 pools that are randomly chosen from the all potential pools.

Habitat. Presence of water will continue to be monitored at Cienega Creek preserve as part of the wet/dry mapping by Pima Association of Governments (Pima Association of Governments 1998). Water availability will also be monitored during sampling for fish. Water quality (especially dissolved oxygen and water temperature) are regulated, in part, by vegetation, both hydro-riparian emergent vegetation and trees, sometimes to the detriment of the species (Bodner et al. 2007). Trees adjacent to the creek will be monitored at long-term monitoring plots (or using LiDAR), which will be located along Cienega Creek.

Threats. Pima County has been—and will continue to—monitor groundwater levels at the Cienega Creek Preserve (Pima Association of Governments 1998) and is considering expanding this effort to implement the protocol recommendations in Supplement G; groundwater levels too low will threaten the presence of water and associated vegetation. In addition, annual fish surveys will also target invasive species such as fish and crayfish. Finally, Pima County will monitor land-use change and development within the Cienega Creek watershed.

Desert Sucker (*Castomus clarkii*)

Current Occurrence in Pima County and Vicinity
No known natural populations of this species currently occur in Pima County. There are populations upstream of Pima County in the Santa Cruz (Powell et al. 2005) and San Pedro rivers and following floods, individuals may establish in Pima County.

Management and Conservation Commitment
Pima County will implement the Pima County Riparian Protection Ordinance to minimize loss of habitat.

Monitoring
No monitoring is planned for this species unless it is reintroduced or reestablished into the County Preserve System. If this occurs, Pima County will work with the USFWS to develop appropriate protocols.

Sonora Sucker (Castomus insignis)

Current Occurrence in Pima County and Vicinity
No known natural populations of this species occur in Pima County. There are populations upstream of Pima County in the Santa Cruz (Powell et al. 2005) and San Pedro rivers and following floods, individuals may establish in Pima County.

Management and Conservation Commitment
Pima County will implement the Pima County Riparian Protection Ordinance to minimize loss of habitat for this species.

Monitoring
No monitoring is planned for this species unless it is reintroduced or reestablished into the County Preserve System. If this occurs, Pima County will work with the USFWS to develop appropriate protocols.

6 Amphibians

Chiricahua leopard frog (*Rana chiricahuensis*)

Current Occurrence in Pima County and Vicinity and Vicinity
Populations in Pima County occur in stock tanks in the Buenos Aires National Wildlife Refuge, canyons in the Santa Rita and Baboquivari mountains, and in Cienega Creek adjacent to the Empire Ranch and Cinco ponds areas. At Cinco ponds, approximately 100 individuals were documented in 1989. In 1994 this species was found ranging from Empire Gulch to Springwater Canyon, but failed to appear there in 1996 (Rosen and Caldwell 2004). Three individuals were found in Cienega Creek at Cienega Ranch in 1986 (Rosen and Schwalbe 1988). Recent surveys of the north end of the Santa Rita Mountains at the site of the proposed Rosemont Mine revealed individuals in 9 locations in around the proposed project site (WestLand Resources Inc 2009).

Management and Conservation Commitments
Pima County will seek to pursue the following management actions and conservation commitments for the Chiricahua leopard frog.

1) Implement the Pima County Riparian Protection Ordinance to minimize loss of habitat.
2) Actively manage this species on Pima County owned and leased lands; maintain and/or re-establish several viable populations in springs, tinajas, stock ponds and other suitable sites, in consultation with AGFD and USFWS.
3) Acquire and protect water rights to maintain and restore habitat for this species.
4) County-controlled Mitigation Lands >3,400 feet will be managed for control/removal of invasive exotics to create suitable habitat for this species and protect sites from other stresses such as spread of chytrid fungus and controllable desiccation.
5) Support simultaneous removal of bullfrogs and crayfish across whole landscapes, where feasible.
6) Discourage creation of pond or lake environments where invasive exotics cannot be prevented on Pima County land.
7) Where feasible, incorporate wildlife crossings into transportation project design in appropriate locations.

