Pima County Multi-species Conservation Plan: 2017 Annual Report

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Photograph on report cover:

Fish monitoring, effluent-dependent Santa Cruz River downstream of Tucson

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1 Introduction

Pima County's Section 10(a)(1)(B) Incidental Take permit (herein Section 10 permit or permit) for the Pima County Multi-species Conservation Plan (MSCP; Pima County 2016) was signed by the Pima County Administrator on July 13, 2016. This report is prepared for the U.S. Fish and Wildlife Service (USFWS) under Incidental Take permit #TE84356A and covers the time period January 1 through December 31, 2017.

Most of the activities discussed in this annual report occur on lands managed or regulated by Pima County and/or Pima County Regional Flood Control District (RFCD), the two permittees under the Section 10 permit. (Pima County and RFCD are herein referred to collectively as "Pima County" unless otherwise noted). Private lands coverage began in January 2017, with the launch of the Certificate of Coverage Program.

The permit area is located within Pima County, Arizona (Figure 1). Land ownership in Pima County is primarily tribal, federal and state trust land (Figure 2).

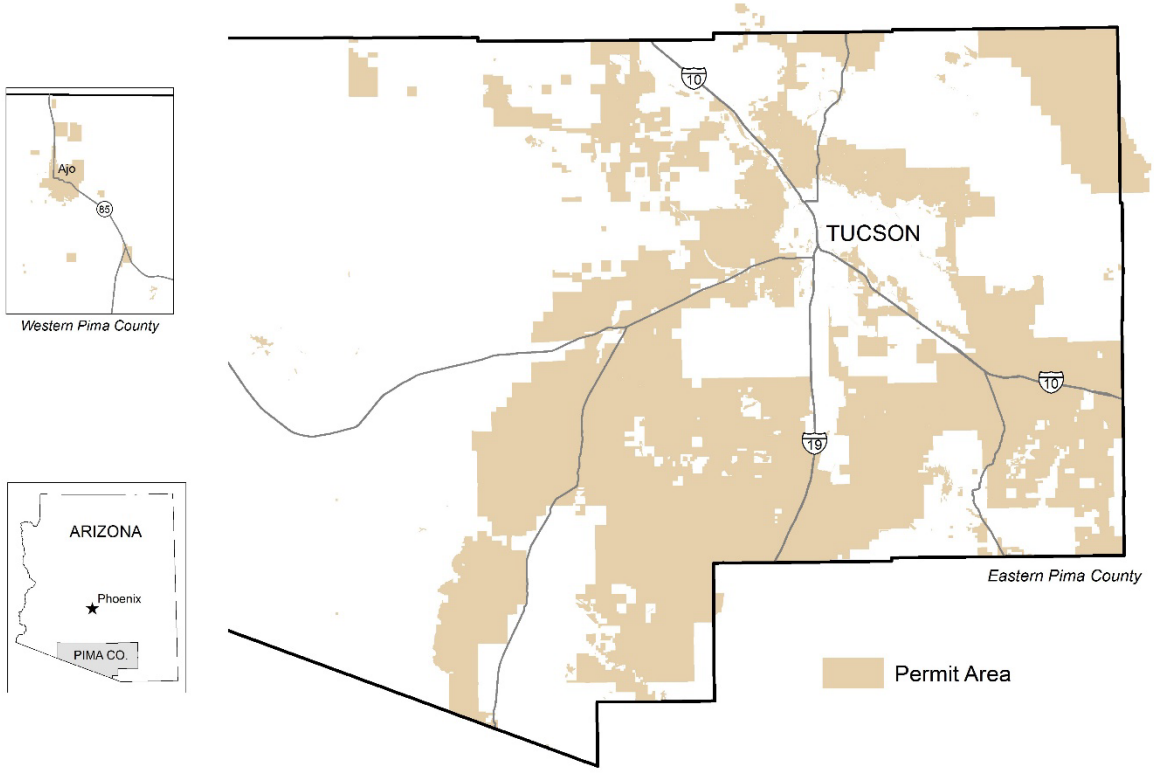

Figure 1. Permit Area of Pima County's Multi-species Conservation Plan.

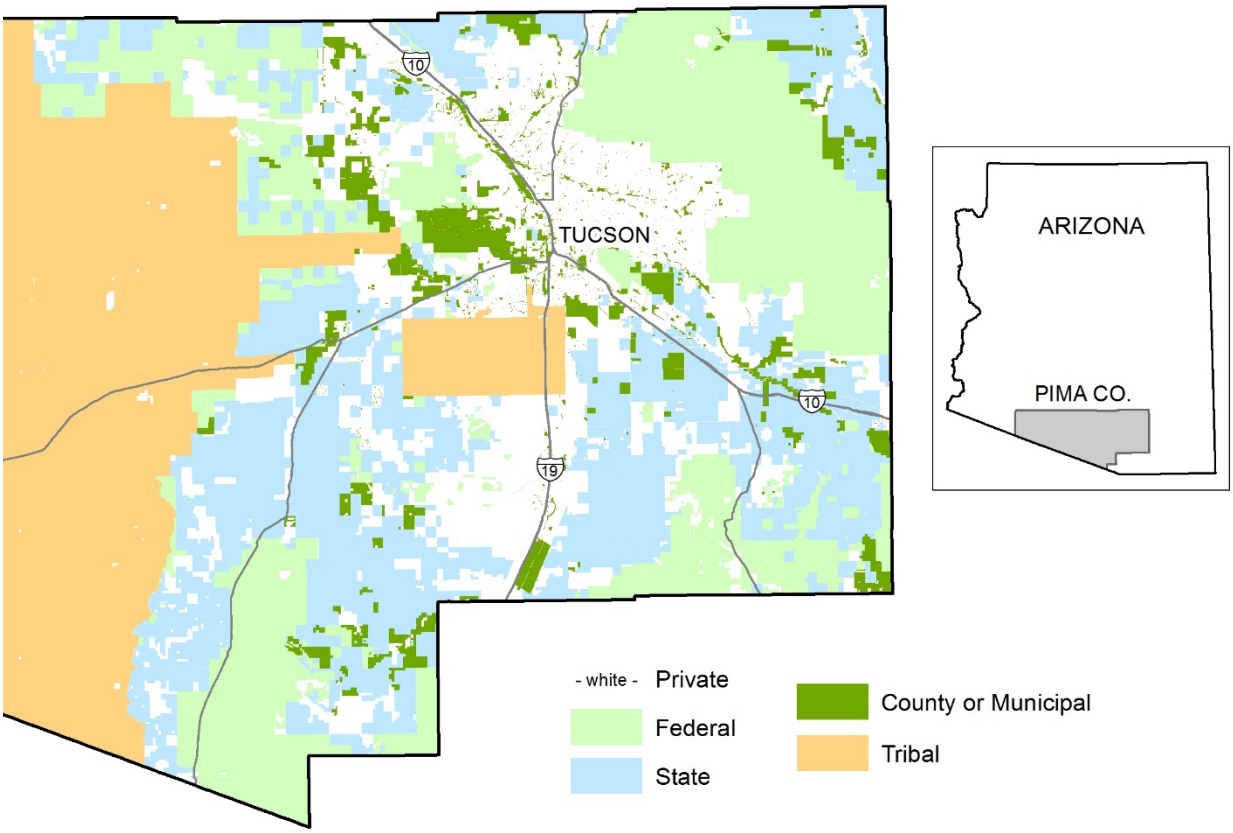

Figure 2. Land ownership in eastern Pima County, as of December 2017. See Figure 3 for location of changes in land ownership during the reporting period.

Annual reporting is required under the terms of the permit. The primary purposes of this annual report, as described in Chapter 9 of the MSCP, are to:

1. Quantify impacts of Covered Activities and mitigation for these impacts;
2. Provide updates on the implementation of the MSCP; and
3. Inform the decision-making process if conditions of the permit or Implementing Agreement are not being met, or when adaptive management is needed.

The format of this report follows the template in the Appendix P of the MSCP. A glossary of terms and acronyms (Pages 53-55) is included to assist the reader and ensure consistency between this document and the MSCP.

2 Permit Changes

No amendments to the MSCP or permit language changes occurred during the reporting period.

3 Administrative Changes

3.1 Permit Area

The Permit Area represents the area within which Covered Activities could occur and has changed slightly during 2017 (Figure 3)—as compared to its description in the MSCP—for the following reasons:

- Annexation has the effect of slightly reducing the Permit Area in which coverage of private activities would become available. Annexations are shown in blue in Figure 3.
- Federal land acquisitions (red in Figure 3) reduce the permit area. Land along the CAP canal and adjacent to Saguaro National Park were conveyed to the federal government.

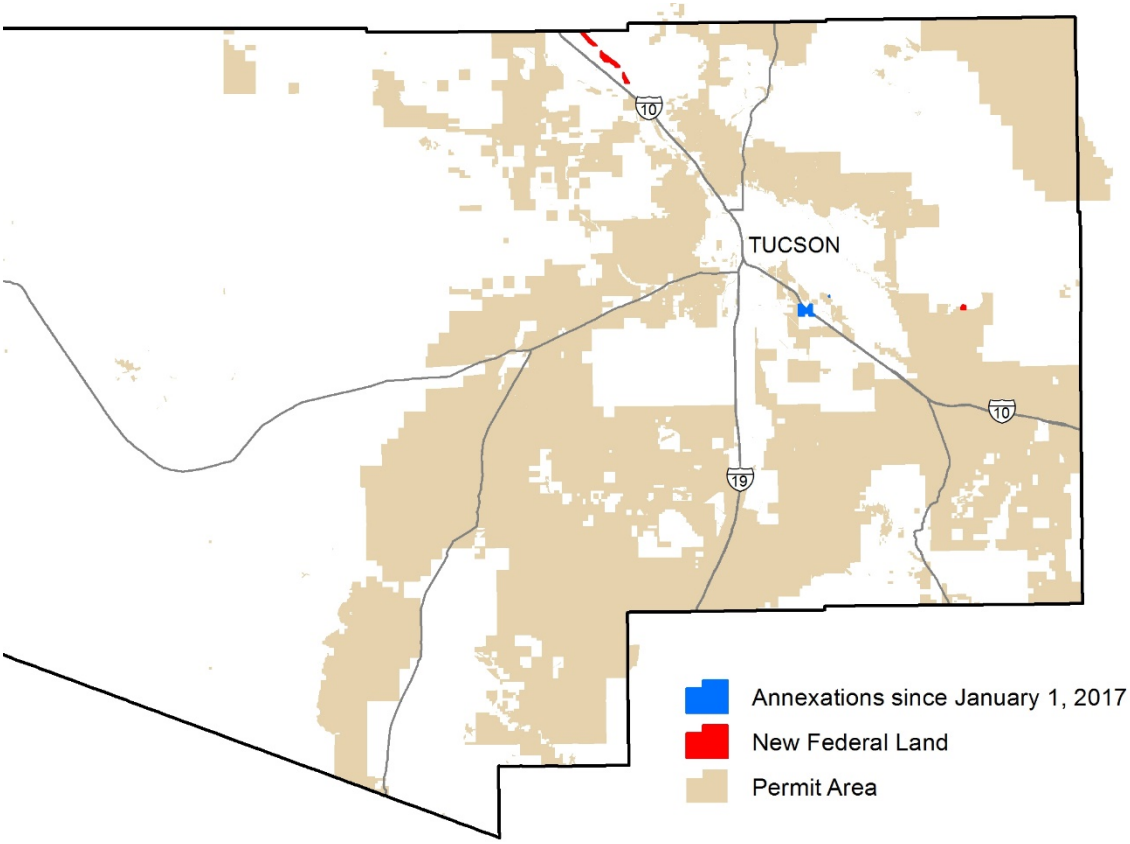

Figure 3. Permit Area changes for Pima County's Multi-species Conservation Plan, January 1 through December 31, 2017. Annexations and a federal land acquisition slightly diminished the Permit Area extent.

3.2 Land Protection

On October 18, 2016, the Pima County and District boards approved master restrictive covenants on 64,487 acres of County-owned land. The covenants prohibit the County from authorizing many types of development such as cell phone towers, golf courses, subdivisions and other land uses that are incompatible with the purposes for which the lands were originally acquired. The restrictive covenants address the MSCP commitment and Section 10 permit

requirements that the County and RFCD provide perpetual legal protection for those open-space lands that are to be used to mitigate for Covered Activities. Lands that are subject to these restrictive covenants are considered to be encumbered.

Legal recordation of restrictive covenants was completed in 2017, triggered the obligation for biennial inspections (Table 1). Inspections conducted in 2017 are discussed under the Monitoring section.

Table 1. Restrictive covenant roles and duties for the Pima County Multi-species Conservation Plan and Section 10(a)(1)(B) permit.

Name (Role)	Duty	Frequency
County or District (landowner)	Inspection and reporting	Biennially, at a minimum
	Violation identification and reporting	Within 2 days of identifying
	Determine when Board action may be necessary for exceptions	As needed
County or District (holder of covenant)	Review potential violations	When delivered
	Review biennial inspection reports	When delivered
	Enforce covenant	At their discretion
	Grant permission for release or alteration of covenants	At their discretion
Arizona Land and Water Trust (beneficiary)	Review biennial inspections	When delivered
	Decide when to enforce	At their discretion
USFWS (regulator)	Grant permission for release or alteration of MSCP covenants	At their discretion

3.3 Army Corps of Engineers Programmatic Consultation

Pursuant to the programmatic consultation with U. S. Army Corps of Engineers (Corps), Pima County worked with the USFWS and the Corps to develop a template for streamlining Endangered Species Act compliance for the 18 nationwide and regional general Clean Water Act permits listed in the MSCP. During 2017, the Corps provided information about the completion status of any projects which might be streamlined via MSCP coverage. One RFCD channel maintenance project utilized this streamlined process during this reporting period. Several inquiries were made regarding the coverage for 404 projects on private lands, but none resulted in a nationwide permit referencing the Section 10 permit.

The USFWS, Corps, and Pima County agreed to report annually on the status of Corps permits issued in relation to the Section 10 permit. The first such report is included in Appendix 1. During 2017, one Corps permit utilized the programmatic consultation.

3.4 Miscellaneous Administration Items

- There were no information requests by the USFWS to Pima County for the purpose of assessing whether the terms and conditions of the permit are being met.
- There were no changes to habitat models or Priority Conservation Areas.
- There were no changes in regional Endangered Species Act listings or critical habitat designations in 2017.

- USFWS authorized Pima County to include old landfills in the built environment reference layer, which is used to calculate take for County capital improvement projects. These updates were completed in 2017.

4 Incidental Take

This section describes incidental take caused by the covered activities identified in the MSCP. As noted in section 3.7.1 of the MSCP, incidental take is determined by acres of habitat loss and reported take of individuals. Permit coverage for private lands began on January 9, 2017, with activation of the Certificate of Coverage Program. Therefore, this will be the first reporting period to include habitat loss from development activities on private land.

4.1 Certificates of Coverage - Development on Private Land

The Certificate of Coverage Program (www.pima.gov/S10PrivateLand) affords the developer of a home, subdivision, commercial, or industrial project an opportunity to comply with the ESA for activities that are permitted by the County. Participation in the program is voluntary and in the sole discretion of the private developer. In 2017, 14 private development projects received coverage under the permit (Table 2, Figure 4).

Table 2. Certificates that provided permit coverage for private development in 2017, Pima County.

