

Pima County
**MULTI-SPECIES
CONSERVATION PLAN**
2019 Annual Report



March 1, 2020

Submitted to the U.S. Fish and Wildlife Services, Southwest Region in partial fulfillment of Incidental Take Permit: TE-84356A-0

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Cover photo: Cat Mountain and adjacent development from Starr Pass in the Tucson Mountain Park.



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Executive Summary

Calendar year 2019 represents the fourth annual report for Pima County’s Multi-Species Conservation Plan (MSCP). The MSCP represents the vehicle by which the County and certain developers may comply with the US Endangered Species Act (via Section 10(a)(1)(B) Incidental Take permit issued July 2016). Pima County and the Regional Flood Control District are joint permittees.

The Section 10 permit authorizes activities that may incidentally harm 44 species (i.e., Covered Species), otherwise known as “take.” Under this permit, the currency used to estimate take is acres of land impacted. Up to 36,000 acres of take is authorized for a period of up to 30 years, in exchange for avoidance, minimization and mitigation measures detailed in the MSCP. The reporting period for the annual report submitted March 1, 2020 is January 1-December 31, 2019.

Take and Mitigation

The table and figures below summarize the number of projects and acres of impact and required mitigation for covered activities under the incidental take permit. Mitigation obligations are quantified using the acreage of Capital Improvement Projects (CIP) and private projects that acquired a Certificate of Coverage (CofCov).

Table S1. Number of covered projects requiring mitigation, and acres of covered impacts and obligated mitigation by category for calendar year 2019.

	# of Projects Mitigated	Total Take	Obligated Mitigation
CIP	6	59.9 acres	292.6 acres
CofCov	52	137 acres	475.1 acres
2019 Total	60	196.8 acres	767.7 acres

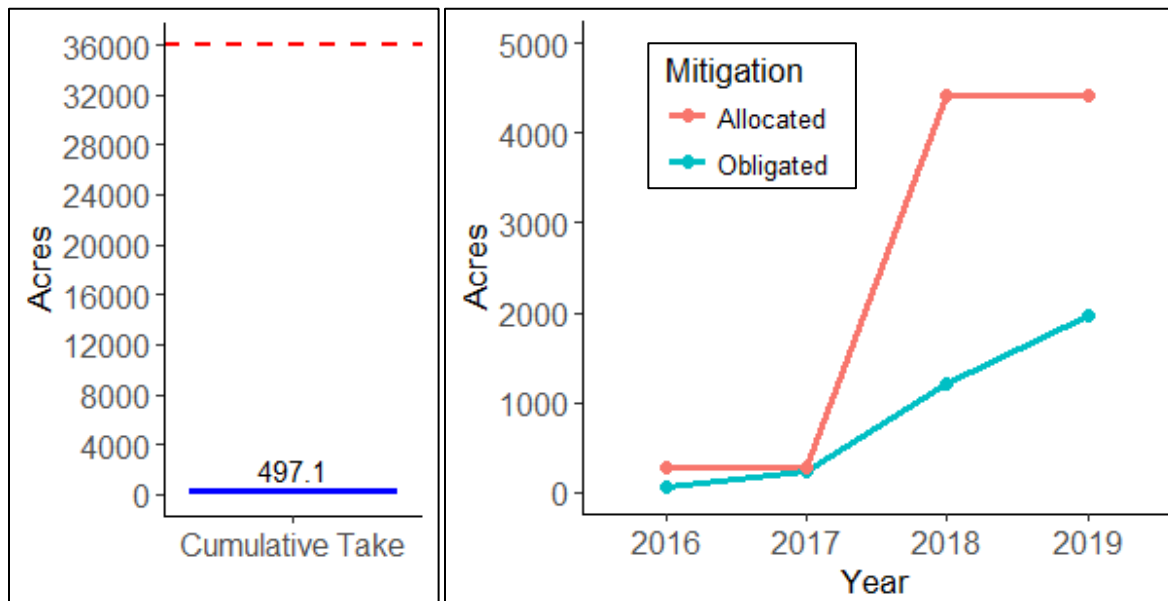


Figure S1. Histogram of cumulative acres of take, 2016-2019 (left). Pima County’s Section 10 permit authorizes up to a total of 36,000 acres of take, shown by dashed red line. Graph of cumulative obligated and allocated mitigation credit by year, 2016-2019 (right).

Notable Achievements

Covering Projects

- The MSCP has covered a total of 164 Capital Improvement Projects completed by the permittees to date.
- A total of 220 private projects have received coverage to date (Private sector coverage is voluntary).
- The MSCP streamlined ESA compliance for three Army Corps of Engineers permits issued to the Regional Flood Control District completed during calendar year 2019.
- The MSCP's take provision was used to stock the endangered Gila topminnow and Huachuca water umbel in a new aquatic feature at the Mission Garden.

Minimizing Habitat Impacts

- The Regional Flood Control District reported that 94.5% of applicants avoided impacting regulated riparian habitat.
- The Pima County Board of Supervisors approved several land-use policies that promote reuse or infill instead of sprawl.

Managing Land

- U. S. Fish and Wildlife Service approved a plan for augmenting populations of covered species on our mitigation lands, and another for managing properties along the San Pedro River.
- A new population of Gila topminnow was established in a stream on the County's M Diamond Ranch.
- During 2019, the portfolio of potential mitigation lands increased by approximately 250 acres.
- Pima County staff, contractors, and volunteers mechanically removed or chemically treated approximately 1,470 acres of buffelgrass on County preserve lands.

Monitoring Species and Habitats

- Office of Sustainability and Conservation staff made 623 separate observations on Covered Species; these were reported to the Arizona Game and Fish Department.
- County staff developed comprehensive monitoring protocols for seven monitoring elements, including upland habitat, water resources, landscape pattern change, invasive aquatic and plant species, off-highway vehicles, and climate.
- County staff in partnership with Tucson Audubon Society and the National Park Service established an additional 21 long-term vegetation and soils monitoring plots on County preserve lands.

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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, 2019.

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).

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).