Monitoring
<u>Species Monitoring</u>. No know populations of this species currently exist within the County Preserve System. However, Pima County will inventory new acquisitions and leased lands (>3,400 feet elevation) for new populations. For populations that are found within the County Preserve System, Pima County will monitor for occupancy at least two times in late spring and early summer (pre-monsoon) at least every other year. Monitoring will be for any

stage of the species life cycle (eggs, tadpoles, adults) using a visual encounter survey (Heyer 1994) that has been modified by the Arizona Game and Fish Department for this species (U. S. Fish and Wildlife Service 2007a). Don Swann (Saguaro National Park) has also developed a survey protocol for the lowland leopard frog and Pima County will investigate the use of that protocol, which also includes a rapid assessment of habitat conditions (mostly water availability) at each visit. Pima County will develop a database for incidental observations of this species so that County staff and cooperators can record observations made while performing other functions.

Habitat. The presence of water is a key habitat feature for this species and therefore the availability of water at monitoring sites will be recorded during surveys for the species. During baseline surveys for this species, Pima County will map potential habitat for this species, with particular emphasis on mapping the location and dimensions of all tinajas within the creek reaches that contain or could contain the species. Water quality (especially dissolved oxygen and water temperature) are regulated, in part, by vegetation, both hydro-riparian emergent vegetation and trees. Trees adjacent to appropriate habitat will be monitored at long-term monitoring plots (or using LiDAR).

Threats. Pima County will participate in monitoring efforts for the chrytid fungus.

Lowland leopard frog (*Rana yavapaiensis*)

Current Occurrence in Pima County and Vicinity

Populations in Pima County are found at Cienega Creek (Caldwell 2002, Rosen and Caldwell 2004) and nearby Davidson Canyon (WestLand Resources Inc 2008), several canyons in the Rincon Mountain District of Saguaro National Park (Flesch et. al. 2006, Swann and Wallace 2008), and several sites in the Santa Catalina Mountains including Sabino, Buehman, Romero, and Molino canyons (Arizona Game and Fish Department 2009b) and Agua Caliente Wash (Sartorius and Rosen 2000).

Management and Conservation Commitments

Pima County will seek to pursue the following management actions and conservation commitments for the lowland leopard frog:

1) Implement the Pima County Riparian Protection Ordinance to minimize loss of habitat.
2) Actively manage this species on County-controlled Mitigation Lands; maintain and/or re-establish several viable populations in springs, tinajas, stock ponds and other sites, where appropriate and in coordination with the USFWS and AGFD.
3) Cooperate with AGFD to establish populations with known genetic sources in new urban environments (backyard ponds, golf courses, park ponds) as well as natural environments (including restored stream segments and springs).
4) Acquire and protect select water rights to maintain and restore habitat for this species.

5) County-controlled Mitigation Lands will be managed for control/removal of invasive exotics to create suitable habitat for this species and protect sites from other stresses such as spread of chytrid fungus and controllable desiccation.
6) Support simultaneous removal of bullfrogs and crayfish across whole landscapes, if feasible.
7) Where feasible, incorporate wildlife crossings into transportation project design in appropriate locations.

Monitoring

Species Monitoring. Pima County will inventory new acquisitions and leased lands for new populations. For populations that are found or that currently exist within the County Preserve System, Pima County will monitor for occupancy at least two times in late spring and early summer (pre-monsoon) every other year. Monitoring will be for any stage of the species' life cycle (eggs, tadpoles, adults) using a visual encounter survey (Heyer 1994) that has been modified by the Arizona Game and Fish Department for the Chiracahua leopard frog (U. S. Fish and Wildlife Service 2007a). Don Swann (Saguaro National Park) has also developed a survey protocol for this species and Pima County will investigate the use of that protocol, which includes a rapid assessment of habitat conditions (mostly water availability) at each visit. Pima County will develop a database for incidental observations of this species so that County staff and cooperators can record observations made while performing other functions.