Certificate of Coverage #	Habitat Loss Acreage
P17CC00003	1.46
P17CC00005	0.97
P17CC00007	0.99
P17CC00008	1.01
P17CC00012	1.16
P17CC00013	0.83
P17CC00014	0.83
P17CC00015	1.15
P17CC00016	3.63
P17CC00018	1.65
P17CC00019	1.46
P17CC00024	1.10
P17CC00025	3.05
P17CC00027	0.89
Total	20.17

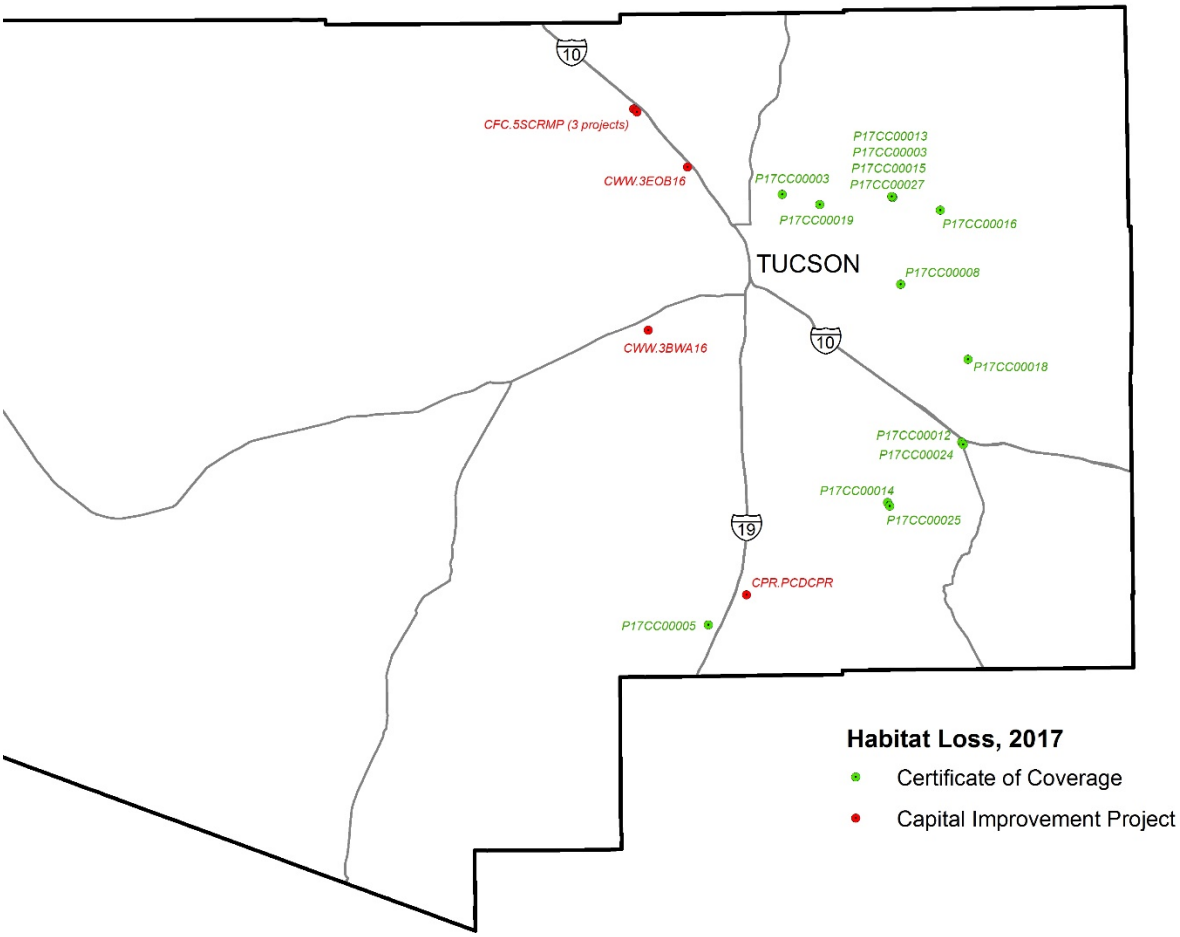

Figure 4. Location of habitat loss due to Covered Activities, January 1- December 31, 2017. Locations are enlarged for clarity. Most ground-disturbing County Capital Improvement Program (CIP) projects occurred inside the built environment, and did not require mitigation. Private projects may elect coverage through the Certificate of Coverage program, and each such project receives mitigation.

4.2 County Capital Improvement Projects

There were 33 County Capital Improvement Program (CIP) projects covered by the permit in 2017 (Appendix 2). Many of the covered projects listed in Appendix 2 did not cause ground disturbance, and others occurred in the built environment where no mitigation is required. Covered Activities also include non-CIP projects and activities that occurred in various locations throughout the permit area but these are not required to be listed each year in the annual report.

After discussion with the USFWS Tucson Field Office, it was mutually determined that a County CIP project would be reported as a Covered Activity whenever it is determined to be "substantially" complete, which is after most of the earthwork is done, but prior to completion of all activities such as landscaping and payment of invoices.

Appendix B of the MSCP describes the methodology used to calculate take for Covered Activities. For the impacts caused by the County, this involves tracking the location and size of areas altered by CIP projects. The tracking process for CIP projects has been in place for several years and requires the submittal of Geographic Information System (GIS) "polygons" which describe the location and aerial extent of completed projects. This tracking process is discussed in greater detail in Section 5.2 of this report.

The built environment layer used for tracking impacts is not always accurate, and this resulted in the need to discuss how to do impacts tracking for several park projects with USFWS. Parks are often a mixed of developed and natural areas. The lining of an existing pond at Agua Caliente affected an already developed area, so this is not recorded as a CIP project to be mitigated. Improvements to the Canoa Ranch headquarters were confined to the developed area and substantially completed prior to the permit, so this project was not mitigated.

4.3 Covered Activities Impacts

Polygons for ground-disturbing CIP projects that were completed on or before December 31, 2017 were used to calculate impacts. These "final polygons" were intersected with the Built Environment GIS layer (known as CIPBUILT). Those portions outside the built environment were then intersected with the Maeveen Marie Behan Conservation Lands System (CLS) to determine the habitat loss, as described in Appendix B of the MSCP. Each CLS category has a specific mitigation ratio that is used to calculate the MSCP mitigation obligation (as described in Section 4.3.1. of the MSCP).

In 2017, four ground-disturbing CIP projects (Figure 4; totaling 28.9 acres) required the County to provide 106.2 acres of mitigation.

Table 3 summarizes the acres of impact for CIP and private development, along with the CLS category and mitigation ratios that applied to these impacts. There was 49.1 acres of loss in 2017; consequently, Pima County will provide 171.65 acres of mitigation.

Table 3. Habitat loss and associated mitigation ratios for 2017, Pima County MSCP.

CLS category	Habitat Loss Acreage	Mitigation Ratio	Mitigation Obligation
Biological Core	6.1	5:1	30.7
Important Riparian Area	16.1	5:1	80.4
Multiple Use Management Area	6.9	3:1	20.6
Special species management area (outside other categories)	0	5:1	0
Outside the CLS	20.0	2:1	40.0
Total	49.1		171.7

5 Conservation Measures

5.1 Avoidance and Minimization

5.1.1 Changes to Ordinances and Standards

In 2017, there were no changes to avoidance and minimization measures as described in Section 4.2 of the MSCP.

5.2 CIP Screening and Reporting Process

The CIP impact reporting process was updated upon approval of the permit and again in 2017. Through an automated GIS script, this process notifies CIP project managers of the intersections between proposed project locations, site-specific natural resources, and protected areas in order to promote avoidance and minimization during planning. The Pima pineapple cactus Priority Conservation Area, burrowing owl Priority Conservation Area, potential bat habitat under bridges, and the need for floodplain compliance are specifically included. During 2017, additional screenings were added to support use of the nationwide permits and to ensure project screening of any projects that might occur in areas of critical habitat for jaguar, Sonoran pronghorn, and Acuna cactus. Effects to these species are not covered by the Section 10 permit.

OSC continues to provide advice on avoidance and minimization for individual projects as requested by the County departments.

5.3 Gila Topminnow for Vector Control

In 2016, County staff began discussions with the USFWS and the Arizona Game and Fish Department (AZGFD) to use native fish for vector control, as outlined in section 3.4.1.2.1 of the MSCP. As a result, five “green pools” or cisterns were stocked with Gila topminnow by the Health Department during 2017 (Figure 5, Appendix 3).

Pima County is the first Health Department in the state to use the Gila topminnow, and another county has expressed interest in utilizing the species as a tool for reducing the threat of mosquito-borne diseases. Assistance for the County program start-up came from the Phoenix Zoo, Arizona State University, and Bureau of Reclamation, as well as USFWS and AZGFD.

Placement of topminnow is subject to numerous requirements intended to ensure the topminnow do not inadvertently escape from the swimming pools and other contained, mosquito-ridden water bodies where Health Department staff may place them. For example, topminnow are not placed in washes or locations that may overflow into washes. There is no obligation for the owner who accepts fish from the Health Department to feed or maintain the fish, and take is reported when the animals are stocked at the site (Appendix 3).

Figure 5. Health Department staff evaluating a "green pool" for mosquitoes. Gila topminnow can now be used to abate mosquitoes, where appropriate to the situation.

5.4 Miscellaneous Avoidance and Minimization Measures

- The RFCD reported 1,643 instances of avoidance of regulated riparian habitat impacts during 2017. There were 82 minimization actions, where impacts were limited to less than 1/3 of an acre disturbance. Twenty (20) instances required riparian mitigation.
- The Priority Conservation Area for the Pima pineapple cactus is shown on the Sonoran Desert Conservation Plan Mapguide as required by the MSCP.
- No weed ordinance letters or violations were issued on MSCP or potential MSCP mitigation lands.

- Forty-nine (49) weed and trash ordinance letters were sent to private property owners this year.
- Eight (8) buffelgrass advisement letters were issued (see sample in Appendix 4). None of the complaints were regarding any County or RFCD-managed potential mitigation lands.

5.5 Mitigation and Allocated Lands

To compensate for the take of Covered Species, Pima County allocates credits as described in Appendix B of the MSCP. Land that has become allocated is known herein as Mitigation Land. Bingham Cienega Natural Preserve, located along the San Pedro River (Figures 6, 7), is the County's first Mitigation Land property.

The number of acres of credits available from Mitigation Land is determined by the Mitigation Land's acreage and the level of legal protection that the property has. When Mitigation Land is owned in fee title (as opposed to owning partial rights or a grazing lease), the property acreage is eligible for 100% credit.

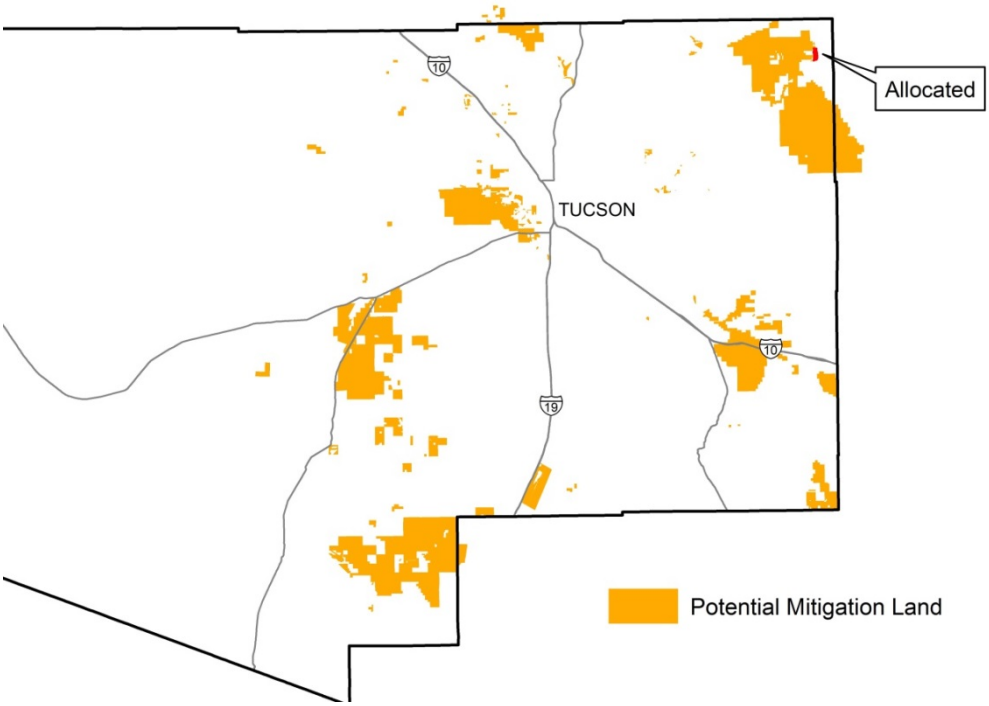

Figure 6. Location of Bingham Cienega Natural Preserve (small, red area in northeast Pima County), the County's first Mitigation Land property, in relationship to other lands owned and leased by Pima County. State grazing leases, conservation easements on ranch lands held by Pima County, and fee-owned lands are included in this depiction of the potential MSCP mitigation lands.

Pima County has developed a method to track the inventory of potential mitigation lands and where allocations have occurred. These are represented in MSCPPORT, a GIS layer that summarizes the diverse portfolio of lands which may be used for credit under the MSCP. (This layer may now be viewed by the public on the SDCP Mapguide site.

The CLS designations are an index to an area's biological value and are used to ensure the quality of Mitigation Land is of equal or higher value than the land where take occurred (see Appendix B and page 49 of the MSCP for more information). Bingham Cienega Natural Preserve is 267 acres in size and lies entirely within an area designated as an Important Riparian Area and is also a CLS-designated Special Species Management Area. Because the credits for Bingham Cienega exceed the mitigation obligation for take for 2016-2017, both in acres and CLS value, the annual mitigation obligation for 2017 has been satisfied (Table 4).

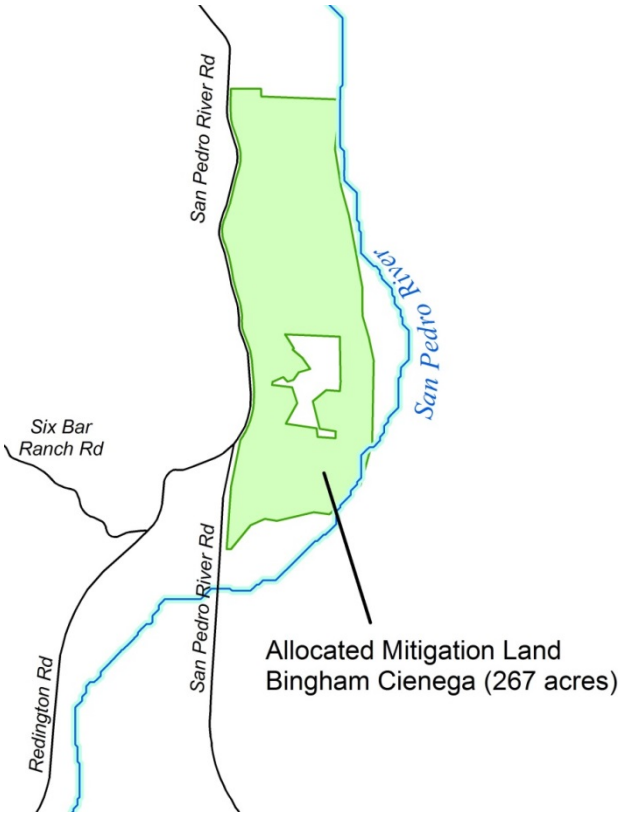

Figure 7. Mitigation Land at Bingham Cienega Natural Preserve that was allocated in 2016 to offset take that occurred during the 2016 and 2017 Section 10 permit reporting period.

Table 4. Total Mitigation obligated and allocated for the Pima County MSCP.

Year Obligated	Mitigation Obligation (Acres)	Mitigation Allocated (Acres)
2016	52.6	267
2017	171.7	
Total (to date)	224.3	267

The CLS mitigation obligation is still less than the mitigation land acres currently allocated, thus no additional mitigation lands were allocated in 2017. It is anticipated that additional habitat loss from Covered Activities in 2018 will trigger new mitigation obligations to be applied against the Bingham Cienega "credits" in Table 3 until additional mitigation lands must be allocated.

As part of the 10-year review, Pima County will review the habitat equivalency for individual species (as discussed in MSCP Section 4.3.3.) such that a minimum 1:1 ratio of habitat loss: acres of mitigation will be maintained for each Covered Species.

No replacement of lost mitigation credit was needed in 2017.

5.5.1 Water Rights in Relation to Mitigation Lands

The restrictive covenants for the Mitigation Land at Bingham Cienega limit the kinds of uses to which water can be put by the County, and prohibit increased levels of surface water or groundwater use by County without permission from USFWS and others.

Water rights quantify amounts and uses to which surface waters may be placed, and identify priorities in times of shortage. There are a number of historic water claims and other uses which Pima County inherited with land acquisitions. Pima County has and will continue to protect its water claims at Bingham Cienega and other potential mitigation lands in the San Pedro watershed through participation in the San Pedro River Adjudication, and through appropriate papers filed with Arizona Department of Water Resources (ADWR).