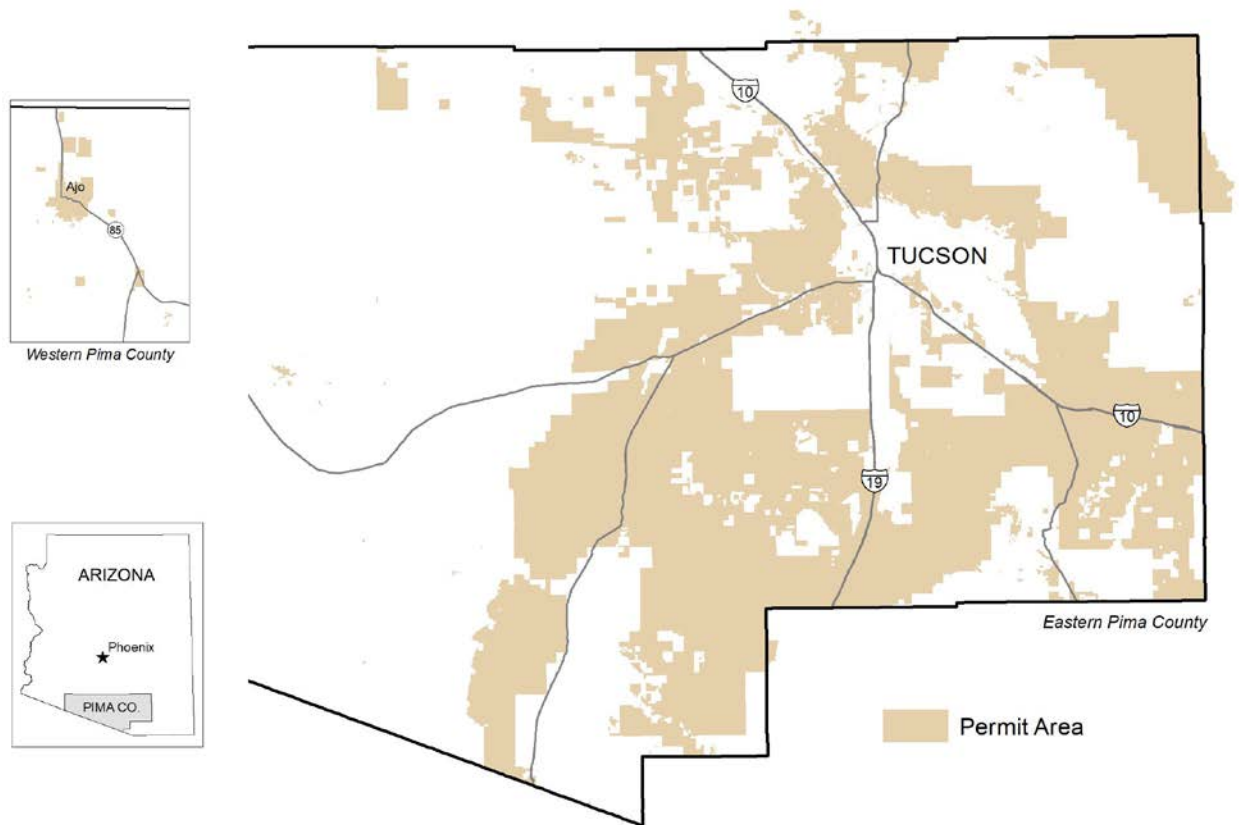


Figure 1. Permit Area for Pima County’s Multi-species Conservation Plan as of December 31, 2019.

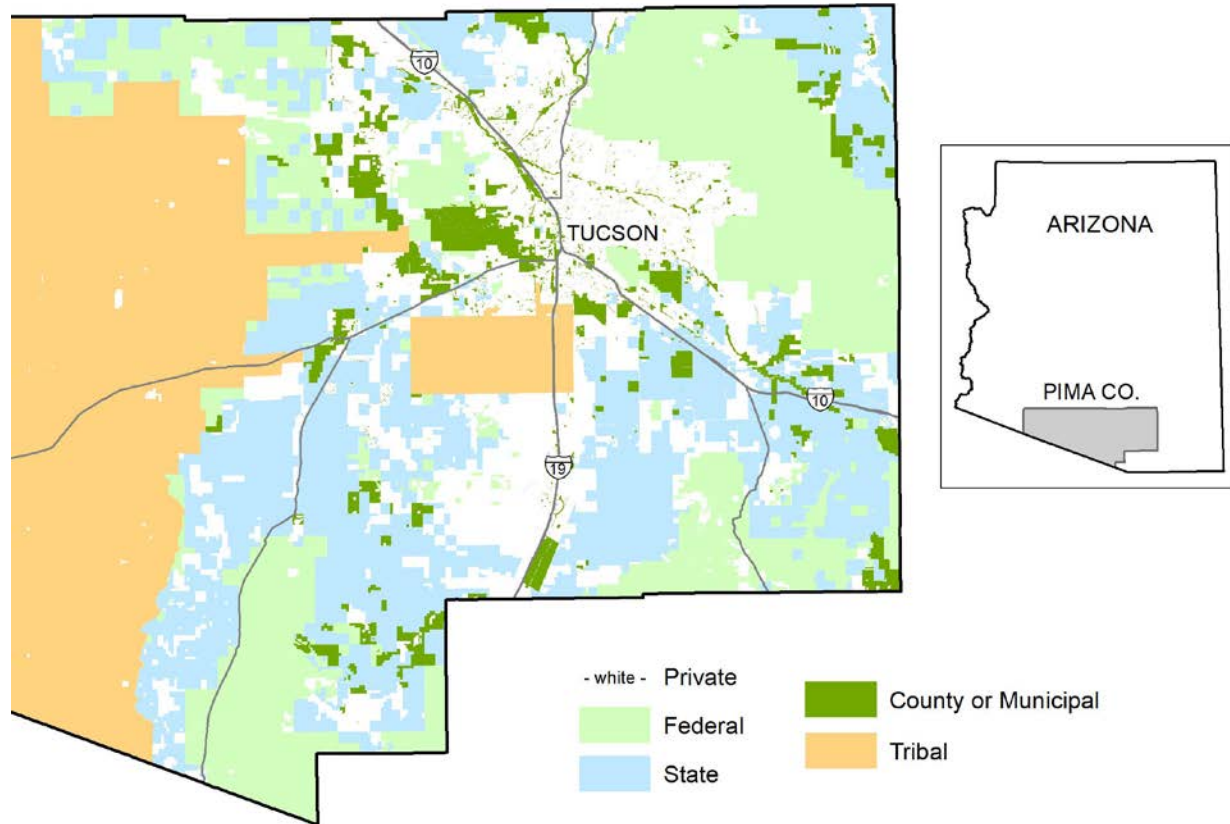


Figure 2. Land ownership in eastern Pima County, as of December 31, 2019. See Figure 3 for location of changes in land ownership during the reporting period.