Habitat. The presence of water is a key habitat feature for this species and therefore the availability of water at monitoring sites will be recorded during each survey. During baseline surveys for this species, Pima County will map potential habitat for this species, with particular emphasis on mapping the location and dimensions of tinajas within the creek reaches that contain or could contain the species. In the Cienega Creek preserve Presence, Pima County and it partners (Pima Association of Governments) will continue to monitor stream flow (Pima Association of Governments 1998). Water quality (especially dissolved oxygen and water temperature) are regulated, in part, by vegetation, both hydro-riparian emergent vegetation and trees. Trees adjacent to the creek will be monitored at long-term monitoring plots (or using LiDAR), which will be located along Cienega Creek.

Threats. Pima County has been, and will continue to, monitor groundwater levels at the Cienega Creek Preserve (Pima Association of Governments 1998) and is considering the protocol recommendations in Supplement G; groundwater levels too low will threaten the presence of water and associated vegetation. In addition, annual fish surveys will also target invasive species such as fish and crayfish that prey on the frog. Finally, Pima County will monitor land-use change and development within the Cienega Creek watershed.

7 Reptiles

Giant spotted whiptail (Cnemidophorus burti stictogrammus)

Current Occurrence in Pima County and Vicinity
The giant spotted whiptail currently occurs in eastern Pima County at the foothills of the Santa Catalina, Rincon, San Luis, Baboquivari and Santa Rita mountains; and along the West Branch of the Santa Cruz River, Arivaca Creek, and Empire Gulch (Edwards and Swann 2003, Flesch et al. 2006, Arizona Game and Fish Department, 2009 #2480, Rosen 2008c).

Management and Conservation Commitments
Pima County will seek to pursue the following management actions and conservation commitments for the giant spotted whiptail:

1) Implement the Pima County Riparian Protection Ordinance to minimize loss of habitat.
2) Where feasible, incorporate wildlife crossings into transportation project design in appropriate locations.

Monitoring
Habitat. Habitat features that are important for this species are primarily meso-riparian and xero-riparian washes with often dense stand of vegetation, small rock outcrops, and course woody debris. Pima County will monitor dominant perennial vegetation species, vegetation density and volume, and course woody debris at long-term monitoring sites within the County Preserve System. Loss of dense vegetation in key areas along streams and washes and within the species' PCA will be of concern for this species. Because of the importance of riparian systems this and other species, Pima County will ensure that an adequate number of long-term monitoring sites and/or other monitoring (e.g., use of remote sensing tools) are within the riparian stratum.

Threats. Pima County will periodically quantify loss and fragmentation of habitat in the species' PCA. Pima County will also monitor the location and extent of wildland fire within the County Preserve System, which could adversely impact this species. The encroachment of fountain grass is also of concern and this will be monitoring along select stream courses.

Red-backed whiptail (Cnemidophorus burti xanthonotus)

Current Occurrence in Pima County and Vicinity
The red-backed whiptail is known to be present from the Ajo and Puerto Blanco mountains and Dripping Springs at Organ Pipe Cactus national Monument (Organ Pipe Cactus National Monument 1999, Flesch 2008a, Arizona Game and Fish Department 2009a) and Martina Mountain (Phil Rosen, personal communication to David Scalero, 4 March 1999).

Management and Conservation Commitments
Pima County will review credible reports of the species entering into the Permit Area.

Monitoring
Habitat. Habitat features that are important for this species are dense vegetation along stream banks, rock outcrops, and course woody debris. Pima County will monitor dominant perennial vegetation species and vegetation density and volume as part of the habitat-based monitoring element of the PCEMP. Data on woody debris will also be monitored at long-term monitoring sites. Loss of dense vegetation in key areas along streams and washes and within the species' PCA will be of concern for this species.