6 Land Management

Land management actions on allocated lands must be reported annually. Therefore, this section summarizes management activities at Bingham Cienega Natural Preserve, our first allocated Mitigation Lands (see Section 5 of this report). Because of the importance of land management—and the many actions Pima County is undertaking to promote sound stewardship of our extensive portfolio of mitigation lands—this section will also highlight key management actions and initiatives that impact this broader suite of conservation lands.

6.1 Park Designations

There were no new park designations on potential mitigation lands in 2017.

6.2 Inspections for Restrictive Covenants

During 2017, staff developed a new inspection report that addresses each restrictive covenant for the Mitigation Lands properties (Appendix 6). Staff performed field inspections of a subset of potential mitigation lands and reported their observations to Arizona Land and Water Trust (ALWT) at the end of 2017. ALWT's reviews of biennial inspection reports provide an additional safeguard to USFWS's enforcement power under the restrictive covenants.

The biennial inspection reports filed in 2017 identified an encroachment on one of the potential mitigation lands owned by the District; the District is working with County's Real Property department to address this encroachment.

6.3 Land Management Activities and Planning: Allocated Lands

Pima County is required to report on management activities that took place on all allocated mitigation lands. As noted in Section 5, Bingham Cienega Natural Preserve is the first property to be allocated, and therefore, management actions and planning actions there will be the primary focus for this report. However, many other management practices have taken place on County-controlled lands that have an impact on Covered Species. Those actions will be briefly reviewed.

6.3.1 Bingham Cienega Natural Preserve (Preserve)

The Preserve was established by RFCD in 1989 and is located on the west side of the San Pedro River, just north of Redington, Arizona and the confluences of Buehman, Edgar, and Redfield canyons. The Preserve historically provided habitat for threatened and endangered species such as the Huachuca water umbel and the Southwestern willow flycatcher.

The Preserve was originally purchased because of the Arizona ash-dominated Cienega and associated spring flows. Early management efforts focused on restoring abandoned farmlands with sacaton grass, mesquite and other native species. Site conditions changed significantly over the years as a result of drought and groundwater pumping outside of the Preserve, leading to a decline in groundwater levels at the Preserve that was documented in 2016 for the permit baseline.

6.3.1.1 Development of a Resource Management Plan

Allocation of the Preserve in March 2017 triggered a two-year window to develop a management plan to be completed on or before March 2019. The planning area (Figure 8), including portions of the M Diamond Ranch, is larger than the area currently allocated for mitigation in order to accommodate future allocations.

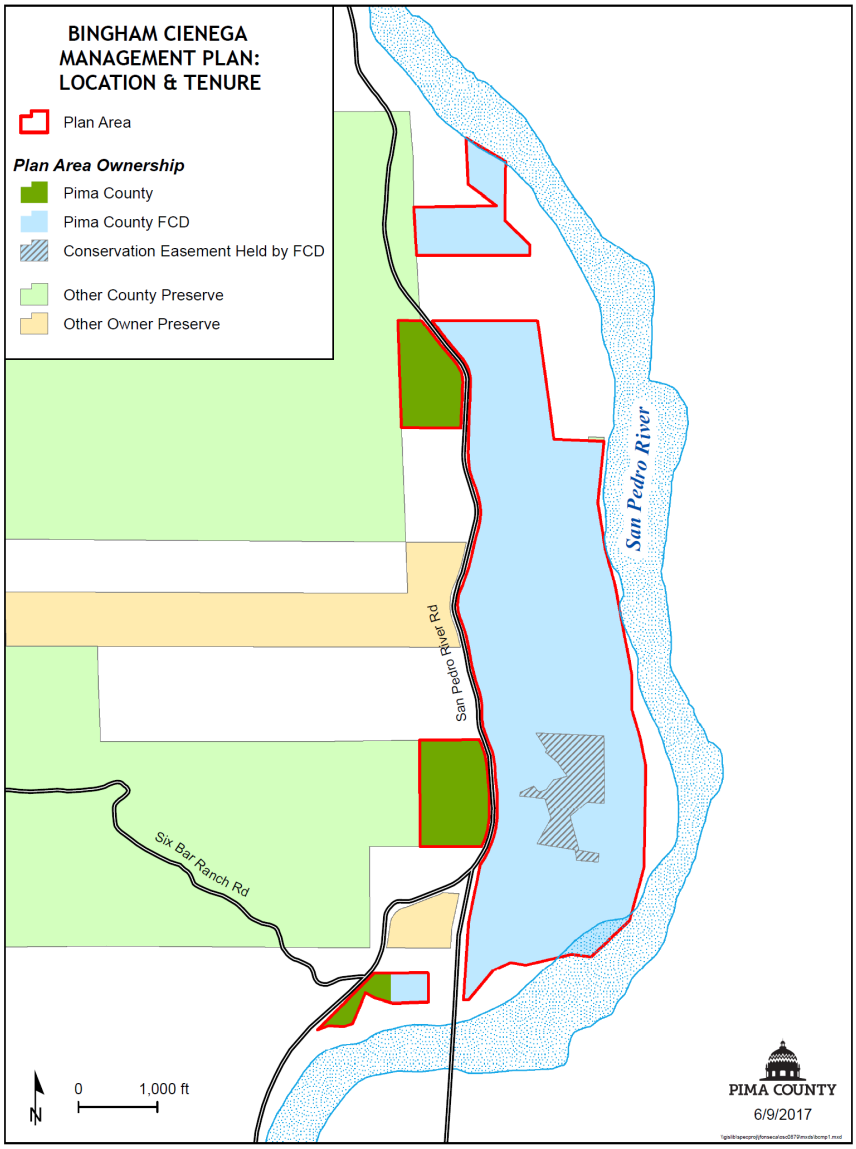

Figure 8. Map of the 405-acre Bingham management planning area. The 19-acre life estate (shown in hatched) is included in the management plan area, as well as the entire 267 acres of the Bingham Cienega Natural Preserve.

Past activities and associated data for the Preserve is extensive, and includes restoration activities, hydrologic models and data, and a previous set of management plans, workplans, and fire management plans. However, many of these documents are outdated relative to current conditions. Also, relatively little was known about the other newly acquired properties within

the planning area. Thus the focus of the planning team's work in 2017 has been to initiate new studies of the plan area.

New studies include documenting vegetation community extent and condition, updating the flora checklist, surveying for western yellow-billed cuckoos and Southwestern willow flycatchers, cultural resource surveys, and analysis of LiDAR vegetation data. District staff reviewed available water resource data, and provided a draft water budget for the area. Dr. Chris Eastoe (professor emeritus, University of Arizona Isotope Geochemistry) provided a synthesis of available regional isotopic data. In addition, staff from the Nature Conservancy resurveyed in 2017 mesquite trees and shrubs that were colonizing the abandoned farmland twenty years ago. These young trees are now over 20 feet tall.

Oral interviews from the Kelly family are also informing the management planning. The Kellys ran the M Diamond Ranch from their Bingham Cienega homestead prior to the sale of the ranch to Pima County in 2012, and currently maintain the 19-acre life estate parcel. In addition, and as part of a larger cultural resources outreach effort, the County is consulting with Native American tribes about the cultural significance of the property.

Staff has identified a number of conservation targets for the plan, and is discussing management objectives for each:

- Shallow groundwater and discharge,
- Tributary streamflow and recharge,
- Mesquite bosque and other distinct plant communities,
- Wildlife connectivity,
- Native aquatic species, and
- Cultural resources.

6.3.1.2 Management Actions at Bingham

The following are actions that took place at the Preserve through July 2017 (the most current reporting period).

Groundwater level monitoring. Depth to groundwater is measured at two wells on the property and one well just to the west. At all three wells, depth to water decreased an average of 2% during the reporting period, thereby showing slightly improved groundwater conditions.

Precipitation. Precipitation was recorded daily at the Preserve. There were 12.1 inches during the reporting period, slightly below of the average from 2003-2015 (12.9 inches; also a drought period).

Fire management. Prior to permit issuance, changing conditions necessitated that management focus shift from restoration of the farm fields to fire management. Creating, expanding, and maintaining fire breaks (Figure 9) and promoting fire suppression actions—in part to protect the health and safety of the residents in the inholding within the Preserve—began in 2005 and continued as documented in last year's MSCP annual report. The RFCD and Pima County Natural Resources, Parks and Recreation (NRPR) staff maintain firebreaks at the Preserve.

Annual to semi-annual vegetation maintenance for this work includes vegetation clearing along specified routes to approximately 16 feet wide, such that a Type-6 Tinder Fire Response Vehicle may have ready access. Arizona Public Service (utility) previously cleared a 30-foot wide swath within their existing utility easement, and therefore RFCD incorporated this clearing into the maintained firebreaks. In 2017, RFCD purchased a new, more-robust pull-behind mower to facilitate firebreak maintenance. An update to the 2006 Fire Management Plan is contemplated due to changing condition of the vegetation and fuel-related hazards.

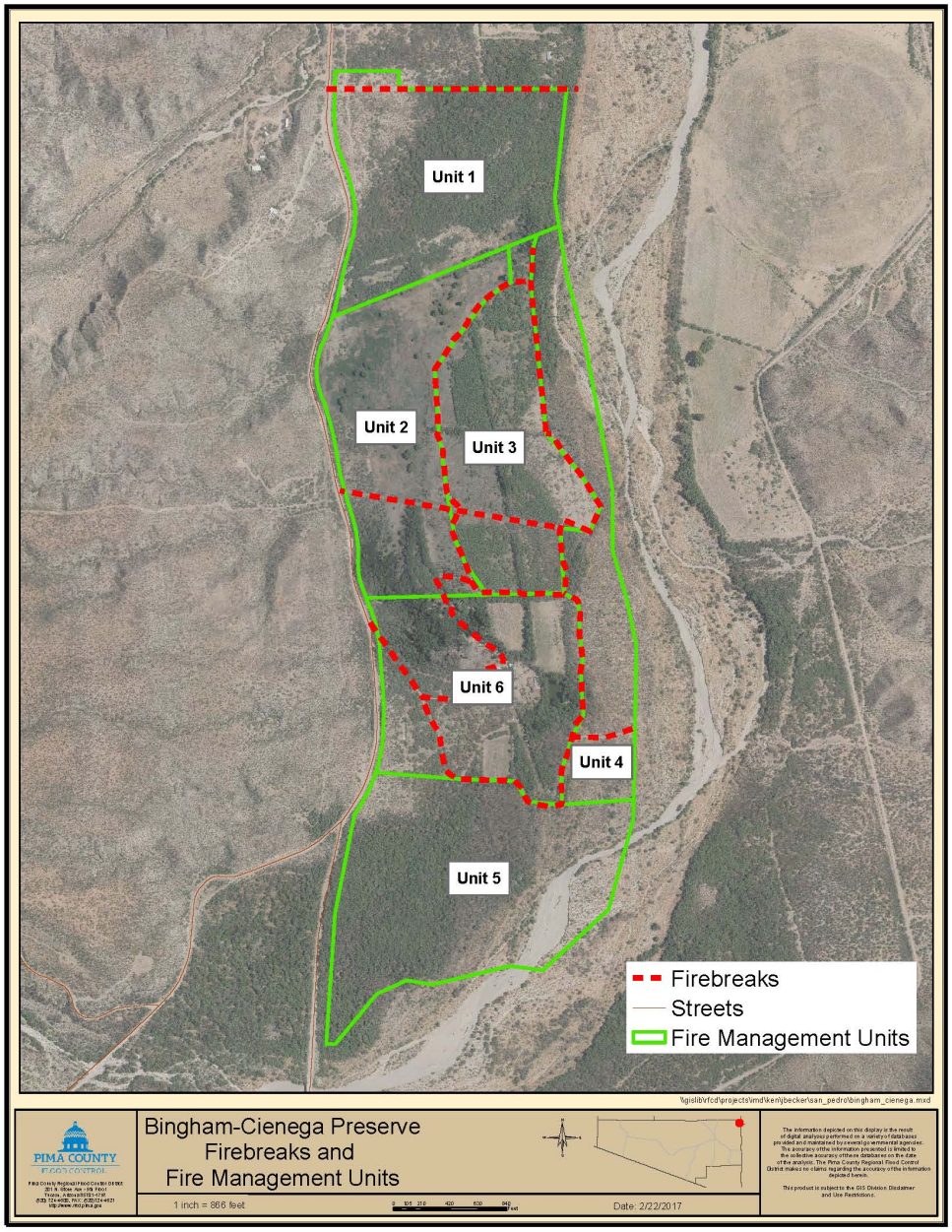

Figure 9. Existing firebreaks and fire lanes in Bingham Cienega Natural Preserve.

Installation of an all-weather water station. The construction of an all-weather water station (Figure 10) was completed in the southern portion of fire unit 6, just south and west of the Kelly Well inside the life estate inholding. The water station will provide water for fire suppression efforts. The site was chosen to allow for easy plumbing from the existing pump and pipes. The pipe runs west from the pump for approximately 100 feet where an overhead standpipe was positioned at the corner of the road. This corner can accommodate Type-6 engines and water tenders as well as smaller pull behind water tank/pump units where they can fill and have plenty of maneuvering space.

The RFCD believes annual testing of the water station will be necessary. No pumped water was discharged for fire response in 2017, but the current restrictive covenant language would require any future discharges for this purpose to be reported as a potential violation unless the "[RFCD] Board of Directors determines, based on clear and convincing evidence presented to said Board, is necessary to protect the public health, safety or welfare." (Section 5.4 MSCP Restrictive Covenants). Approval of the fire management plan by the RFCD Board of Directors and Supervisors will provide a basis for an exemption.

Figure 10. New all-weather water station installed at the Bingham Cienega Natural Preserve in 2017.

Fence maintenance. Perimeter fence repairs continued to be a focus in 2017, primarily as a result of falling trees that died due to past wildfires and continuing drought. In 2017, the Arizona Conservation Corp returned to the Preserve for the third consecutive year to work on fences and to assist with fire risk suppression efforts.

6.4 Land Management Activities and Planning: Unallocated Mitigation Lands

Pima County is required to report land management activities on allocated lands, as for Bingham Cienega Natural Preserve (Section 6.3.1, above). However, staff from three Pima County departments have been involved in a wide range of management activities on unallocated lands that further demonstrate our commitment to Covered Species and their habitats. Key highlights of these management actions are included here, but this is not an exhaustive list.

6.4.1 Invasive Species Control

Pima County has a long history of making significant commitments to controlling invasive species, as evidenced by our being a founding member of the Southern Arizona Buffelgrass Coordination Center. Focal species for eradication efforts have included giant reed grass (*Arundo donax*), fountaingrass (*Pennisetum setaceum*), saltcedar (*Tamarisk* sp.), and especially buffelgrass (*Pennisetum ciliare*). Since 2000, Pima County and our partners with the Sonoran Desert Weedwackers (a volunteer organization) have used over 36,000 hours of volunteer time to remove an estimated 596 tons of buffelgrass. In 2017, Pima County and volunteers removed an estimated 55 tons of buffelgrass using 3,642 volunteer hours from 792 volunteers spread over approximately 900 acres. In addition, staff and contractors chemically treated about 90 acres of steep slopes for buffelgrass on County lands. County staff also treat and maintain about 800 acres for buffelgrass and other invasive weeds associated with river paths each year. In 2017 County staff played a critical role in the creation of a new buffelgrass and fountain grass informative brochure for the public.

6.4.2 Continued Mapping and Filling of Open-topped Pipes

Metal pipes are common features of working landscapes and are used for a wide range of applications, most commonly fencing and mining claim markers. Vertical, open-topped pipes are a hazard to a variety of wildlife species, especially birds, which enter these artificial cavities and then are unable to escape. County staff continue to fill and/or cap these features to prevent wildlife deaths. In 2017, Pima County staff documented and filled/capped 72 open-topped pipes of 3 inches in diameter or greater. Capping open-topped pipes will continue to be a priority in 2018.