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 Appendix P of the MSCP. A glossary of terms and acronyms (Pages 60-62) 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.

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3 Administrative Changes

3.1 Permit Area

The Permit Area represents the area within which Covered Activities could occur and has changed slightly during 2019 (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 reduce the permit area. Releases of state trust land to the private sector increase the permit area if the land released is located in the unincorporated area. There were no federal land acquisitions or releases of state trust land affecting the permit area during 2019.

The permit area also includes locations where Covered Activities by the Permittees occur, principally on the potential mitigation lands in other counties and where the Permittees work in incorporated areas.

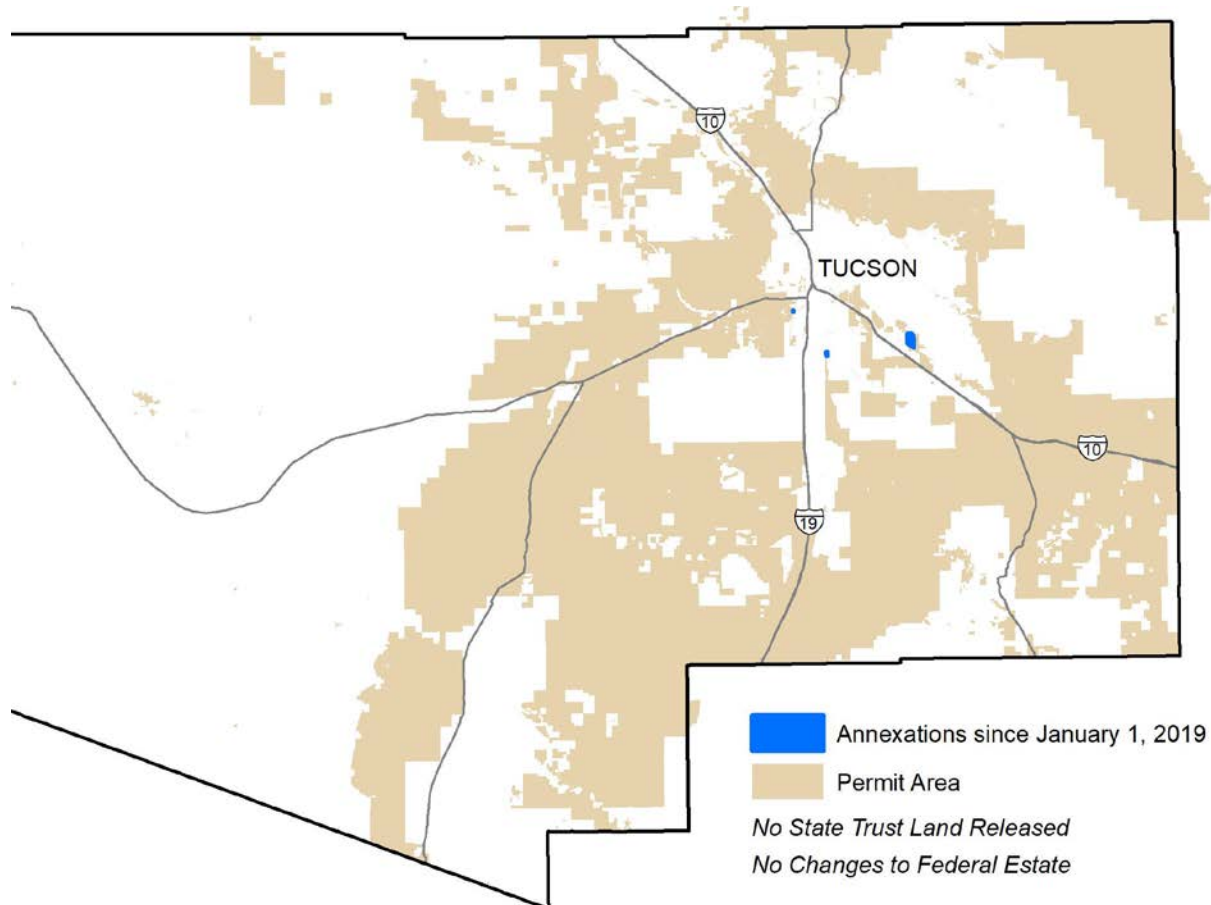


Figure 3. Permit Area changes for Pima County’s Multi-species Conservation Plan, January 1 through December 31, 2019. Annexations slightly diminished the Permit Area extent.

3.2 Regulatory Streamlining

The MSCP was designed to facilitate more streamlined compliance with other regulatory requirements. To date, there are three opportunities where leveraging MSCP mitigation provides regulatory streamlining:

- Endangered Species Act compliance for the 18 U. S. Army Corps of Engineers (Corps) nationwide and regional Clean Water Act permits listed in the MSCP;
- Endangered Species Act compliance for Corps Clean Water Act Individual Permits when the Corps and USFWS, at their discretion, determine MSCP mitigation provided by Pima County is acceptable;
- Pima County Native Plant Preservation Ordinance compliance with mitigation requirements for Pima pineapple cactus, needle-spined pineapple cactus, and Huachuca water umbel when private development obtains a Certificate of Coverage.

Table 1. Number of County and private development projects that utilized MSCP mitigation to streamline regulatory compliance.

Project Type	2019	Cumulative Total
County	5	7
Private Development w/CofCov	2	2

3.2.1 Army Corps of Engineers Clean Water Act

Pursuant to the programmatic consultation with Corps, Pima County worked with the USFWS and the Corps to streamline Endangered Species Act compliance for the 18 nationwide and regional general Clean Water Act permits listed in the MSCP. The USFWS, Corps, and Pima County agreed to report annually on the status of Corps permits issued in relation to the programmatic consultation. In 2019, the format of the report was augmented to include additional information. The revised report is in Appendix 1.