Threats. Pima County will periodically quantify loss and fragmentation of habitat in the species' PCA.

Desert box turtle (Terrapene ornate luteola)

Current Occurrence in Pima County and Vicinity
The distribution of this species in Pima County is not well known, but it has been observed in the Las Cienega Conservation Area, in the Santa Cruz River valley near Sahuarita, and in the Altar Valley (Arizona Game and Fish Department 2009b). A few specimens have been found along the San Pedro River in Pima County (Hall and Steidl 2007). A dead carcass was located on Esperanza Ranch south of Tucson (Llewellyn and Zetlan 2007). Two individuals were found in the Rincon Mountain District of Saguaro National Park in 2005 (Flesch et al. 2006), but it is unclear if these are natural populations or released pets (Phil Rosen, personal communication to Don Swann).

Management and Conservation Commitments
Pima County will seek to pursue the following management action and conservation commitment for the desert box turtle:

1) Protect and enhance habitat conditions for existing natural populations (mainly Cienega Creek and San Pedro River) as indicated by emerging research.
2) Where feasible, incorporate wildlife crossings into transportation project design in appropriate locations.

Monitoring
Species monitoring. Pima County will develop a database for incidental observations of this species so that County staff and cooperators can record observations made while performing other functions.

Habitat. Habitat features that are important for this species are semi-desert grasslands, from shrubless areas to grasslands moderately invaded by shrubs and trees such as mesquite. The desert box turtle is also associated with sparse to moderate densities of perennial grasses. Pima County will monitor dominant perennial woody and grass species

and vegetation density and volume at long-term monitoring plots within the County Preserve System. An increase in shrub cover in semi-desert grasslands will be of concern for this species.

Threats. Pima County will periodically quantify loss and fragmentation of habitat in the species' PCA. Pima County will also monitor the location and extent of wildland fire within the County Preserve System, which could adversely cause lethal take of individuals. Ultimately, however, fire is likely a net positive for this species as fire helps to reduce shrub cover.

Sonoran desert tortoise (*Gopherus agassizii*)

Current Occurrence in Pima County and Vicinity

The Sonoran desert tortoise is widespread across many low elevation areas of Pima County where rocky outcrops, caliche-incised washes, and bajadas occur. They are found west of Tucson in the Avra Valley and nearby Mountains (Rosen 2003, Flesch et al. 2006, Zylstra 2008, Town of Marana 2009), north and east of Tucson in the Santa Catalina and Rincon mountains (Murray 1996, Flesch et. al. 2007, Zylstra 2008), and the far western portion of the County (Rosen and Lowe 1996, Wirt et. al. 1999, Schmidt et al. 2007).

Management and Conservation Commitments

Pima County will seek to pursue the following management action and conservation commitment for the Sonoran desert tortoise:

1) Review directives in the forthcoming Management Plan for the Sonoran Desert Population of the Desert Tortoise in Arizona.
2) Acquire conservation land if known occupied habitat becomes available.
3) Protect and create linkages and travel corridors to the extent possible.
4) Where feasible, incorporate wildlife crossings into transportation project design in appropriate locations.

Monitoring

Species monitoring. Pima County recognizes the need to monitor this wide-ranging, long-lived species, but believe this is best done at a larger spatial scale than the County's preserve network. To this end, Pima County awaits the development of a long-term monitoring protocol to be developed by the Arizona Game and Fish Department. Once that plan is released, Pima County will decide if the plan is appropriate for Pima County to be involved. Pima County will develop a database for incidental observations of this species so that County staff and cooperators can record observations made while performing other functions.

Habitat. Habitat features that are important for this species include burrows and shrubby desert upland vegetation. Pima County will monitor dominant perennial woody and grass

species and vegetation density and volume at long-term monitoring sites within the County Preserve System. Changes in understory species composition, especially the increase in buffelgrass (which causes a reduction in food sources), are likely to impact this species, and therefore is a concern.