6.4.3 Open-space Infrastructure Mapping

Pima County owns and leases dozens of open-space properties, but for many of these properties there is scant information on the physical infrastructure such as roads, water lines, fences, and stock tanks. This dearth of information began to change in 2016, and continued into 2017 with a focus on using GPS units to map infrastructure on all of the County's properties, in particular the ranch properties. Four of the County's ranches—including Bingham Cienega Natural Preserve—have been completed thus far. To accommodate this new information, NRPR created a geo-database and standard operating procedures for the collection, storage, and mapping of this

information, which is used in development of coordinated resources management plans (see section 5.2 of the MSCP) and to inform the placement of long-term monitoring plots for vegetation and soils (see Appendix Q of the MSCP).

6.4.4 Habitat Restoration Activities

Both the NRPR and RFCD departments have staff focused on habitat restoration activities, and this section highlights two projects that were initiated or completed in 2017.

6.4.4.1 Wildlife Water Projects

County staff also finished construction on a wildlife water source at Ramsey Well, Sands Ranch, in 2017, as well as creation of a pond at Canoa Ranch.

6.4.4.2 Northern Altar Watershed Area Project

In 2005, Pima County acquired the 4,500-acre King 98 Ranch as part of the 2004 Open Space Conservation Bond program. Over two miles of the Altar Wash wind through the property and approximately 400 acres had been farmed for decades. Since that time the farmed lands have suffered significant drying, wind and water erosion, and a general decline in surface vegetative cover.

Starting in 2016 (Phase I), Pima County partnered with the Altar Valley Conservation Alliance to implement a series of low, contour-following berms and strategically placed rockwork to capture sheet flow to provide additional moisture to an area planted on the upstream edge of the berms with a native plant seed mix (Figure 11). In 2017, initial results were evaluated and plans for Phase II began. Subsequent to berm construction during Phase I, there was significant growth of vegetation in the treated areas. Overall, the restoration site captured, stored and released water more slowly after project implementation, reducing soil erosion. Issues encountered during Phase I included going too deep with the keyline plow (a soil aeration method that limits disturbance), breached berms, ponding that drowned out vegetation, a quick-sealing soil crust, and growth of unwanted vegetation. Phase II will include correction of most of these issues. Additionally, the ground between berms that lies outside of previously seeded areas will be ripped to further slow water. Installation of hooks or curves along some berms and onto the ends of berms will also keep more of the surface flow near the berms (instead of spilling out into the open area on the east end of the project area).

Figure 11. Restoration of retired agricultural fields on the King 98 Ranch was a continuing management activity in 2017. The goals of the project are to create conditions to allow for revegetation of the site and to arrest erosion. Panels show retired agricultural fields before (A), during (B), and after (C) treatment.

6.4.5 Water Rights Management

Pima County has a policy of managing water rights on County land and to do this, Pima County has a process to assure that water rights are transferred to the County or RFCD upon acquisition of a property.

Pima County is also participating in the adjudication of water rights in the Gila River watersheds, along with many other parties in the state. The San Pedro watershed is being adjudicated first. The Sands and the Clyne ranches, County-owned MSCP lands, are located at the very top of the Babocomari watershed, a major tributary to the San Pedro River. Pima County has amended and strengthened the water rights claims made by the ranch's predecessors for these lands in southeast Pima County. Responding to these filings, the Special Master unexpectedly placed these filings on the court docket for public review and comment. Following a few additional clarifications, the Special Master issued her ruling on March 31, 2017. The holding is attached in Appendix 7.

The affected claims have now migrated from their former status as “claims”, to their present status as water rights proposed by the Special Master for confirmation in the Gila Adjudication. While this is a favorable development, it needs to be mentioned that there are tens of thousands of other such claims that the court needs to address before anything approaching a final decision can be expected.

Additionally, the judge in the Gila Adjudication has settled on the proposed boundaries of the “sub flow” zone of the San Pedro River, clarifying which wells (owned by Pima County and by everyone else) will be scrutinized for surface water rights in addition to whatever groundwater rights may have been asserted. This development highlights the importance of the work Pima County continues to do to identify pre-Statehood water uses that took place on MSCP lands.

Finally, the RFCD successfully concluded a process—begun over twenty years ago—to appropriate the natural flow of Buehman Creek for the conservation of fish and wildlife. The Certification by ADWR of this in-stream water right effectively forecloses new water uses upstream of (and tributary to) Buehman Creek (Figure 12). This is a major accomplishment that significantly strengthens the County’s ability to protect this rare riparian stream. A copy of the recently issued Certificate of Water Right 33-96545 is attached in Appendix 5.

For the claims we own in the San Pedro River watershed and the Santa Cruz River watershed, efforts are ongoing to correct the location, the claimed uses, and the consumption data at sites where historic claims affect MSCP lands. Pima County will continue to protect our water rights at Bingham Cienega and other potential mitigation lands in the San Pedro watershed through participation in the San Pedro Adjudication, and through appropriate filings in the Gila Adjudication with ADWR and the Maricopa County Superior Court. The County Attorney’s Office monitors new requests for surface water appropriations for threats to the County’s own water rights, and continues to research the availability of additional pre-Statehood water rights claims to bolster the County’s legal standing in the Adjudication.

Figure 12. Water in Buehman Canyon represents some of Pima County most important surface water resources. In 2017, Pima County's Regional Flood Control District received an in-stream surface water right for wildlife that will help ensure the protection of this important resource.

6.4.6 Adaptive Management

No reported actions

7 Monitoring

The Pima County Ecological Monitoring Program (PCEMP) is a new program begun at the time of permit issuance. As indicated in the MSCP, three main elements of the PCEMP will be addressed in the first few years: inventories of county preserves, single species monitoring, and field visit protocols. Progress was made on these and other PCEMP elements, as highlighted below. Additionally, the PCEMP Science and Technical Advisory Team (STAT) was convened in November 2017.

7.1 Property Inventories and Assessments

The PCEMP activities take place on all County-owned and leased properties greater than 100 acres (including properties not eligible for MSCP mitigation credit; e.g., Tucson Mountain Park), as well as certain smaller properties with relevant biological resources. Due to the spatial extent and geographic dispersion of Pima County's preserve lands (Figure 6), the County is still acquiring new information about the natural resources, conditions, and threats on many properties. This information is invaluable for a host of data needs, including informing the sampling designs for PCEMP elements.

Each property visit had one or more goals prior to each visit; the goal was often to conduct species-specific inventories, visit an area with very little information or few or no previous visits, make species-specific observations that would help inform the monitoring program, and/or determine the condition of a known resource. While in the field, staff used GPS units to record routes traveled and used the "waypoint" function and digital cameras to record observations of species, threats, or other features of interest. Data collected were used to write a property visit report (trip reports are available upon request) and all GPS track logs documenting the specific dimensions of the individual staff member's survey route were converted to GIS shapefiles and archived. Observations related to threats (e.g., invasive species, open-topped pipe) or resource damage (e.g., cut fence, road conditions) were passed along to the appropriate Pima County managing department. Incidental observations of MSCP-Covered Species as well as other species of interest were recorded and entered into a geodatabase curated by Pima County IT staff.

Pima County staff performed 110 individual visits to 37 properties from January through December 2017 (Figure 13). Staff visited Cienega Creek Natural Preserve more than any other property (N=12). A key feature of property inventories was the collection of observations on Covered Species. Towards this end, staff made 1,171 separate observations, of which 150 (13%), 149 (13%), and 141 (12%) were of Sonoran desert tortoise, needle-spined pineapple cactus, and Arizona Bell's vireos, respectively (Table 5). Staff made observations on 16 of the 28 (57%) vertebrate Covered Species. The Arizona Bell's vireo was found at the most preserves (Table 6; N=17).

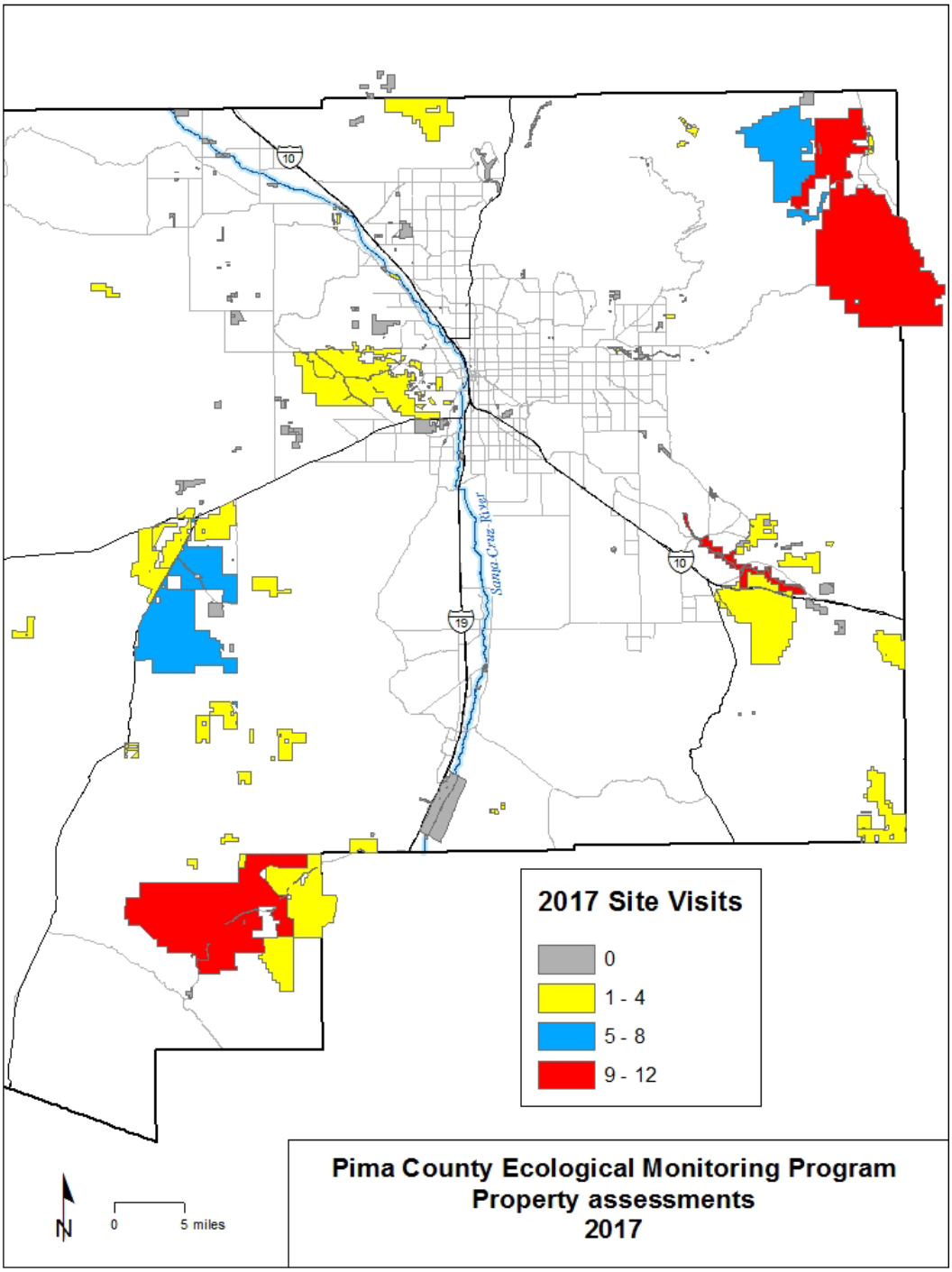

Figure 13. Number of property site visits in 2017 by PCEMP staff. Visits made by other Pima County staff are not reported here.

Table 5. Number of observations of Covered Species, 2017. For many species, the number of observations does not correspond to the number of individuals; however, those data are recorded. For the Sonoran desert tortoise and talussnail, the number of observations includes both live individuals and sign such as scat and carcasses/empty shells. For cactus ferruginous pygmy owls, Chiricahua leopard frogs, and western yellow-billed cuckoos, reported numbers represent the maximum number of detections during one of multiple surveys of the same sites.

Taxon Group	Species	Number of observations
Plants	Huachuca water umbel	0
	Needle-spined pineapple cactus	149
	Pima pineapple cactus	65
	Tumamoc globeberry	20
Mammals	Merriam's mouse	0
	Lesser long-nosed bat	0
	Mexican long-tongued bat	19
	California leaf-nosed bat	0
	Townsend's big-eared bat	13
	Western red bat	0
	Western yellow bat	0
Birds	Abert's towhee	47
	Arizona Bell's vireo	141
	Cactus ferruginous pygmy owl	20
	Rufous-winged sparrow	73
	Southwestern willow flycatcher	0
	Swainson's hawk	18
	Western burrowing owl	0
	Western yellow-billed cuckoo	34
Fishes	Desert sucker	0
	Sonora sucker	0
	Gila chub	1
	Gila topminnow	2
	Longfin dace	61
Reptiles	Desert box turtle	1
	Giant spotted whiptail	21
	Groundsnake (valley form)	0
	Northern Mexican gartersnake	0
	Sonoran desert tortoise	150
	Tucson shovel-nosed snake	0
Amphibians	Lowland leopard frog	129
	Chiricahua leopard frog	74
Invertebrates	Talussnail species	133
Total observations		1,171

Table 6. Covered Species and Pima County properties where each was found in 2017. List includes only those properties where live individuals were found by either county staff or a partner organization (e.g., Tucson Audubon Society) working on a County preserve.

Species	Property
Mexican long-tongued bat	A7 Ranch Buehman Canyon Cienega Creek Natural Preserve
Townsend's big-eared bat	Buehman Canyon Marley Ranch M Diamond Ranch Oracle Ridge Rancho Seco Tucson Mountain Park
Abert's Towhee	Bingham Cienega Buehman Canyon Cienega Creek Natural Preserve Colossal Cave Mountain Park Los Morteros M Diamond Ranch Tanque Verde Creek Tortolita Mountain Park Tumamoc
Arizona Bell's Vireo	A7 Ranch Bar V Ranch Bingham Cienega Buehman Canyon Cienega Corridor Cienega Creek Natural Preserve Clyne Ranch Colossal Cave Mountain Park FLAP 4007 M Diamond Ranch Marley Ranch Roy Drachman Agua Caliente Regional Park Sands Ranch Six Bar Ranch Sopori Ranch Tanque Verde Creek Tortolita Mountain Park
Cactus ferruginous pygmy owl	Diamond Bell Ranch Lord's Ranch Marley Ranch Old Hayhook Ranch

Species	Property
Rufous-winged sparrow	A7 Ranch Cienega Corridor Cienega Creek Natural Preserve Colossal Cave Mountain Park Diamond Bell Ranch Elephan Head Sec. 15 Mit. Lands M Diamond Ranch Marley Ranch Rancho Seco Sopori Ranch Tucson Mountain Park Tumamoc
Swainson's hawk	Bingham Cienega Cienega Creek Natural Preserve Clyne Ranch Empirita Ranch Rancho Seco Sands Ranch Six Bar Ranch Sopori Ranch
Western yellow-billed cuckoo	Bingham Cienega Buehman Canyon Cienega Creek Natural Preserve M Diamond Ranch
Gila chub	Cienega Creek Natural Preserve
Gila topminnow	Cienega Creek Natural Preserve
Longfin dace	Buehman Canyon Cienega Creek Natural Preserve
Giant spotted whiptail	A7 Ranch Buehman Canyon Diamond Bell Ranch Empirita Ranch M Diamond Ranch Six Bar Ranch Tanque Verde Creek
Sonoran desert tortoise	Cienega Corridor Diamond Bell Ranch M Diamond Ranch Marley Ranch Tucson Mountain Park
Lowland leopard frog	A7 Ranch Buehman Canyon Cienega Creek Natural Preserve M Diamond Ranch Oracle Ridge Six Bar Ranch
Chiricahua leopard frog	Clyne Ranch
Needle-spined pineapple cactus	Bar V Ranch Cienega Corridor Cienega Creek Natural Preserve Empirita Ranch M Diamond Ranch Six Bar Ranch

Species	Property
Pima pineapple cactus	Diamond Bell Ranch Elephant Head Sec. 15 Mit. lands Marley Ranch South Wilmot LLC
Tumamoc globeberry	Buckelew Properties
Talussnail species	Buehman Canyon M Diamond Ranch Marley Ranch Rancho Seco

7.2 Covered Species

Pima County will monitor various parameters for 15 species to fulfill permit obligations (see Appendix Q of the MSCP) in a phased approach over the first few years of the permit. In 2017, activities related to these Covered Species fell into two categories: 1) collecting background information necessary to develop the best monitoring plan possible and 2) initiation of monitoring protocols.