The programmatic consultation did not encompass Individual Permits. However, the Corps and U. S. Fish and Wildlife Service may, in their discretion, accept MSCP mitigation provided by Pima County as compensation for effects to listed species resulting from County projects and private projects participating in the Certificate of Coverage program. During 2019, no County projects utilized this process to provide mitigation for listed species.

3.2.2 Pima County Native Plant Preservation Ordinance

In 2018, Pima County developed a procedure that allows private developments to rely on a Certificate of Coverage to streamline compliance with certain provisions in Pima County Code 18.72 – Native Plant Preservation. Specifically, this procedure allows the Pima pineapple cactus (PPC), needle-spined pineapple cactus (NSPC), and Huachuca water-umbel (HWU) mitigation the County provides for a private development project receiving a Certificate of Coverage to be used as off-site mitigation for purposes of complying with the Native Plant Preservation Ordinance (NPPO). Under this new procedure, private developments will be allowed to rely on a Certificate of Coverage to serve as off-site mitigation for purposes of fulfilling replacement and supplemental PPC, NSPC, or HWU, consistent with the NPPO requirements (Section 18.72.090.B).

In 2019, two private development projects that received a Certificate of Coverage leveraged MSCP mitigation to streamline their compliance with the Native Plant Preservation Ordinance.

3.2 Miscellaneous Administration Items

- There were no changes to habitat models or Priority Conservation Areas.
- USFWS approved the Bingham Management Plan.
- USFWS clarified how we may fulfill mitigation obligations for impacts to Special Species Management Areas.
- The Aquatic Species Management Plan was approved by USFWS. The approval does not direct, authorize or fund any particular action on land owned or managed by Pima County or the Regional Flood Control District.
- Pima County informed USFWS that we believe early completion of an MSCP obligation does not require a minor modification.
- Nursery manager Jessie Byrd obtained Arizona Dept. of Agriculture permit to move HWU; this species was planted on County property at Mission Garden acequia
- USFWS agreed that MSCP educational provision covers the topminnow and HWU at Mission Gardens
- USFWS approved OSC-RFCD draft procedure to allow Certificates of Coverage to streamline certain IRA requirements under Title 16.30.
- Critical habitat was designated for the Sonoyta mud turtle. This is not a covered species and there is no potential for take in the permit area.
- USFWS reviewed and supported the proposed application of restrictive covenants to 253.62 acres and unencumbering 3.31 acres, see Chapter 10.
- USFWS agreed that no separate 10(a)1(A) is needed for propagation of MSCP-covered endangered plants such as HWU and Pima Pineapple Cactus and that transportation of listed plants from one Pima County property to another does not violate federal law.
- Species translocations or reintroductions of plants as well as animals to private property are a covered activity under the MSCP. A certificate of biological inclusion for plantings onto private property can address owner's activities that might have a federal nexus.
- USFWS advised that downlisting of Gila topminnow may be warranted; no action is needed on our part if this happens.
- There were no information requests in 2019 by the USFWS to Pima County for the purpose of assessing whether the terms and conditions of the permit are being met.
- For approved adjustments to ecological monitoring, see Chapter 7
- Pima County moved Pima Pineapple Cactus salvaged from one County-owned property to Prickly Park (Pima County Native Plant Nursery) and provided follow-up information to USFWS.
- The permittees improved the accuracy of incidental take calculation for parcels greater than 10 acres in size (see Chapter 4).

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.

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. A total of 220 projects have been authorized to receive coverage since the program began in 2017. Authorization for incidental take remains in effect for six years from the date of issuance; coverage is granted when project grading is complete. To date, no certificates have expired and a total of 110 projects have received coverage.

In CY2019, we refined how we determine the area of take on properties larger than ten acres that receive a Certificate of Coverage via a building permit (Figure 4). Our general process for determining take for these properties is to count the entire area of the parcel as the disturbance area regardless of the actual disturbance area. However, with especially large parcels, the difference between the parcel size and actual disturbance area can be significant and can result in the provision of far more mitigation than is necessary to compensate for the actual disturbance. Because of this, we refined our process for determining take on properties that are over ten acres that receive a Certificate of Coverage via a building permit. Working with Pima County IT GIS and RFCD, we can now calculate take for those properties using the actual area of disturbance rather than the entire parcel area. This allows us to right size our mitigation obligations in those situations where the parcel size is significantly larger than the actual area of disturbance.”

In 2019, 52 projects received coverage subsequent to completion of grading (Table 2, Figure 4) resulting in a loss of approximately 137 acres of habitat. Two of the covered projects were located on parcels 10 acres or more in size.



Figure 4. In light yellow is the area of disturbance represented by the parcel boundaries. In orange is the actual 0.30-acre disturbance based on information provided by the applicant to RFCD. In CY2019, we rely on actual disturbance to calculate take for parcels 10 acres or more in size.

Table 2. Certificates that provided permit coverage for private development in 2019, Pima County.

Certificate of Coverage #	Actual Habitat Loss Acreage
P17CC00002	11.47
P17CC00017	1.01
P17CC00026	1.57
P17CC00041	0.74
P17CC00047	4.18
P17CC00049	1.01
P17CC00056	4.07
P17CC00063	0.99
P17CC00064	0.86
P17CC00073	1.33
P18CC00003	3.35
P18CC00004	2.46
P18CC00008	1.54
P18CC00018	3.57

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P18CC00020	4.00
P18CC00022	1.18
P18CC00025	1.78
P18CC00026	1.26
P18CC00027	5.01
P18CC00029	3.25
P18CC00031	4.25
P18CC00034	0.39
P18CC00035	4.08
P18CC00037	3.32
P18CC00038	3.06
P18CC00040	1.01
P18CC00044	0.90
P18CC00046	1.38
P18CC00050	0.87
P18CC00053	4.94
P18CC00054	2.86
P18CC00055	1.67
P18CC00057	1.17
P18CC00058	6.20
P18CC00060	3.22
P18CC00061	3.39
P18CC00062	0.88
P18CC00065	1.16
P18CC00068	1.29
P18CC00069	3.51
P18CC00070	3.31
P18CC00072	4.51
P18CC00074	4.15
P18CC00075	3.52
P18CC00076	1.42
P18CC00078	3.73
P19CC00001	2.42
P19CC00002	3.32
P19CC00003	2.25
P19CC00005	1.41
P19CC00007	1.10
P19CC00018	1.67
Total	136.99