Threats. Pima County will periodically quantify loss and fragmentation of habitat in the species' PCA. As noted in the habitat section (above), Pima County will continue to collect information on the spatial distribution and relative abundance of buffelgrass within the County' Preserve System and provide this information to the Buffelgrass Coordination Center, which is standardizing the protocol for buffelgrass mapping and abundance estimates (Rogstad 2008).

Mexican garter snake (Thamnophis eques megalops)

Current Occurrence in Pima County and Vicinity and Vicinity

Once found along the Rillito and Santa Cruz rivers in an around Tucson, the only current locations in Pima County are at Cienega Creek, including the Cienega Creek Natural Preserve (Rosen and Schwalbe 1988, Rosen and Caldwell 2004). It is thought to occur in the Altar Valley and Arivaca Cienega, but no confirmation has been found (Rosen and Schwalbe 1988). No other Pima County locations were found for this snake (Arizona Game and Fish Department 2009a). A 2007 survey of the lower Santa Cruz River found no Mexican garter snakes (D. Abbate personal communication, in Town of Marana 2009). The species is found in greater abundance to the southeast of Pima County in the San Raphael Valley, Canelo Hills, and Sonoita grasslands (Rosen et. al. 2001). Pima County will also develop a database for incidental observations of this species so that County staff and cooperators can record observations made while performing other functions.

Management and Conservation Commitments

Pima County will seek to pursue the following management action and conservation commitment for the Mexican garter snake:

1) Implement the Pima County Riparian Protection Ordinance to minimize loss of habitat.
2) Acquire and protect water rights to maintain and restore habitat.
3) Where feasible, incorporate wildlife crossings into transportation project design in appropriate locations.

Monitoring

Species Monitoring. Pima County will monitor occupancy of this species at Cienega Creek Preserve using either visual encounter surveys (Heyer 1994) or minnow traps, which have been successful for capturing this species (Rosen and Caldwell 2004). Because of the low detectability of this species, Pima County will survey a select set of sites at least four times within a seasonal period of peak activity for this species (MacKenzie et al. 2003, MacKenzie et al. 2006). Pima County will monitor the same sites every three years.

Habitat. Habitat features that are important for this species are close proximity to standing water, emergent vegetation, hydro-riparian streamside vegetation, and course woody debris. To monitor these some of these habitat needs, Pima County and its partner Pima Association of Governments will continue to monitor the distribution of standing water at Cienega Creek Preserve. Pima County will also monitor vegetation at the Preserve and other locations with the species' PCA in the County Preserve System, with particular emphasis on mesic riparian areas. Pima County is also investigating the use of LiDAR to monitor, which are important for this species.

Threats. Pima County will periodically quantify loss and fragmentation of habitat in the species' PCA. Pima County may also monitor groundwater levels in select sites in eastern Pima County (e.g., Tanque Verde Creek and Cienega Creek Preserve) using the protocol recommendations in Supplement G; groundwater levels too low will threaten the open water and associated vegetation that is so important to this species.

Ground snake (valley form) (*Sonora semiannulata*)

Current Occurrence in Pima County and Vicinity

Found in desert grassland areas around the base of the Tortolita, Santa Catalina, and Rincon mountains. Two individuals were found at the Rincon Mountain District of Saguaro National Park in 2001-2002 (Flesch et al. 2007), but no individuals were found in the Tucson Mountain District of Saguaro National Park (Flesch et al. 2006). Rosen (2004) reports other credible historical sightings near Oracle and Reddington Pass and throughout the Avra Valley. Four historical records of the ground snake show that it occurs along the Blanco Wash, from the confluence with the Santa Cruz River south to Avra Valley Road (City of Tucson 2008). In June 2003, one ground snake was found at Blanco Wash and Silverbell Road (Rosen 2004). In 2004, ground snakes were confirmed to persist at Red Rock (Pinal County). Surveys in 2004 found no reconfirmation of the species along I-10, near the Marana exit (Rosen 2004), but surveys in 2008 revealed two individuals (Rosen 2008a). A photographic voucher was collected at the base of the Tortolita Mountains in the Town of Marana, near Stone Canyon (Rosen 2004).