In order to carry out the monitoring program for most species on County preserves, data specific to each species needs to be collected, including species' distribution, relative abundance, and most effective survey method. The property inventories and assessment (reported in the previous section) were also used to collect important information about Covered Species for which species-specific monitoring is required.

In 2017, Pima County completed a first round of monitoring for several species" southwestern willow flycatcher, western yellow-billed cuckoo, and cactus ferruginous pygmy owl. The following provides a brief summary of findings from 2017 and includes summary results from species where monitoring was completed, or how those findings will be used to inform the monitoring requirement of each species for which a first round of monitoring remains to be completed (i.e., Sonoran desert tortoise).

7.2.1 Required Monitoring – first round completed

7.2.1.1 Cactus Ferruginous Pygmy Owl

Pima County collaborated with Dr. Aaron Flesch (University of Arizona) to develop a habitat suitability model and begin monitoring for this species. Pygmy owl monitoring was conducted across transects on Diamond Bell Ranch, Marley Ranch, Old Hayhook Ranch, Tucson Mountain Park, and Lord's Ranch (Figure 14). Each transect was surveyed during three survey periods between spring and fall 2017. In consultation with the USFWS, a pygmy owl monitoring protocol was adopted similar to that of the large area survey protocol established by the USFWS and AZGFD (USFWS 2000; Appendix 9). Pygmy owls were detected at least once on all of the properties surveyed except Tucson Mountain Park and a maximum of 20 territories were found. A comprehensive final report will be completed in 2018.

7.2.1.2 Western Yellow-billed Cuckoo

Pima County contracted the Tucson Audubon Society to monitor cuckoos; they used the USFWS-approved monitoring protocol to complete full surveys (Haltermann et al. 2015; four surveys during the three survey periods) at Bingham Cienega Natural Preserve and Cienega Creek Natural Preserve (Figure 15; Appendix 10). Additional, single visit cuckoo surveys were undertaken at Posta Quemada Canyon, Edgar Canyon, lower Buehman Canyon, and Davidson Canyon in exchange for reducing monitoring effort for the southwestern willow flycatcher.

Cuckoos occurred throughout Bingham Cienega. The most cuckoos detected on a single survey at Bingham Cienega was nine (9), and the fewest was five (5). Following criteria presented in the monitoring protocol, there were three (3) probable cuckoo breeding territories and two (2) possible breeding territories on this property.

Cuckoos were densely distributed in parts of Cienega Creek Natural Preserve. Surveys here recorded a minimum of eight (8) and a maximum of 18 cuckoos during any given survey. The western part of Cienega Creek Preserve held two (2) possible and one (1) probable breeding territory. The eastern part of Cienega Creek Preserve contained an estimated five (5) probable, four (4) possible, and one (1) confirmed cuckoo breeding territory.

Four cuckoos were documented in lower Buehman Canyon and none were detected in Davidson, Posta Quemada, or Edgar canyons during exploratory surveys. While no cuckoos were detected in during the exploratory survey at Edgar canyon, County staff made an incidental observation of a cuckoo giving an alarm call in September, suggesting possible breeding activity there.

7.2.1.3 Southwestern Willow Flycatcher

Pima County contracted the Tucson Audubon Society to monitor for southwestern willow flycatcher (flycatchers). This monitoring effort followed the approved general survey protocol (Sogge et al. 2010) to survey for flycatchers on two County properties: Bingham Cienega Natural Preserve and Cienega Creek Natural Preserve (Figure 16; Appendix 11). (In consultation with the USFWS, we reduced the scope of the monitoring effort for this species due to a lack of suitable habitat on A7 Ranch, but expanded the scope of yellow-billed cuckoo monitoring in return.) No flycatchers were detected any of the three survey periods. Bingham Cienega Natural Preserve continues to be dry with shallow ground water continuing to decline significantly below land surface, which has resulted in riparian vegetation dying off. The cienega area, which in the past has had abundant surface water, has not had surface flows since 2007. Barring any significant returns of surface water, this property is unlikely to provide suitable flycatcher breeding habitat and the County may petition to remove flycatcher surveys at Bingham Cienega. Cienega Creek Natural Preserve contains segments of potentially appropriate flycatcher breeding habitat and the possibility remains that flycatchers could be detected there.

7.2.2 Required Monitoring – data acquisition and monitoring plan development

7.2.2.1 Sonoran Desert Tortoise

In preparation for the initiation of active monitoring in the summer of 2018, County staff spent a substantial amount of time in the field documenting the distribution and density of Sonoran

desert tortoise populations across many County preserves. A more comprehensive grasp of how this species is distributed across County preserves is a crucial part of moving forward with designing a monitoring program for this species. In addition to searching for live tortoises, a key focus of property inventories was to look for tortoise sign such as burrow and scat in order to assess habitat suitability and relative abundance for this species (Figure 17). Pima County documented a high-density tortoise populations on the M Diamond Ranch on the eastern flank of the Santa Catalina Mountains (lower San Pedro River valley). These tortoise populations occur in a highly eroded system of bluffs and washes made up of relatively loose sediments and scattered layers of caliche that does not include the more typical rocky ridges and boulder fields that are commonly associated with tortoises. The presence of this abundant tortoise population was not previously known. Staff also continue to document live tortoises and their sign on County preserve lands east of the Altar Valley (e.g., Sierrita and Cerro Colorado Mountains), valuable observations that expand our knowledge of where tortoises occur in this under-surveyed part of their range. Data from these outings are being used in the development of the tortoise monitoring sampling frame.

7.2.2.2 Pima Pineapple Cactus

The Pima pineapple cactus is an important species in the County's MSCP, in part because of its distribution relative to projected Covered Activities. The County has agreed to monitor the species at 10 sites within the County preserves. Assisted by a grant from the USFWS, Pima County partnered with Dr. Aaron Flesch (University of Arizona) to test the applicability of using distance sampling methods to monitor Pima pineapple cactus. This project was completed in 2017, and found that distance sampling provides reasonably precise and unbiased estimates of cactus population density (Appendix 8). Consequently, County staff, in consultation with the USFWS, is developing a monitoring program for this species that will use a distance sampling methodology to track population density and abundances over large areas.

7.2.2.3 Chiricahua Leopard Frog

Chiricahua leopard frogs naturally colonized Hospital Tank on the County's Clyne Ranch in 2016 (David Hall, University of Arizona). This site had historical records of Chiricahua leopard frogs, but had not been found there for a number of years, likely due to the presence of nonnative bullfrogs and green sunfish. Efforts were made to remove the nonnative fish and bullfrogs, and while there are still mosquitofish present in the tank, there are no longer green sunfish present. Additionally, David Hall and his team have repeatedly made efforts to remove all of the nonnative bullfrogs, and by 2016 no adult bullfrogs occurred in the tank. County staff revisited Hospital Tank on 21 June 2017 and confirmed the presence of metamorphosizing bullfrog tadpoles from a larval cohort that had gone undetected in 2016. These have since been removed by David Hall's efforts. Surveys of Hospital Tank later in 2017 yielded a maximum of 74 juvenile and adult Chiricahua leopard frogs (David Hall, personal communication). Pima County staff will revisit Hospital Tank again in June 2018.

7.2.2.4 Lowland Leopard Frog

Pima County continued to survey for new lowland leopard frog sites in 2017, and identified three previously unknown sites on the east side of the Catalina Mountains: 1) an unnamed tank south of Alder Canyon on the northwestern part of Six Bar Ranch, 2) Grapevine Spring on the

southern part of A7 Ranch, and 3) tinajas in upper Espiritu Canyon on A7. County staff plan to revisit both of these sites in in 2018. County staff also documented presence, and in some cases numbers, of lowland leopard frogs in other known sites on County preserves. Sites known to previously harbor lowland leopard frogs on County lands all contained leopard frogs or their larvae during 2017: Cienega Creek and Youtcy, Espiritu, Buehman, and Edgar canyons.

7.2.3 Species Monitoring Not Required

7.2.3.1 Giant Spotted Whiptail

Recording incidental observations of covered species for which no monitoring is required is still an important element of the PCEMP. While Pima County does not include monitoring population parameters for the giant spotted whiptail in the MSCP, field staff are attuned to the nuances of lizard species identification and habits and made 21 observations of the Giant spotted whiptail during various property inspections. Several of these observations were made in under-surveyed areas and are likely to be small range extensions for this species, including on the north side of the Sierrita Mountains and on Empirita Ranch on the north side of the Whetstone Mountains and south of Interstate 10.

7.2.3.2 Talussnail

Twelve species and subspecies of talussnail are covered under the permit, most of which lack comprehensive information on their patterns of distribution and ecology. During regular property inventories, the PCEMP continues to survey for and record observations of talussnail habitat through identification of empty talussnail shells and—where possible—the collection of live individuals as voucher specimens (Figure 18). The collection and preservation of voucher specimens in this cryptic group of species is crucial because rigorous species determination usually relies on detailed morphological and/or molecular analyses of properly preserved specimens. As noted earlier, 133 separate observations were made (Table 5). This total included eight (8) live individuals from three (3) properties representing four (4) new localities. Data from these survey efforts will be integral to designing a future monitoring program for these species' habitats (20 sites every five years). Additionally, the County is seeking to partner with researchers at the University of Arizona to support a proposed research project on the ecology, distribution, and habitat of the Sonoran talussnail (*Sonorella magdalenensis*) on County preserve land.

7.3 Habitat Monitoring

All species are in part defined by their habitat or environment, which can be thought of as providing all of the resources a species requires for survival and reproduction. As such, any changes to a species' habitat may be correlated with changes in species' population parameters. Consequently, careful monitoring of habitat may be one effective way to indirectly monitor potential changes in species' populations, an especially prudent strategy given the large scale of the County's MSCP lands (>200,000 acres) and the many species covered under the MSCP, some of which do not have planned species-specific monitoring programs under the MSCP. To accomplish this element, Pima County will monitor a battery of soil and vegetation-based parameters across a number of long-term monitoring plots across County preserves.

7.3.1 Long-term Vegetation and Soil Monitoring Plots

As noted in the MSCP (Appendix Q), the County adopted the vegetation and soils monitoring protocol developed by the National Park Service's Sonoran Desert Inventory and Monitoring Program (Hubbard et al. 2012). This protocol relies on randomly selecting monitoring plots using a probabilistic-based sampling approach, which means that inferences may be made across the entire set of lands available to be sampled. Combined with the fact that this same protocol is being used across large landscapes in and near Pima County that are managed by other agencies (i.e., National Park Service (NPS) and the USFWS), the results of the monitoring effort on County preserve lands can be compared against similar areas but with varying management histories.

In 2017, the County collaborated with NPS's Sonoran Desert Inventory and Monitoring Program and Tucson Audubon Society to set up and complete the first 22 monitoring plots. Over the next four seasons, 20 additional plots will be set up and monitored each year, until a minimum of 100 total plots is reached or until power analyses and initial data suggest that a sufficient number of plots have been completed to be able to detect biologically meaningful change. Voucher specimens from difficult-to-identify and/or geographically relevant plant species will be accessioned into the University of Arizona's herbarium or a reference collection that the NPS curates.

7.3.2 Perennial Water Sources

Relative to surface area, riparian and aquatic habitats have a disproportionately large influence on biodiversity, particularly in arid regions such as most of the lands in the County preserve network. Additionally, many of the species covered under Pima County's MSCP occur in riparian areas. As such, annual wet/dry mapping of all known and potentially perennial water sources took place in June 2017. A summary of this effort will be presented to the USFWS in early 2018.

7.4 Other Monitoring Elements

Though not required to be worked on or reported in the first year of the program, County staff made progress on the following elements:

7.4.1 Geodatabase Development

Pima County IT department staff have been working on a cross-departmental geodatabase for monitoring data. IT staff employed ArcGIS Collector to build a user interface based on various datasheets and dropdown menus for the user to collect and integrate data into the database using a portable, hand-held device. The County will be acquiring several rugged tablets in 2018 to serve this purpose. County IT staff have additionally integrated ~2500 incidental observations of MSCP-covered and other species that have been collected during the past few years into this database.

7.4.2 Cave, Mine and Adit Inventory

County staff continue to inventory caves, mines, and adits for presence (or possibility) of covered bat species. The County is also working with the local BLM office to gain access to abandoned mines on BLM grazing leases that the County holds (primarily on Rancho Seco),

many of which serve as roost habitat for Covered Species. In preparation for upcoming monitoring of the lesser long-nosed, Mexican long-tongued, California leaf-nosed, and Townsend's big-eared bats, the County has identified a subset of abandoned mine roosts that are known—or suspected—to harbor one or more of these bat species. These features will be completely inventoried and monitored for their structure, condition, bat species occupancy, and any relevant management needs in 2018.

7.4.3 Shallow Groundwater

The RFCD has a long history of monitoring shallow groundwater, starting first along Cienega Creek Natural Preserve and now monitoring six shallow groundwater areas in eastern Pima County and producing results in annual reports (Appendix 12). Future reports will continue to support the MSCP monitoring objectives for assessing depth to water in select shallow groundwater systems, as outlined in Appendix Q of the MSCP.

7.5 Science and Technical Advisory Team (STAT)

The PCEMP Science and Technical Advisory Team was convened in November 2017 to provide Pima County with technical expertise and collaboration for implementation of the PCEMP. Current members are experts in aspects of the PCEMP, including species-, landscape-, and threat-level monitoring. Additionally, current STAT members are drawn from organizations managing lands and species within eastern Pima County, and they represent the County's larger effort to continually foster regional collaboration with native species and natural resource conservation. STAT's future responsibilities will be to provide oversight, review, and technical support for PCEMP's annual reporting efforts, species monitoring protocol development, and proposed changes to Covered Species Priority Conservation Areas and/or species models. STAT members are affiliated with the following organizations:

- National Park Service
- U.S. Forest Service
- Arizona Department of Game and Fish
- Sky Island Alliance
- The Nature Conservancy

7.6 Non-MSCP Covered Species

7.6.1 Other Snails

PCEMP staff spend a significant amount of time in the field during property inventories and in the course of monitoring MSCP-covered species. Not surprisingly, staff also contributed significant observations and data on species that are not covered by the MSCP, but that are still biologically significant. For example, a routine property inventory of a part of the County's Marley Ranch led to the discovery of a new locality for an additional species of little known, but non-covered terrestrial snail, the Black Mountain rabdotus (*Naesiotus nigromontanus*) in the Sierrita Mountains. While clearly under-surveyed, this widespread Mexican species was previously only known from a single canyon in the United States (Pajarito Mountains, Santa Cruz County).

7.6.2 Invasive Plant Species

PCEMP staff report on the occurrence and location of a variety of invasive plants including buffelgrass, fountain grass, African lovegrass, giant reed, and star thistle, bur bristlegrass, and others. In 2018 PCEMP staff made 156 observations and follow-up reports to County managers of these and other invasive plants.