4.2 County Capital Improvement Program (CIP)

CIP projects are generally infrastructure projects that cost more than \$100,000 to construct. A County CIP project is reported in the Annual Report as a Covered Activity when:

- it is initiated by County or District and determined to be “substantially” complete. This is after most of the earthwork is done, but prior to completion of all activities such as landscaping and payment of invoices
- It is initiated by County or District and determined to be complete in the Corps of Engineers Section 404 annual coordination report in Appendix 1. These may typically be phased CIP projects such as removal of sediment, or non-CIP projects that required pre-construction notification to the Corps

There were a total of 18 County CIP projects covered by the permit in 2019 (Appendix 2). Many of the covered projects listed in Appendix 2 did not cause ground disturbance, and therefore are not associated with a mitigation requirement. Others occurred entirely or partly in the built environment where no mitigation was required. Of the ground-disturbing projects, only six CIP projects required mitigation and these are shown on Figure 5.

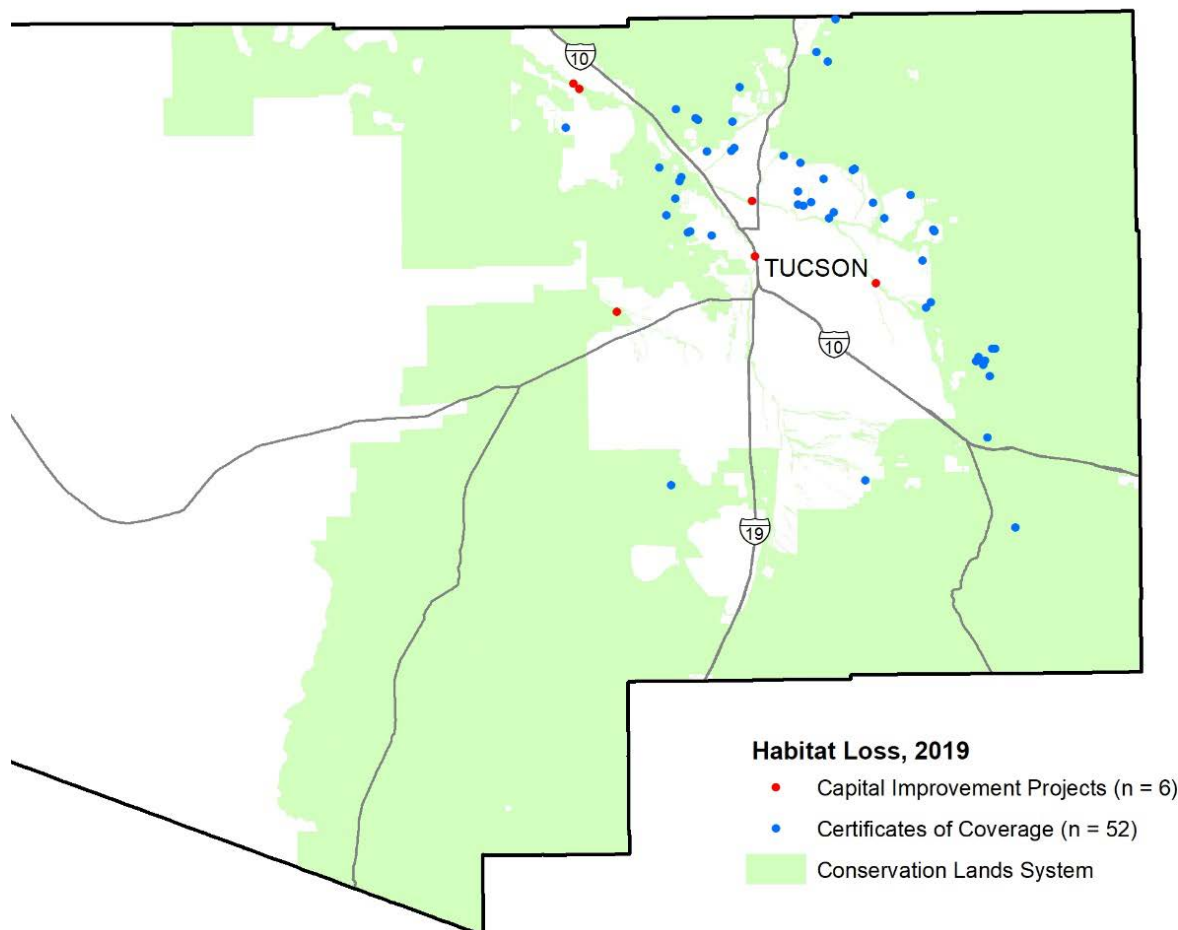


Figure 5. Location of habitat loss due to Covered Activities, January 1- December 31, 2019. Locations are enlarged for clarity. Private projects may elect coverage through the Certificate of Coverage program, and each such project receives mitigation.

Covered Activities also include non-CIP projects and activities that occurred in various locations throughout the permit area but most of these are not required to be listed each year in the annual report. However, if the MSCP coverage was relied upon to satisfy the Section 404 permit issued by the Corps, then mitigation is required and the project will be listed in Appendix 1. Such is the case for several non-notifying projects listed in Appendix 1.

Appendix 3 represents potential CIP projects which may be completed in the future years. Based on this information, it appears that transportation and flood control projects will provide a continuing source of impacts that require mitigation.

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. Private sector impacts are tracked using a combination of Accela and ArcGIS. GIS acres, not survey data, are the basis for impact acreages.

The built environment layer used for tracking impacts is not always accurate, and this resulted in the need to discuss how to accomplish impacts tracking for several park projects with USFWS. Parks in particular are often a mix of developed and natural areas. In 2020, Pima County intends to present to USFWS a comprehensive update of the built environment based on the [Land Use-Land Cover](#) mapping by Regional Flood Control District that would provide a more accurate basis for CIP impacts tracking in the future.