Management and Conservation Commitments

Pima County will seek to pursue the following management action and conservation commitment for the ground snake:

1) Implement the Pima County Riparian Protection Ordinance to minimize loss of habitat.
2) Acquire conservation land if known occupied habitat becomes available.
3) Conserve County lands along the Santa Cruz River floodplain downstream of the Avra Valley Road.
4) Where feasible, incorporate wildlife crossings into transportation project design in appropriate locations.

Monitoring

Species Monitoring. Pima County will develop a database for incidental observations of this species so that County staff and cooperators can record observations made while performing other functions.

Threats. Pima County will periodically quantify loss and fragmentation of habitat in the species' PCA. Buffelgrass is likely a threat to this species and Pima County will continue to collect information on the spatial distribution and relative abundance of buffelgrass within the County Preserve System and provide this information to the Buffelgrass Coordination Center, which is standardizing the protocol for buffelgrass mapping and abundance estimates (Rogstad 2008). Off-road vehicle use in this species' habitat is very likely impacting this species. To monitor this, Pima County staff will note off-road vehicle (ORV) use during site visits to properties. ORV use can also be detected with visual inspection of aerial images, and possibly with the use of LiDAR.

Tucson shovel-nosed snake (Chionactis occipitalis klauberi)

Current Occurrence in Pima County and Vicinity

The last known records of the Tucson shovel-nosed snake in or near Pima County were: (1) Sanders Road and Avra Valley Road in 1979 (Rosen 2003) (2) and near Picacho Reservoir (Pinal County) in 2006 and 2007 (Rosen 2008b), and (3) north of the West Silverbell Mountains (Pinal County) (Rosen 2008b). One individual was found in the Sonoran Desert National Monument on State Route 238. Despite extensive survey efforts to locate the species in the Avra Valley, particularly in 2007-2008, no individuals were found (Rosen 2003, 2007, Rosen 2008b). It is unknown if the species currently persists in the Permit Area.

Management and Conservation Commitments

Pima County will seek to pursue the following management action and conservation commitment for the Tucson shovel nosed snake:

1) Acquire conservation land if known occupied habitat becomes available.
2) Conserve County lands along the Santa Cruz River floodplain downstream of the Avra Valley Road.
3) Where feasible, incorporate wildlife crossings into transportation project design in appropriate locations.

Monitoring

Species Monitoring. Pima County will develop a database for incidental observations of this species so that County staff and cooperators can record observations made while performing other functions. Pima County will also investigate any credible sighting of this species with the County Preserve System.

Habitat. Habitat features that are important for this species are open, undeveloped areas with sandy to loamy soils. Soils type and consistency are part of initial assessments of long-term monitoring plots. Pima County is also investigating the use of LiDAR to monitor and soil impacts from off-road vehicle use.

Threats. Fragmentation and degradation of habitat is key for this species and Pima County will periodically quantify loss and fragmentation of habitat in the species' PCA. As noted in the habitat element, off-road vehicle use in this species' habitat is very likely impacting this species. To monitor this, Pima County staff will note off-road vehicle (ORV) use during site visits to properties. ORV use can also be detected with visual inspection of aerial images, and possibly with the use of LiDAR. Buffelgrass is likely a significant threat to this species and Pima County will continue to collect information on the spatial distribution and relative abundance of buffelgrass within the County' Preserve System and provide this information to the Buffelgrass Coordination Center, which is standardizing the protocol for buffelgrass mapping and abundance estimates (Rogstad 2008).