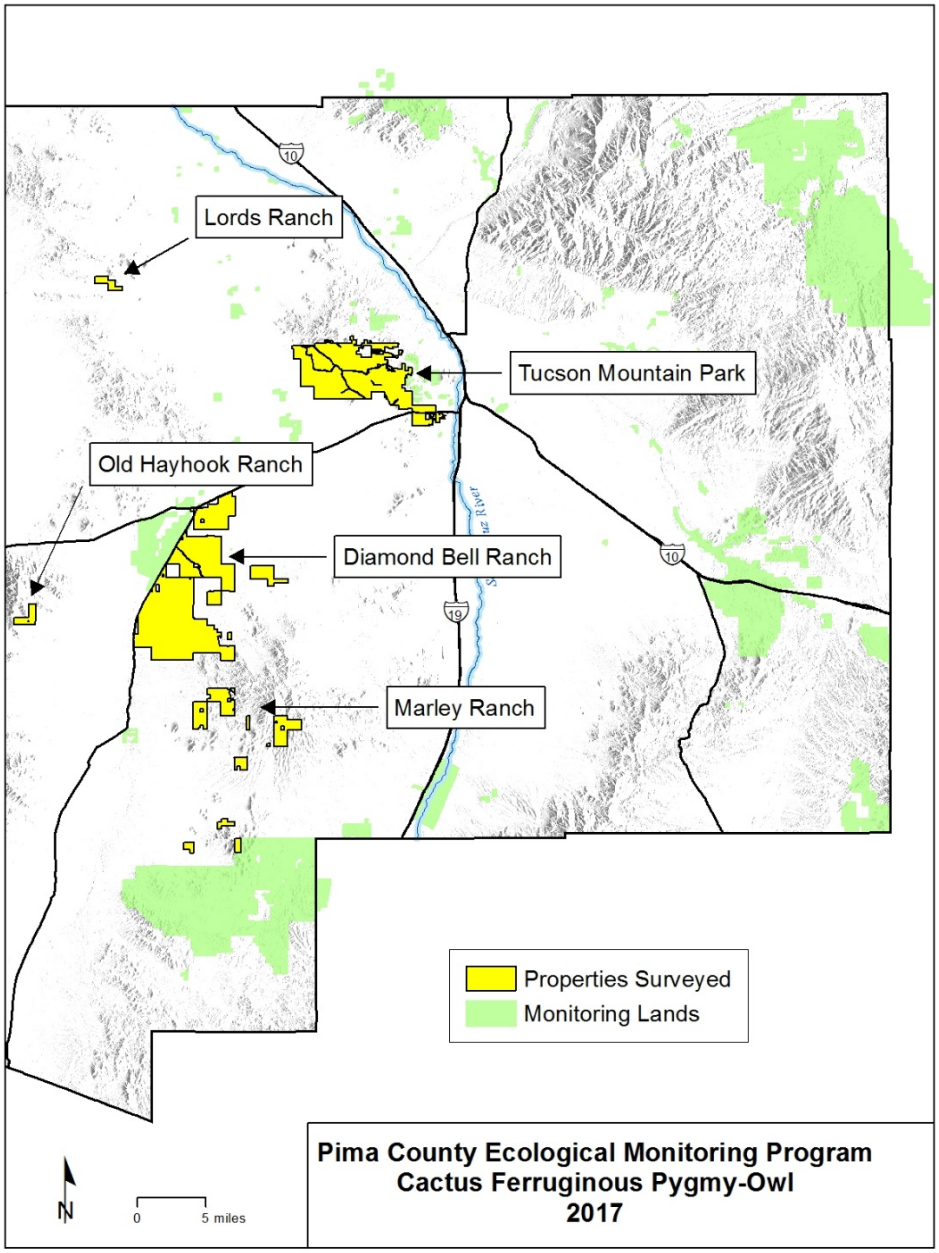

Figure 14. In 2017, Cactus ferruginous pygmy owls were surveyed for across 10 transects in suitable habitat on Diamond Bell Ranch, Marley Ranch, Old Hayhook Ranch, Tucson Mountain Park, and Lord's Ranch. Results of these surveys will be reported in 2018.

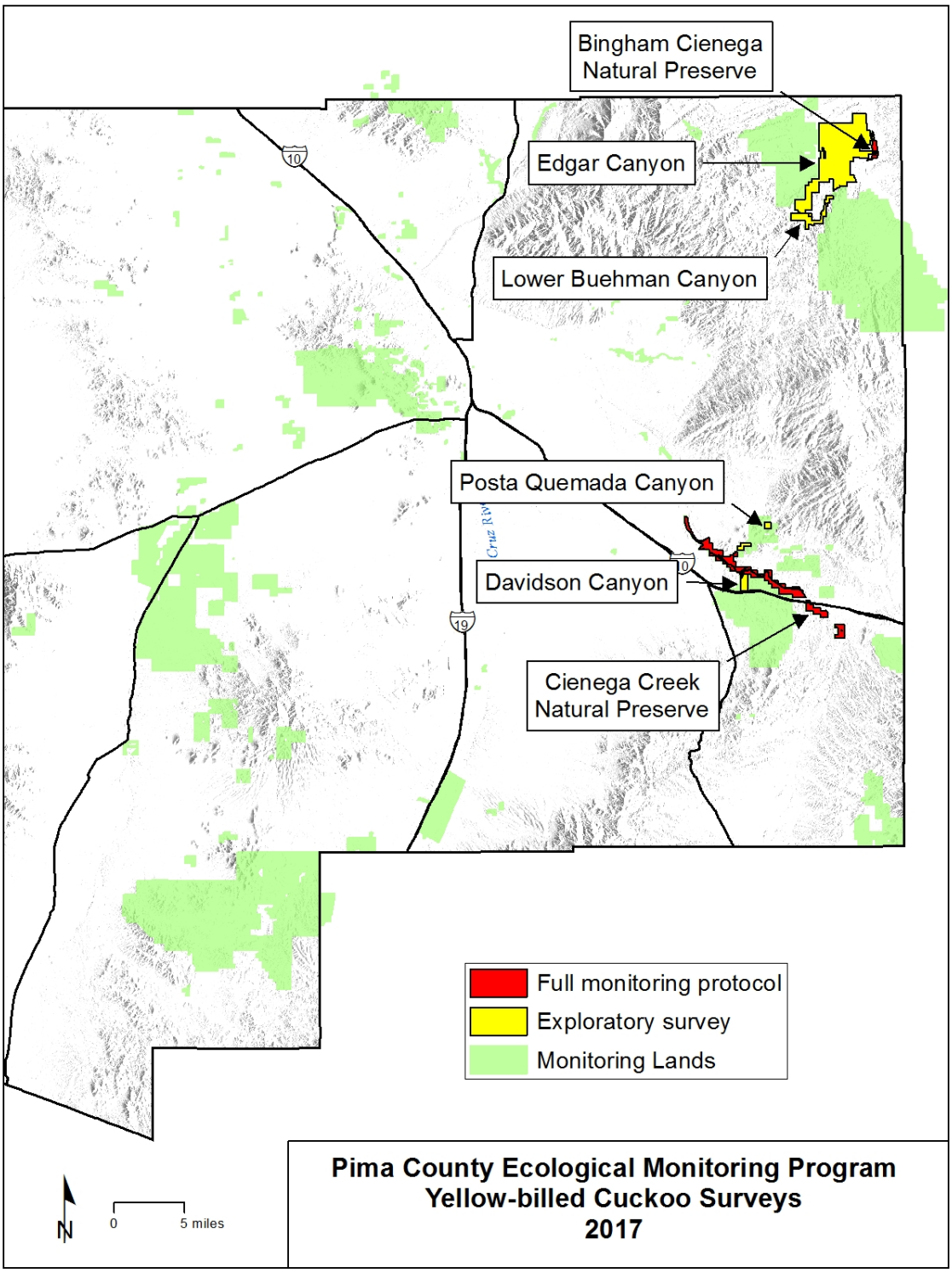

Figure 15. The PCEMP followed the USFWS-approved survey protocol to survey for Western yellow-billed cuckoos at Bingham Cienega Natural Preserve and Cienega Creek Natural Preserve. Exploratory surveys were done in an additional four drainages on County lands.

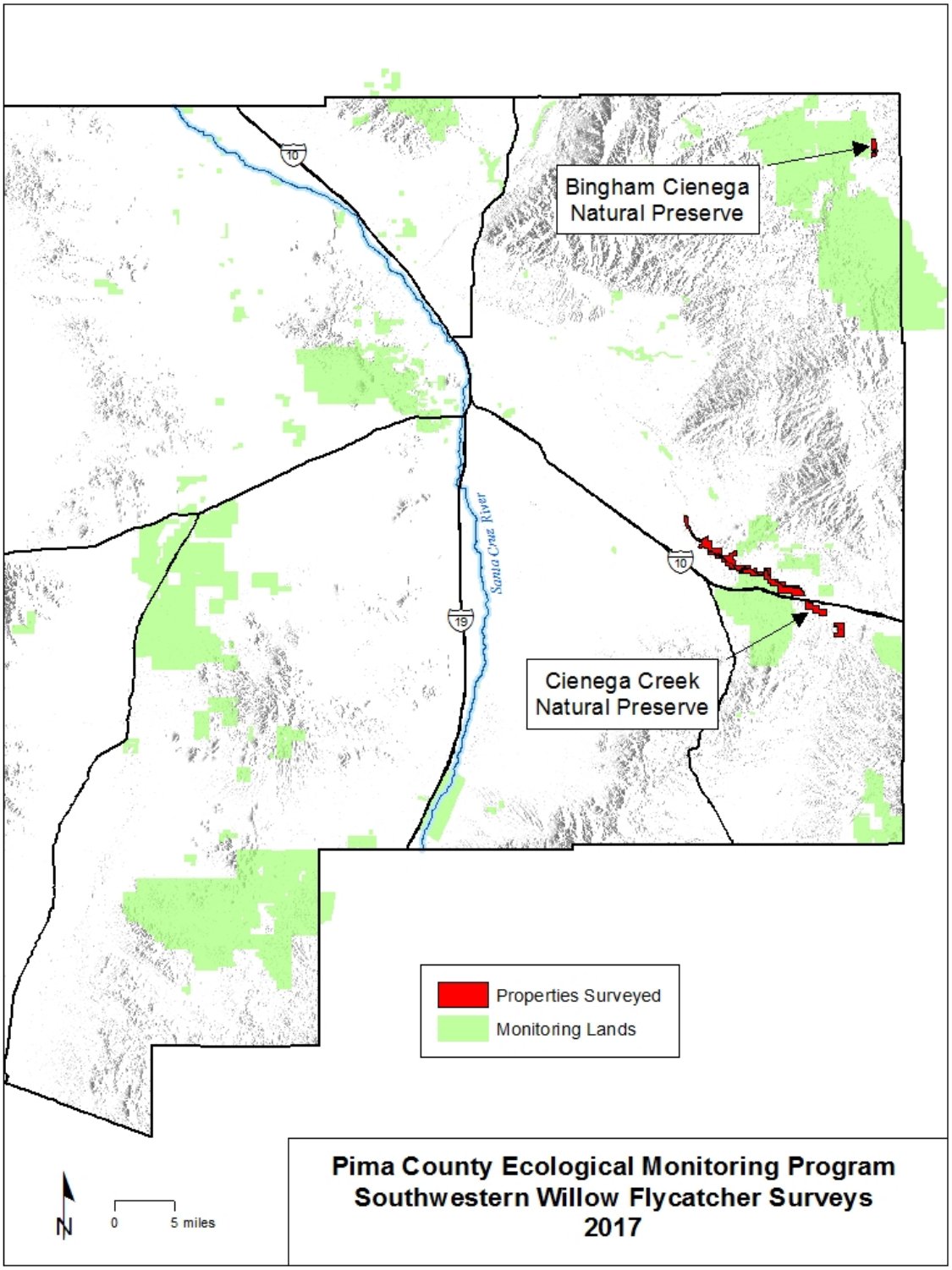

Figure 16. The PCEMP followed the USFWS-approved general survey protocol to survey for Southwestern willow flycatchers at two properties in 2017, Bingham Cienega Natural Preserve and Cienega Creek Natural Preserve. No flycatchers were detected during any of the three survey periods.

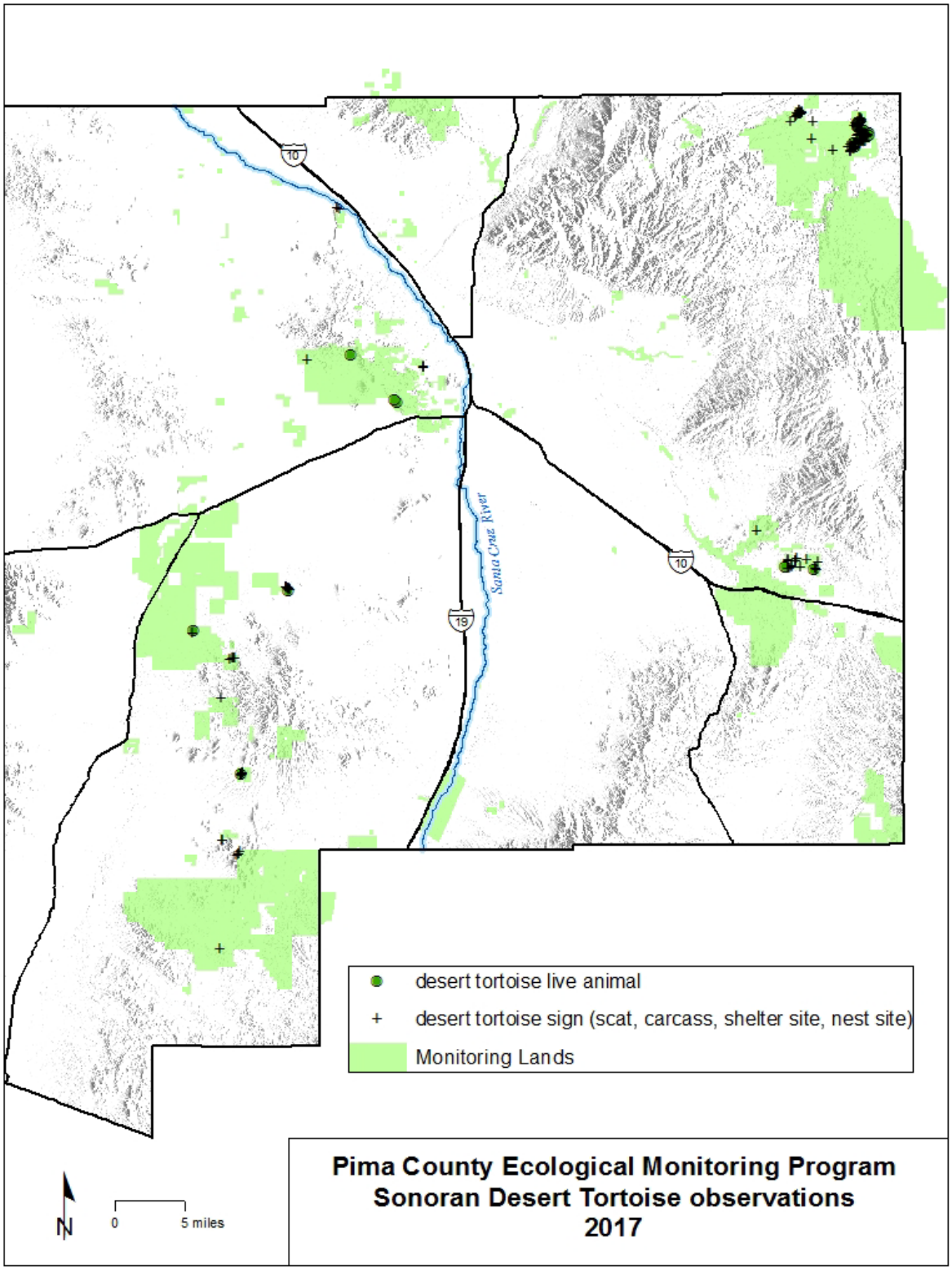

Figure 17. Observations of Sonoran desert tortoise (live individuals and sign) were made on nine properties, 2017. Staff are gaining a much better understanding of the distribution of this species and these observations will help inform the monitoring design.