4.3 Covered Activities Impacts

Polygons for ground-disturbing CIP projects that were substantially completed on or before December 31, 2019 were used to calculate impacts, in addition to several sediment removal projects by RFCD. The project polygons were checked to ensure ground disturbance was correctly identified. The list of ground-disturbing projects was then screened to eliminate any on federal or tribal lands, as these impacts are not covered under the permit. The remaining projects were intersected with the Built Environment GIS layer (known as [CIPBUILT](#)). Those portions outside the built environment, or federal or tribal lands, 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 2019, six ground-disturbing projects conducted under four unique CIP project numbers (Figure 5; Table 3; totaling 59.9 impact acres) required the County to provide 292.6 acres of CLS mitigation. The largest project requiring mitigation this year was the 30.48-acre sediment removal project in the Rillito. Private sector impacts required 475.1 acres of mitigation.

Table 3. Ground-disturbing CIP projects requiring mitigation in 2019 as mapped on Figure 5

CIP Number	Project Name	Acres
CWW.3AVB16	New Influent Emergency Overflow Basin - Avra Valley WRF	3.18
CWW.3MRP19	Atterbury Wash Project	0.15
CFC.5RRWMP	Rillito River Maintenance Projects - Phase 2 Oracle to La Canada	30.48
CFC.5SCRMP	Santa Cruz River Maintenance Phase 2 Congress to Speedway	23.28
CFC.5SCRMP	Santa Cruz River Maintenance: Sanders Bridge north bank	1.08
CFC.5SCRMP	Santa Cruz River Maintenance: Sanders Bridge south bank	1.70

Table 4 summarizes the total acres of impact for both CIP and private development, along with the CLS category and mitigation ratios applicable to these impacts. There were 196.8 acres of loss in 2019; consequently, Pima County will provide 767.7 acres of mitigation to compensate for impacts occurring in 2019.

Table 4. Habitat loss and associated mitigation ratios for 2019, Pima County MSCP.

CLS category	Habitat Loss Acreage	Mitigation Ratio	Mitigation Obligation
Biological Core	20.2	5:1	101.0
Important Riparian Area	62.0	5:1	310.0
Multiple Use Management Area	62.1	3:1	186.3
Special species management area (outside other categories)	21.8	5:1	109.0
Outside the CLS	30.7	2:1	61.4
Total	196.8		767.7

5 Conservation Measures

5.1 Avoidance and Minimization

5.1.1 Changes to Ordinances and Standards

In 2019, there were no changes to avoidance and minimization measures as described in Section 4.2 of the MSCP.

5.1.2 Certificate of Coverage - Important Riparian Area Mitigation Streamlining

In 2019 Pima County and the Regional Flood Control District developed a draft procedure that would allow private developments to rely on a Certificate of Coverage to streamline compliance with certain requirements for Important Riparian Area mitigation under Title 16.30 and associated guidelines. USFWS approved the draft procedure, and it is now undergoing stakeholder review that was initiated by the Regional Flood Control District in Fall 2019. It is expected that this procedure will be finalized and implemented in 2020.

5.2 CIP Screening and Reporting Process

No substantive changes in the CIP screening and reporting process occurred in 2019. The screening 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. Project managers now receive copies of their initial polygons for verification of accuracy.

Advice on avoidance and minimization for individual projects is provided by environmental compliance personnel in various County departments, and by Office of Sustainability and Conservation as requested.

5.3 Gila Topminnow for Vector Control

In 2017, County staff began using Gila topminnow for vector control, as outlined in section 3.4.1.2.1 of the MSCP. In 2019, only one potentially vector-producing nuisance aquatic feature was stocked with Gila topminnow by the Health Department, which occurred at a large golf course pond (Figure 6, Appendix 4). This represents the first stocking of topminnow in a non-residential setting.

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.



Figure 6. Pima County Health Department staff stocking golf course pond with Gila topminnows in 2019.

Pima County was the first Health Department in the state to use the Gila topminnow for vector control in 2017. In June 2019, neighboring Pinal County established a topminnow vector control program utilizing a similar structure to Pima County's. Potential Pinal County stocking locations are also within the historic range of the species (Gila River drainage); however, it is unknown how many stockings have been completed. This development presents Pima County Health Department staff with a potential opportunity to collaborate with Pinal County staff on refining methods for topminnow rearing, introductions, and monitoring, with an ultimate goal of improving use of topminnow for vector control.

5.4 Riparian Avoidance and Minimization Measures

The RFCD reported that 2000 riparian habitat reviews occurred in 2019 versus 2292 for 2018. Of these, 94.5% of the applicants avoided impacting regulated riparian habitat. In other words, there were 1889 instances of avoidance of regulated riparian habitat impacts. There were 111 minimization actions, of which 88 had impacts that were limited to less than 1/3 of an acre disturbance. Twenty-three (23) instances required riparian mitigation in addition to minimization.

In 2020, RFCD will clarify what is meant in the Floodplain Management Ordinance when it states that a permit applicant shall provide "evidence that no reasonably practicable alternative exists" relative to avoidance and minimization. This will not require modification of any key provisions of the Ordinance.

5.5 Other Avoidance and Minimization Measures

The Pima County Board of Supervisors has approved several policies that promote reuse/infill instead of sprawl:

- 1) a doubling of height limits in all industrially zoned lands;
- 2) an Infill Incentive District that provides an easy path to redevelop a targeted industrial area, greatly minimizing or eliminating the need for on-and-off site improvements; and
- 3) a zoning code amendment to allow more compact development in our more dense zoning categories (i.e. no increase in overall density, but smaller lots and reduced setbacks).

A baseline sewer service area was created to monitor incursions into the Conservation Lands System (see Landscape Pattern Monitoring Protocol – Appendix 10 for more information).

In 2019, the Governor's office approved an updated Arizona Noxious Weed List. Pima County Office of Sustainability supported the effort. Species added to the Noxious Weeds List now include many that occur in Pima County: fountain grass (*Pennisetum setaceum*), tamarisk (*Tamarix ramossisima*), tree of heaven (*Ailanthus altissima*), giant reed (*Arundo donax*), Sahara mustard (*Brassica tournefortii*), Malta starthistle (*Centaurea melitensis*), johnsongrass (*Sorghum halepense*), yellow bluestem (*Bothriochloa ischaemum*) and stinknet (*Oncosiphon piluliferum*). See Figure 7 for an example of invasive giant reed prior to removal on Cienega Creek Natural Preserve.