8 Invertebrates

Talus snails (*Sonorella* species)

Current Occurrence in Pima County and Vicinity

This diverse genus of rock snail is usually found in loose masses or "slides" of coarse broken volcanic or limestone rock known as talus. Many different species are known to occur in Pima County, at a variety of elevations:

Species Name	Known Location(s) in Pima County
Sonorella. papagorum syn w/ S. ambigua (may also be syn. w/ eremita)	Black Mtn, San Xavier District
S. eremite	Mineral Hill; San Xavier District
S. imperatrix	Total Wreck Mine vicinity
S. imperialis	Empire Mtns
S. insignis	Whetstone
S. magdalenensis syn. S. tumamocensis	Cerro Colorado; Roskruge; S. Tucson Mtns; N. Santa Ritas, Tumamoc Hills
S. odorata odorata; o. marmoris	Head of Alder Canyon; Old Dan's Gulch below Marble Peak; Soldier Camp; Bear Wallow
S. rosemontensis	Rosemont area
S. sitiens	Las Guijas Mtn
S. sabinoensis	Tucson Mtns Wild Pig Amphitheater; Buehman
S. tortillita	Tortilita Mtns.

Management and Conservation Commitments

Pima County will seek to pursue the following management action and conservation commitment for talus snails:

1) Talus deposits should be identified in rapid assessments for preserve management purposes, and prioritized for survey efforts.
2) Management plans for County reserves that include talus deposits should recommend specific measures to avoid and minimize disturbances from County activities. Discretionary projects may not be routed across potentially occupied habitat.
3) If buffelgrass management is needed on occupied talus deposits in County-controlled Mitigation Lands, best management practices should be developed first, in consultation with mollusc experts.
4) Requests from outside agencies for right-of-way, grading and floodplain permits should be reviewed for potential habitat impacts. Further investigations of potentially suitable habitat should be required, inclusive of focused surveys and support for confirmation of species taxonomy.
5) If state or federal agencies permit an activity on County-controlled Mitigation Lands over which Pima County has no jurisdiction, Pima County will request avoidance, inclusive of donation of property rights on remaining habitat and taxonomic studies.
6) Map talus deposits on the urban periphery.
7) Develop avoidance and minimization measures that apply to utility construction across such deposits.
8) Pima County and BLM will evaluate the potential for talus snail occurrences located on BLM Recreation and Public Purposes Act lands.

Monitoring

Species monitoring. Inventory of talus slopes will be conducted within the County Preserve System. Site visits will include searching for evidence of talus snails (i.e., shells).

Threats. Pima County will visit known locations with talus snails every 3-5 years to note changes or threats. Pima County will periodically quantify loss and fragmentation of habitat in the species' PCA using methods described in the MSCP.

Arkenstone cave pseudoscorpion (*Albiorix anophthalmus*)

Current Occurrence in Pima County and Vicinity

This species is only known to occur in Arkenstone cave and (more recently discovered in) Colossal Cave in Colossal Cave Mountain Park.

Management and Conservation Commitments

Pima County will seek to pursue the following management action and conservation commitment for the Arkenstone cave Pseudoscorpion:

1) Gather all information (locations, research, threats) about the Colossal Cave complex.

2) Establish electronic and physical repositories for records for the complex.
3) Create advisory group to draft inventory, research, and monitoring needs for the cave complex.
4) Establish standard operating procedures for permitting research activities and until then restrict access for any purpose.
5) Establish standards and guidelines for management of caves by all Pima County departments.

Monitoring

Species. Recent sightings of this species in Colossal Cave may represent an opportunity to monitor presence without entering Arkenstone Cave. Pima County will work with park staff to determine the feasibility of this approach.

Threats. The primary concern for this species is vandalism and loss of food resources. Pima County will periodically check to ensure of no unauthorized entry into Arkenstone Cave is permitted. Also, bats within Colossal Cave will be monitored and any precipitous decline in this group of species may be a precursor to changes the Arkenstone Cave pseudoscoprion. (The Pseudoscorpion feed on insects that—in turn—feed on bat guano). If there is a significant reduction in bat populations at the caves, Pima County will consult with experts to determine if additional research is needed.