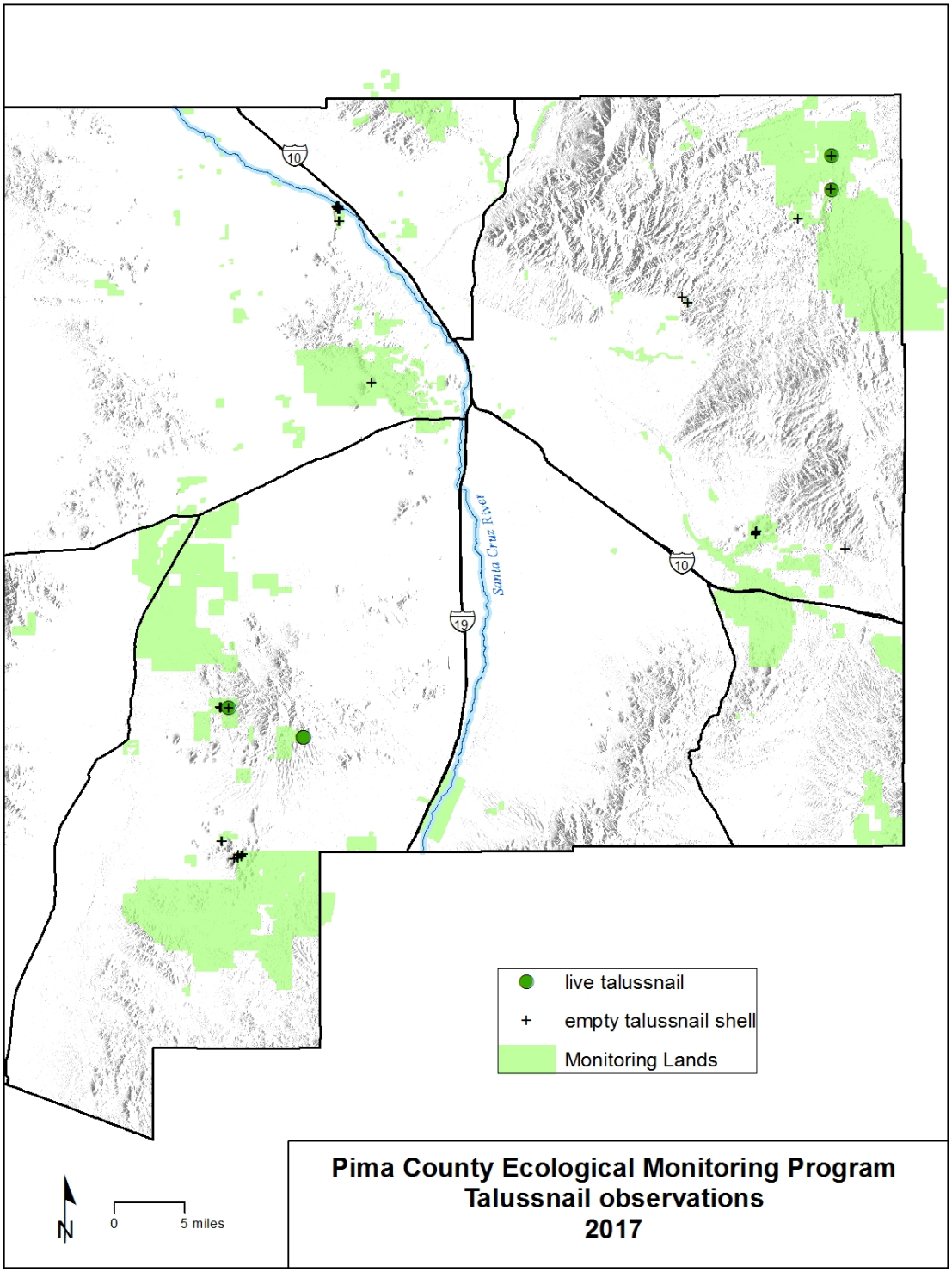

Figure 18. The distribution of talussnails on County preserves was unknown prior to 2016, but ongoing survey efforts in 2017 continued to refine the understanding of where talussnails occur, with talussnail shells or live individuals found on nine properties.

8 Changed or Unforeseen Circumstances

Changed circumstances are scenarios that could affect Covered Species (Table 7.2 of the MSCP) and are differentiated from unforeseen circumstances in that the latter cannot reasonably be anticipated.

8.1 Changed Circumstances

Changed circumstances are "changes in circumstances affecting a species or geographic area covered by a Habitat Conservation Plan (HCP) that can reasonably be anticipated by Plan developers and the [USFWS] and that can be planned for" (50 CFR §17.3). Table 7.1 of the MSCP lists identifiable changed circumstances and Pima County's potential responses.

8.1.1 Reporting

Some changed circumstances cannot be fully evaluated until new MSCP program and reporting mechanisms are underway. In 2016, we listed the reporting frequency for changed circumstances along with the proposed methods of evaluation. A number of changed circumstances determinations will be based on ecological monitoring data for species, vegetation or landscape-related elements.

During 2017, we became aware of the quagga mussel in the Central Arizona Project canal and Pima County obtained additional information about this situation (Appendix 13). During 2018, we will evaluate available data to understand vulnerabilities to other water bodies in Pima County. This information is relevant to the potential for new non-native aquatic species being introduced to the Santa Cruz watershed. If introductions to the watershed occur as a result of existing or expanded CAP operations, and this affects covered species, it would be considered a changed circumstance.

8.1.2 Assessment of Changed Circumstances for 2017

As discussed with the USFWS Tucson Field Office, we report changed circumstances for the 2017 calendar year (Table 7).

8.2 Unforeseen Circumstances

The USFWS did not identify any unforeseen circumstances that affect covered species or their habitats in 2017.

Table 7. Status of changed circumstances through the 2017 reporting period. Because changed circumstances can require management actions, the County's responses are also included.

Circumstance/Scenario	Occurred during reporting period?	Evidence	If yes, what Response(s)
Desiccation of other groundwater-dependent riparian systems [i.e., not Cienega Creek at the Preserve or stretches of the effluent dominated Santa Cruz River]	Yes	ADWR GWSI well hydrographs at Sopori, Arivaca Creeks (Figures 19 & 20)	Pima County has no obligation to respond with regard to this change, but we are working with partners to understand climate change and potential restoration of shallow groundwater systems in other parts of Pima County.
Native species (e.g., beaver or prairie dog) introduced or re-established, which reduce the abundance, distribution or habitat for Covered Species within the Permit Area.	Species introduced, but Impacts not known to occur	AZGFD released prairie dogs at Sands Ranch, but no impacts to Covered Species are known to us	
State land is conveyed to private sector in Permit Area	Yes	Based on GIS inquiry, see Figure 1	Automatically becomes part of the Permit Area per the terms of the MSCP. See Section 3.1 of this report
Immigration of Covered Species into County-controlled mitigation lands or elsewhere in the Permit Area.	Yes	Gila topminnow colonized a portion of the Santa Cruz River	This is a desirable outcome; USFWS had previously requested salvage opportunity

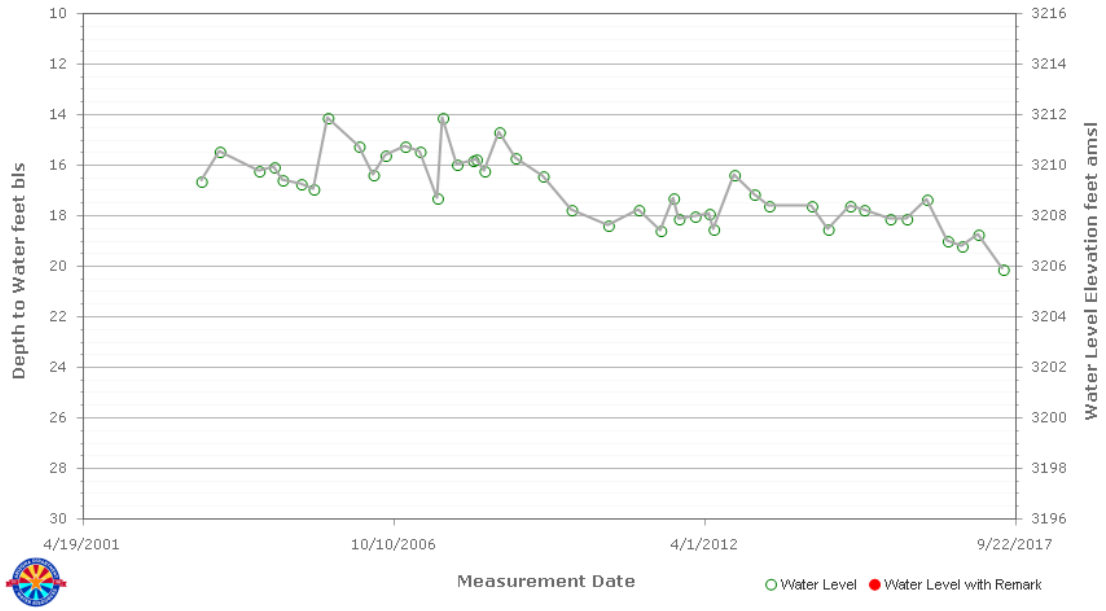

Figure 19. Arizona Department of Water Resources (ADWR) GWSI well hydrograph from Sopori Wash (20-12-05 aac) showing a declining trend that could be causing riparian habitat impacts in a portion of Santa Cruz County downstream of Pima County's Sopori Ranch.

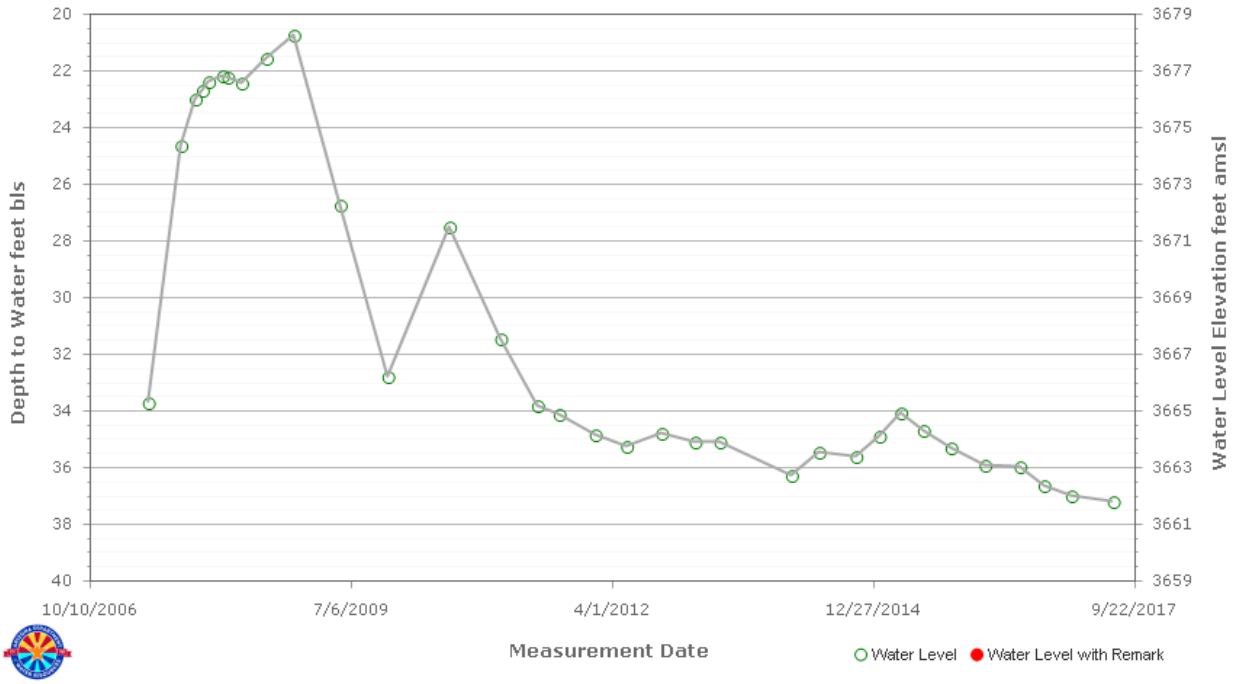

Figure 20. ADWR GWSI well hydrograph from Arivaca Creek (21-10-35ccd) showing a declining trend that could be causing riparian habitat impacts in a portion of Santa Cruz County downstream of Pima County's Sopori Ranch.

9 Fiscal Year Funding

9.1 Expenditures

Pima County spent almost $3,000,000 in services to implement the MSCP in 2017 (Table 8). Many of these programs existed long before the MSCP and fulfill other County needs, but they are included here because their continued existence contributes to conservation, enforcement, management, monitoring, and administration of MSCP elements. These estimates are based primarily on the percentages of various budget units for the adopted budget for the Fiscal Year ending June 2018, except for the Sheriff's estimate, which is based on calendar year 2017 visits to potential mitigation land addresses.

Table 8. Estimated expenditure (in thousands of dollars) by County department for avoidance, minimization, management, and monitoring activities in support of Pima County's Multi-species Conservation Plan, July 2017-June 2018.

Department	Expenditure
County Administrator	0
Communications	11
Development Services	123
Regional Flood Control District	458
Information Technology	103
Natural Resources, Parks and Recreation	1,497
Public Works Administration	145
Sheriff's Department	26
Office of Sustainability and Conservation	540
Transportation	19
MSCP and Section 10 Program Total	$2,911

In general, the County funding resources have not materially changed from the estimates provided in Chapter 8 of the MSCP. Two departments, Development Services and Transportation, reported decreased budgets but these do not affect the avoidance and minimization activities they provide for the MSCP.

Highlights from the reporting period for the departments listed in Table 8 include:

- The **County Administrator's Office** explored options to acquire additional lands in 2017, although no monies are attributed to this activity.
- **Communications** helped provide publicity for the new Health Department use of topminnow.
- **Development Services** continued to administer various avoidance and minimization measures embedded in existing ordinances, but their budget decreased due to staff attrition and reduced work load.
- **Information Technology** department provided assistance in preparing the MSCP and subsequent reporting.
- **Sheriff's Department** enforced laws on mitigation lands and provided search and rescue.
- **Department of Transportation** minimized impacts along roadways, but their budget decreased due to lack of CIP funding and diminished staffing.

- **Public Works Administration** (Real Property staff) worked to acquire several new floodprone lands and donations, and helped with legal protections for the fee-owned mitigation lands.
- **Natural Resources, Parks, and Recreation** (NRPR) manages most of the potential mitigation lands. Kerry Baldwin's vacant position (Natural Resources Superintendent) was filled in late 2017 with the hiring of Karen Simms. Robert Padilla and Chris Cawein provided direction to the NRPR team during the period of vacancy.
- **Regional Flood Control District** fulfills a regulatory role in minimizing effects on habitat for riparian species and supports management of mitigation land, including the allocated land at Bingham Cienega. This year they provided a new report on shallow groundwater monitoring, and Chief Hydrologist Frank Postillion retired.
- **Office of Sustainability and Conservation** supports the land managers with information and monitoring data, and administers the Certificate of Coverage Program. An additional staff member, Jeff Gicklhorn, was added this year to support the required duties of the PCEMP.

9.2 Revenue

The Certificate of Coverage Program has two revenue-generating elements that are applicable only to residential subdivision, commercial, or industrial projects: 1) an Application Fee ($720.00) and 2) Compliance Monitoring Fee ($2450.00). When any of the eligible types of projects request a Certificate of Coverage, an Application Fee is collected. Subsequently, a Compliance Monitoring Fee is collected only when the project provides natural open space to be used as MSCP mitigation. For the 2017 calendar year, the Certificate of Coverage Program generated a total of $1,420.00 in revenue (all of it derived from Application Fee receipts for two residential subdivision projects). Compliance Monitoring Fees were not collected as neither project provided natural open space to be used for MSCP mitigation.

The OSC utilizes these funds to administer the Certificate of Coverage Program, including monitoring of MSCP mitigation land generated through this program.

9.3 Grants

The USFWS's Partners for Wildlife program granted Pima County monies prior to permit issuance of the Section 10 permit for several projects. One grant was for erosion-control work at Peck Spring, a site that contained lowland leopard frogs, a Covered Species. There were no new grant monies or received by Pima County or the RFCD since permit issuance that contributed to fulfilling MSCP requirements. However, we benefitted from partnerships with a number of organizations, some of which received grants to improve habitat or monitor species or their habitats. These are described in relevant sections of this report.

10 Non-mitigation Lands Transactions and Processes

In the parlance of the Section 10 permit, mitigation lands are those lands that have been allocated to offset impacts that have already occurred. Non-mitigation land transactions can

affect the pool of lands available to offset future impacts, therefore we report on significant changes here.

In 2017, an additional 557 acres of land were acquired. Of these, 465 acres were donated to the County to achieve compliance with the Conservation Lands System guidelines. The rest were acquired with Floodprone Lands Acquisition funds (Figure 21).

Inspections in 2017 revealed encroachments by two different entities on RFCD-owned potential mitigation land. RFCD sent letters to the property owners requesting the removal of the encroaching structure or equipment. One property owner requested the Board to allow the encroachment, but the Board denied this request. The RFCD will improve fencing after the encroachments are removed.

In executing the Board of Supervisors' and the RFCD Board of Directors' 2016 approval and direction to record restrictive covenants on certain lands, the County individually recorded the restrictive covenants against those properties identified in the 2016 approval.