Figure 7. Highly invasive giant reed (*Arundo donax*) is included on the 2019 updated Arizona noxious weed list. Infestation at Cienega Creek Preserve shown prior to removal by Pima County NRPR staff.

Approximately 50 County staff were trained on recognition and abatement of stinknet (*Oncosiphon piluliferum*), a new invasive species that was first detected on City and private land near Prince Road and Interstate Highway 10 this year.

Pima County Department of Environmental Quality continues to administer the weed ordinance. No weed ordinance letters or violations were issued on MSCP or potential MSCP mitigation lands. One hundred fourteen (114) weed and trash ordinance letters were sent to private property owners this year.

5.6 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. Lands located along the San Pedro River and along Cienega Creek have been allocated so far as compensation for impacts that have occurred since 2016 (Figure 8).

The number of acres of credits available 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. So far, all allocated lands are owned in fee simple.

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The inventory of potential mitigation lands and where allocations have occurred are represented in Figure 8 and 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 in greater detail by the public on the [SDCP Mapguide](#) site.) Appendix 5 provides a parcel list of lands allocated so far.

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). The San Pedro allocations are primarily Important Riparian Area (IRA) and CLS-designated Special Species Management Area (SSMA). The deeded lands allocated along Cienega Creek are primarily CLS-designated Important Riparian Areas and Biological Core.

The credits for deeded lands allocated so far exceed the mitigation obligation for take for 2016-2019 (Table 5); therefore, the mitigation obligation has been satisfied. The 2016-2019 CLS obligations are summarized in Table 6. CLS obligations for Multiple Use and Outside of CLS can be met by any higher categories, such as Biological Core, Important Riparian Area, or Special Species Management Areas.

Allocations trigger a timeline for management plans. The Bingham Management Plan is completed and approved. A new management plan will be prepared for the allocated lands along Cienega Creek and other nearby, unallocated properties by March 1, 2021.

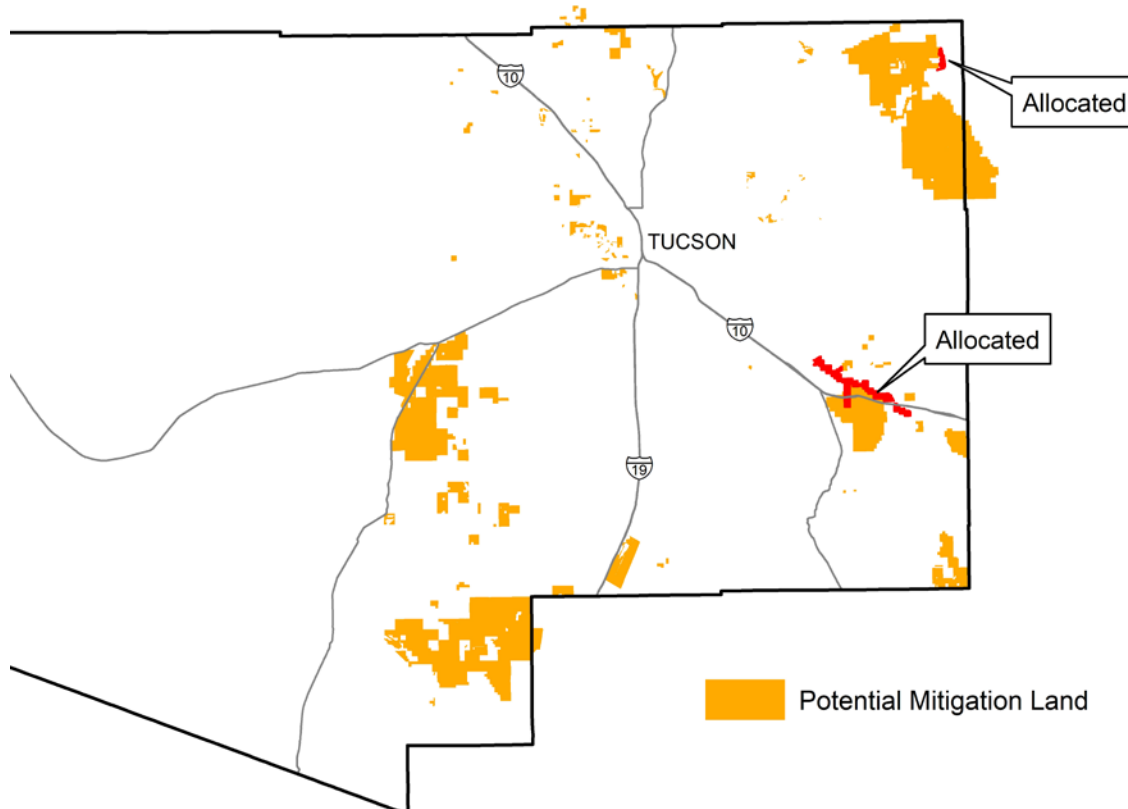


Figure 8. Location of all mitigation lands allocated under the MSCP to date (Dec 31, 2019). These areas consist of the Bingham Planning Area (allocated in 2017) and the allocation of the Cienega Creek Natural Preserve and a small portion of Bar V Ranch (allocated in 2019), shown in relation to other potential mitigation lands managed by Pima County.

Table 5. Mitigation credits obligated and allocated for the Pima County MSCP by year.

Year Obligated	Mitigation Obligation	Mitigation Allocated
2016	52.6	267.0
2017	171.7	0
2018	977.3	4140.5
2019	767.7	0
Total (to date)	1969.3	4407.5

Table 6. Cumulative CLS mitigation credits (2016-2019) obligated and allocated for the Pima County MSCP.

Category	CLS Obligation	Cumulative Allocation
Biological Core	505.7	2059.2
IRA	525.1	2122.3
Multiple Use	345.3	223.4
Outside	190.5	2.7
SSMA on MU or Outside*	402.6	0
TOTAL (to date)	1969.2	4407.5

*These obligations are met with any combination of Biological Core, IRA, or SSMA.

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 2019.