During 2017, several requests to utilize these potential mitigation lands for new, incompatible uses were received from outside entities, but none of these were authorized. Incompatible uses could only proceed if the restrictions were modified or released. Pima County OSC is consulting with USFWS on a potential future modification or release of restrictions, as required by the covenants.

MSCP restrictive covenants on additional lands are being proposed for 2018. Assuming that the Board approves these restrictions in 2018, then these lands will be added to the inventory of potential MSCP mitigation lands available for future allocation for permit impacts.

Pima County is evaluating additional potential acquisitions of land under the Section 6 grant program administered by USFWS. Any acquisitions based on this funding source would not be eligible as mitigation lands, but would support the species and habitat objectives of the MSCP.

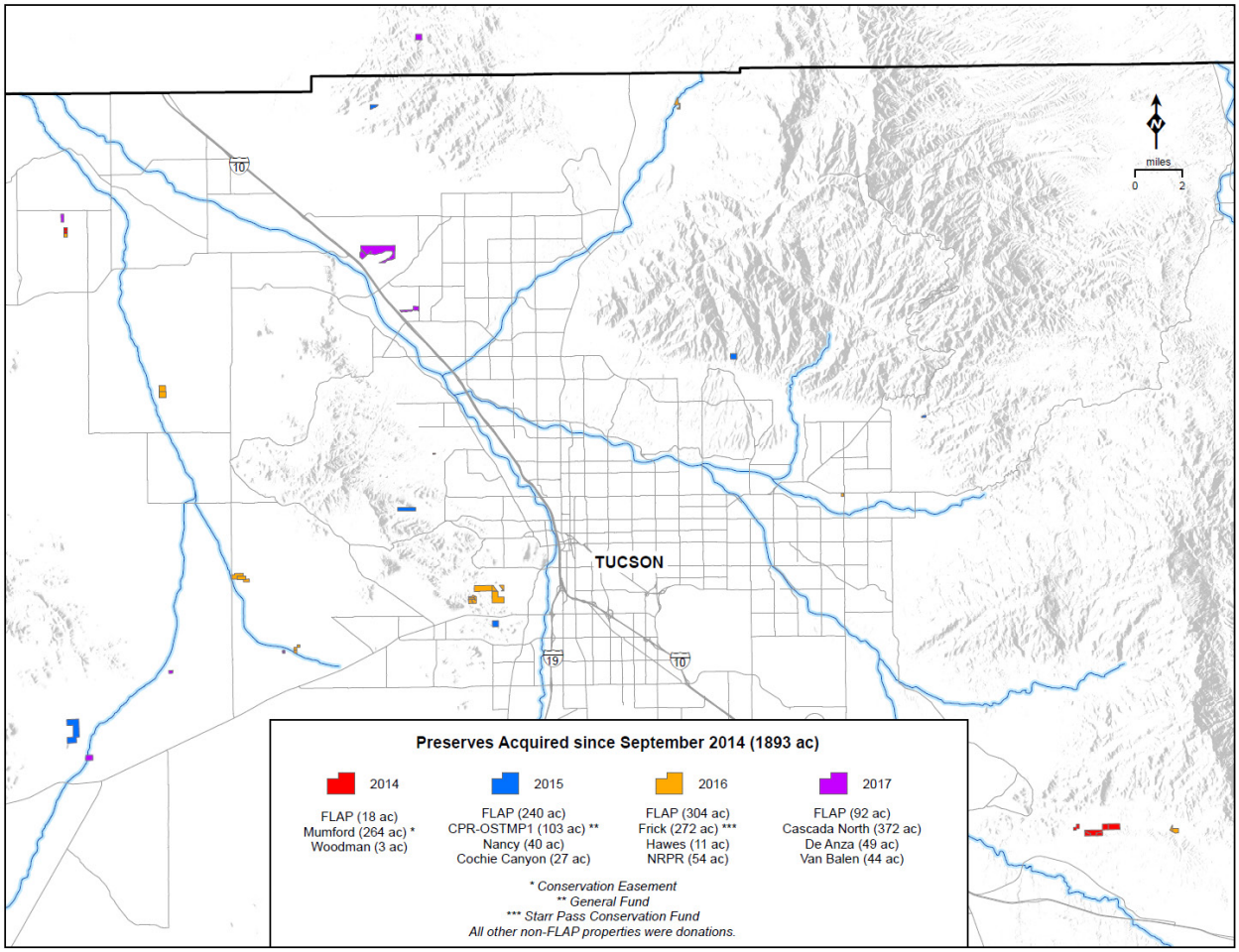

Figure 21. Land acquisitions by year since September 2014.

11 Partnerships

11.1 Arizona Conservation Corps

Arizona Conservation Corps (AZCC) aims to continue the legacy of the Civilian Conservation Corps of the 1930s by connecting youth, young adults, and recent-era military veterans with conservation projects on public lands. Pima County's NRPR has utilized the services of AZCC for a number of years to help out with management of potential MSCP mitigation lands. Local and urban youth from metropolitan areas in southern Arizona work with NRPR staff to construct and repair fences, remove invasive species, plant native species, and clean up wildcat dumps.

11.2 Arizona Land and Water Trust

Pima County has an agreement with the ALWT to provide Pima County with third-party beneficiary for both types of restrictive covenants. ALWT will ensure that any changes made by Pima County or the RFCD are consistent with the terms of the agreement. The ALWT will evaluate the property inspections provided to them in 2017.

11.3 University of Arizona

Pima County worked with Dr. Aaron Flesch (University of Arizona) to develop a habitat suitability model and monitoring program for the cactus ferruginous pygmy owl, and conducted a full protocol of surveys for the species on lands owned and leased by Pima County. Dr. Flesch's work is expected to be completed in June 2018. University of Arizona wildlife biologist David Hall and his crew continue to monitor Hospital Tank on Pima County's Clyne Ranch, for bullfrogs and other invasive species, and to perform removal efforts as needed. This work is critical for maintaining the Chiricahua leopard frog population at this site, the only known one on County lands.

11.4 Arizona Game and Fish Department

Pima County has long-standing, prior access agreements with AZGFD to maintain access to backcountry areas through Rancho Seco, Six Bar, and A7 Ranch. Under these access agreements, AZGFD may grant funds to Pima County for land management. In 2017, Pima County conferred with AZGFD on the potential use of native fish for vector control and Pima County provided comments to the department on the Santa Cruz basin fish management plan. AZGFD also used County land for release of black-tailed prairie dogs. AZGFD and Pima County both participated in identifying conservation opportunities in Avra Valley, and Pima County facilitated access to County lands for AZGFD breeding grassland bird monitoring efforts.

11.5 Cienega Watershed Partnership and U. S. Bureau of Reclamation

The Cienega Watershed Partnership (CWP) has received a grant from the Bureau of Reclamation (BOR) to evaluate potential sites for remediation of erosion or other water quality issues. We will work with CWP and BOR to evaluate sites in the Cienega Watershed in 2018.

11.6 The Nature Conservancy

In 2017, the Nature Conservancy renewed monitoring of plots they established twenty years ago at Bingham Cienega to determine the fate of young mesquite that had established in abandoned farm fields. Both a control plot and a thinned plot were relocated and revisited. The Nature Conservancy also provided information about their management of San Pedro lands adjacent to Bingham, and shared documents relevant to our management of other lands in the vicinity.

11.7 National Park Service

Pima County entered into a cooperative agreement with the Sonoran Desert Inventory and Monitoring Network (SODN) of the NPS, based in Tucson. This allowed the County to leverage a soils and vegetation monitoring protocol for County lands that has been developed by SODN and is currently in use across federal lands managed by multiple agencies near or adjacent to County lands (allowing meaningful comparisons across a larger scope). Additionally, it streamlines collaborations in data synthesis and interpretation, as well as expertise.

11.8 Tucson Audubon Society

Pima County contracted with the Tucson Audubon Society to assist in the implementation of the NPS soils and vegetation monitoring protocols on County lands as well as to aid in the monitoring of Southwestern willow flycatcher and Western yellow-billed cuckoos on County lands. The County benefited from leveraging the expertise and efforts of Tucson Audubon staff who have considerable experience with both of these monitoring efforts.

11.9 Southern Arizona Quail Forever

This organization is supporting provision of a wildlife guzzler on Sands Ranch, using a modified well and storage system with attached solar. This system will provide water year-round, independent of the livestock operation. This organization has donated funds and labor for the project. Southern Arizona Quail Forever is a relatively new organization focused on quail hunting and quail habitat in Pima, Cochise, and Santa Cruz Counties.

11.10 Frank Reichenbacher

We are fortunate to have experts donate their time to assist staff. Frank Reichenbacher, the leading expert on Tumamoc globeberry, visited one population of globeberry plants on County conservation lands to assist staff to inventory plants during the fall of 2017. During this visit, he identified new plants, as well as checking on the status of previously discovered plants, which will be added to a GIS database that he is compiling for globeberry occurrences throughout Pima County.

12 Prospective Issues

- Pima County OSC is developing a procedure to address requests to utilize County-owned potential mitigation lands for purposes not allowed by the restrictive covenants. The County is consulting with the USFWS and ALWT on those aspects that pertain to potential modification or release of restrictions.
- Pima County OSC is exploring the potential for private development to rely on a Certificate of Coverage to streamline compliance with *Pima County Code 18.72 – Native Plant Preservation* and *Pima County Code 16.30 – Watercourse and Riparian Habitat Protection and Mitigation Requirements*.
- During 2018, NRPR intends to update park rules for all types of park lands, with public involvement.
- In 2018, Pima County OSC intends to submit a proposal for USFWS consideration regarding species enhancement credits.
- With the support of AZGFD, Pima County is working towards applying for USFWS Section 6 monies to acquire important riparian habitat and water rights adjacent to the County's Buehman Canyon preserve that provides important habitat for threatened western yellow-billed cuckoos, as well as lowland leopard frogs, longfin dace, and a myriad of other species.
- Pima County RFCD is working on a new land cover classification for eastern Pima County that may help refine our understanding of the built environment. This should become available later in 2018.
- Pima County is working to minimize the potential impacts of the SunZia power line, the Interstate 11 road corridor, and the Rosemont mine on potential mitigation lands, and to evaluate any relevant information that these projects generate.
- Pima County will continue to respond to AZGFD and others regarding potential native species introductions, such as the black-tailed prairie dogs introduced to Sands Ranch in 2017. An internal procedure for evaluating proposed species introductions of any kind on County lands will be considered.
- USFWS may consider whether the take statements for aquatic species such as the topminnow should be revised in light of natural colonization as a result of improved habitat conditions.
- USFWS assistance will be needed to continue dialogue with other federal agencies on streamlining their Section 7 consultations in light of the MSCP.
- Pima County will seek a longer term agreement for species monitoring and management on State Trust land.

13 Acknowledgements and Certifications

This report is prepared in partial fulfillment of the terms of permit #TE-84356A-0.

This report reflects the continued collaboration of many County departments who provide stewardship to open space lands or provide basic services like information technology, financial reporting, and law enforcement. Our thanks go to the many individuals in the departments who provided assistance: Information Technology; Natural Resources, Parks and Recreation; Sheriff; County Attorney's Office; County Administration; Regional Flood Control District; Finance; Transportation; Environmental Quality; Real Property; Office of Sustainability; Health Department; and Public Works Administration.

We also appreciate the information shared by AZGFD, Pima County and RFCD staff, and others for evaluating changed circumstances.

To the best of my knowledge, I certify that the information submitted is true, accurate, and complete.

_____

_____

14 Glossary and Acronyms

14.1 Glossary

Adaptive management. Adaptive management is an iterative learning process that identifies gaps in understanding, facilitates action, and modifies management based on new information (Walters 1986). Pima County will employ two types of adaptive management: 1) those decisions for which a single management action is needed (responsive management actions) and 2) decisions that require recurrent actions (recurrent decisions).

Board. Referred to collectively as the Board of Supervisors for Pima County and the Board of Directors for the Pima County RFCD.

Built environment. The GIS shapefile representing pre-permit land uses in Pima County. It was developed in 2008 by Pima Association of Governments, and updated by Pima County.

Certificate of Coverage Program. The program through which the County will grant Section 10 permit coverage to any property owner, at their discretion. This program affords the developer of a home, subdivision, commercial, or industrial project an opportunity to comply with the ESA for activities that are permitted by the County. Participation in the program is voluntary and in the sole discretion of the private developer.

Changed circumstances. "Changes in circumstances affecting a species or geographic area covered by an HCP that can reasonably be anticipated by Plan developers and the USFWS and that can be planned for (e.g., the listing of a new species, or a fire or other natural catastrophic event in areas prone to such events)." (50 CFR §17.3).

County. When referring to the applicants, Pima County and Pima County RFCD. When referring to mitigation lands, lands managed by either of the two applicants.

Covered Species. Species covered under Pima County's Section 10 permit.

Fee simple. A term of property law where the owner has title (i.e., ownership) to the land.

Implementing Agreement. Specifies all terms and conditions of activities under the HCP. By signing the Implementing Agreement, USFWS explicitly acknowledges approval of the plan and declares that it meets the requirements of an HCP to allow issuance of appropriate permits for target or other named species, should those species become listed.

Incidental take. Take that results from, but is not the purpose of, carrying out an otherwise lawful activity. Take can be both lethal and non-lethal.

Incidental take permit (also called Section 10 permit). A permit issued under Section 10(a)(1)(B) of the Endangered Species Act to a non-Federal party undertaking an otherwise lawful project that might result in the incidental take of an endangered or threatened species. Application for an incidental take permit is subject to certain requirements, including preparation by the permit applicant of a conservation plan, generally known as an HCP.

Maeveen Marie Behan Conservation Lands System (CLS). The biological reserve system design adopted as the Regional Environmental Element of Pima County's 2001 Comprehensive Plan Update, and any subsequent revisions. The CLS provides the principal basis for the selection of lands for mitigation under the permit.

Mitigation Lands. Those lands, leases, or rights held by Pima County and committed as compensation for impacts to habitat of Covered Species stemming from Covered Activities under Pima County's Section 10 permit. Mitigation lands are either owned in fee simple, leased, or held as a partial property right (e.g. conservation easement or other legally enforceable property right).

Mitigation lands, County-controlled. All mitigation lands for which Pima County has a property interest (e.g., fee simple ownership, conservation easement, or grazing lease). Excludes mitigation lands derived from the Certificate of Coverage Program.

Mitigation lands, County-owned. All lands that are owned by Pima County in fee simple and used as compensation for impacts under the terms of Pima County's Section 10 permit.

Pima County. When referring to the proposed permit holder, the term includes Pima County RFCD, a separate taxing authority that is governed by the same elected officials as Pima County.

Preserve Network (Pima County). Land owned and managed for open space preservation, considered in the aggregate. Includes all County-controlled mitigation lands, as well as other Pima County preserves (e.g., Tucson Mountain Park) for which no habitat mitigation credit is being sought.

Priority Conservation Area. Those areas identified by species experts where conservation is necessary for the Covered Species' long-term survival.

Regional Flood Control District (RFCD). The Pima County RFCD is a separate legal entity from Pima County, and one of the two applicants in the MSCP.

Sonoran Desert Conservation Plan (SDCP). Overarching conservation plan for Pima County. The Pima County MSCP is one element of the plan, which includes cultural resource goals, as well as biological goals.

Unforeseen circumstances: "Changes in circumstances affecting a species or geographic area covered by an HCP that could not reasonably have been anticipated by plan developers and the USFWS at the time of the HCP's negotiation and development, and that result in a substantial and adverse change in the status of the Covered Species." (50 CFR §17.3).

14.2 Acronyms

ADWR	Arizona Department of Water Resources
AZGFD	Arizona Game and Fish Department
ALWT	Arizona Land and Water Trust
AZCC	Arizona Conservation Corps
CFR	Code of Federal Regulations
CIP	Capital Improvement Program
CLS	Maeveen Marie Behan Conservation Lands System
Corps	U.S. Army Corps of Engineers
GIS	Geographical Information System
HCP	Habitat Conservation Plan
MSCP	Multi-species Conservation Plan
NRPR	Natural Resources, Parks and Recreation Department (Pima County)
OSC	Office of Sustainability and Conservation (Pima County)
PCEMP	Pima County Ecological Monitoring Program
RFCD	Pima County Regional Flood Control District
USFWS	United States Fish and Wildlife Service

15 Literature Cited

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