5.6.1 Water Rights in Relation to Mitigation Lands

Part of the newly allocated land in the Cienega Creek Natural Preserve is located in an area where groundwater uses are subject to regulation. Pima County holds some groundwater rights on the allocated properties, but the restrictive covenants for the deeded Mitigation Lands limit the kinds of uses to which water can be put by the County. The covenants prohibit increased levels of surface water or groundwater use by County without permission from USFWS and others. To that end, Pima County and RFCD are working to establish baseline water use for each restricted property that can be integrated with the Biennial Inspection reporting. Each property may have multiple wells that contribute to the baseline. For non-exempt irrigation wells, the baseline will reference reports of historic use to ADWR; for exempt wells, it will be based on the existing pump size, as there is no reporting requirement to ADWR.

Water rights quantify amounts and uses for which surface waters may be placed on property, and identify priorities among water users in times of shortage. There are a number of historic water right claims which Pima County and RFCD acquired in relation to mitigation lands at Cienega Creek and along the San Pedro River.

Pima County and RFCD are defending their water right claims 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. In 2019, the Special Master approved the County and RFCD's claims for the Bingham-Cienega Natural Preserve.

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

5.6.2 Establishing Mitigation Credit for Species Enhancement Actions

Pima County's MSCP identified species enhancement actions as possible sources of mitigation credit in addition to traditional property allocations, as well as discussed the potential challenges with calculating appropriate mitigation credit for these 'above and beyond' projects:

"Mitigation credit for conservation of fee title, State Trust lands, and land within private developments is relatively straightforward because it is based on an acre-by-acre calculation. More difficult to quantify are those actions that lead to conservation of Covered Species, but where the conservation effect may occur in an area greater than the immediate area of the action. These conservation measures are known as species enhancements (SE). Species enhancements have

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benefits that are greater or different than their spatial footprint and are typically more expensive to implement. As such, they are typically over and above what is required in HCP management and mitigation. Examples include:

- Constructing wildlife crossing structures to improve connectivity among populations;
- Establishment of additional populations or occupied habitat of Covered Species;
- Restoration of special elements, especially riparian and aquatic;
- Non-native species removal and control efforts that are above and beyond those required in the MSCP, as well as efforts that take place outside of mitigation lands; and
- Technology transfer and/or labor to neighboring land owners for Covered Species restoration efforts.” (MSCP Section 4.4.3)

In 2019, two potential species enhancement actions under the MSCP were completed, one at Edgar Canyon and one at the Mission Garden property owned by Pima County (discussed in further detail in section 7.2.1.3). Both sites involved establishing populations of the Gila topminnow, and the Mission Garden site additionally established Huachuca water umbel. Additional sites including ponds at Agua Caliente Park, Roger Road Nodal Park, and Hospital Tank, are under preparation.

The MSCP identified the approach that Pima County will take when attempting to determine mitigation credit for any completed species enhancement action:

“Pima County will work with the USFWS to determine, on a case-by-case basis, appropriate mitigation credit for these projects. Pima County and the USFWS will likely seek input from subject matter experts to assist in the evaluation of proposed species’ enhancements. In some instances, and for a variety of reasons, species’ enhancements may only be temporary. In these cases, species occupancy may be allowed to be taken back to a previously agreed upon baseline condition. Take of species related to a return to baseline is covered under the Section 10 permit. Mitigation credit for such temporary enhancements will be adjusted accordingly.” (MSCP Section 4.4.3)

Establishment of new covered species populations creates the opportunity for Pima County to work with USFWS to develop a framework for calculating appropriate mitigation credit. Staff have reviewed numerous reports and publications from other HCPs that discuss species enhancement actions and credit calculation frameworks; however, most projects are area (acre) based and none appear to be well suited to the particular projects and needs of the MSCP. The County has other species enhancement actions planned, primarily focused on stocking created aquatic features with native fish species (Gila topminnow, Gila chub, and longfin dace). Any proposed credit framework needs to address the costs associated with habitat creation, population establishment, and long-term maintenance of these species enhancement actions. Importantly, such a framework also needs to address the long-term benefits projects may have for species conservation and recovery as well. Establishing a mutually agreed upon credit framework is a complex task, and one which Pima County will continue to work on into calendar year 2020.

6 Land Management

Land management actions on allocated lands must be reported annually. Therefore, this section summarizes activities at allocated lands at Bingham Cienega and Cienega Creek Natural Preserve (see Section 5 of this report for maps of allocated lands). Because of the importance of conserving our extensive portfolio of potential mitigation lands for future allocation—the second section will also highlight key management actions and initiatives that affect this broader suite of conservation lands.

6.1 Park Designations

There were no new park designations on existing or potential mitigation lands in 2019.

6.2 Inspections for Restrictive Covenants

During 2019, Pima County provided the Arizona Land and Water Trust (ALWT) biennial inspection reports for properties with MSCP Restricted Covenants; these reviews have not yet been completed by ALWT. The biennial inspection reports identified two unauthorized encroachments from neighboring properties onto mitigation properties owned by the RFCD, one along Agua Verde Creek and another along Agua Caliente Wash. RFCD is working with the property owners to resolve the unauthorized trespass by fencing the boundary. RFCD also completed removals of the unauthorized materials on District land reported in the 2017 MSCP Annual report and fenced the property. No additional incursions occurred there.

6.3 Land Management Activities on Allocated Lands

Pima County is required to report on management activities that took place on allocated mitigation lands. As noted in Section 5, both the Bingham planning area and the Cienega Creek Natural Preserve (excluding the Empirita Ranch Headquarters) have been allocated as of March 2019, and therefore, management actions and planning actions on these properties will be the primary focus for this report. However, many other management practices have taken place on non-allocated County-controlled lands that have an impact on Covered Species. Those actions will also be briefly reviewed.

6.3.1 Bingham Planning Area

In January 2019, Pima County and RFCD completed a management plan for lands along the San Pedro River called the Bingham Planning Area, encompassing lands that were allocated in 2017 (Figure 9). The allocated lands are 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 area historically provided habitat for threatened and endangered species such as the Huachuca water umbel and the southwestern willow flycatcher, which were associated with a cienega and spring flows that were much diminished prior to the permit baseline. Though those two species have not been observed on the site for many years, threatened western-yellow billed cuckoos, as well as a variety of other species, continue to occur there.

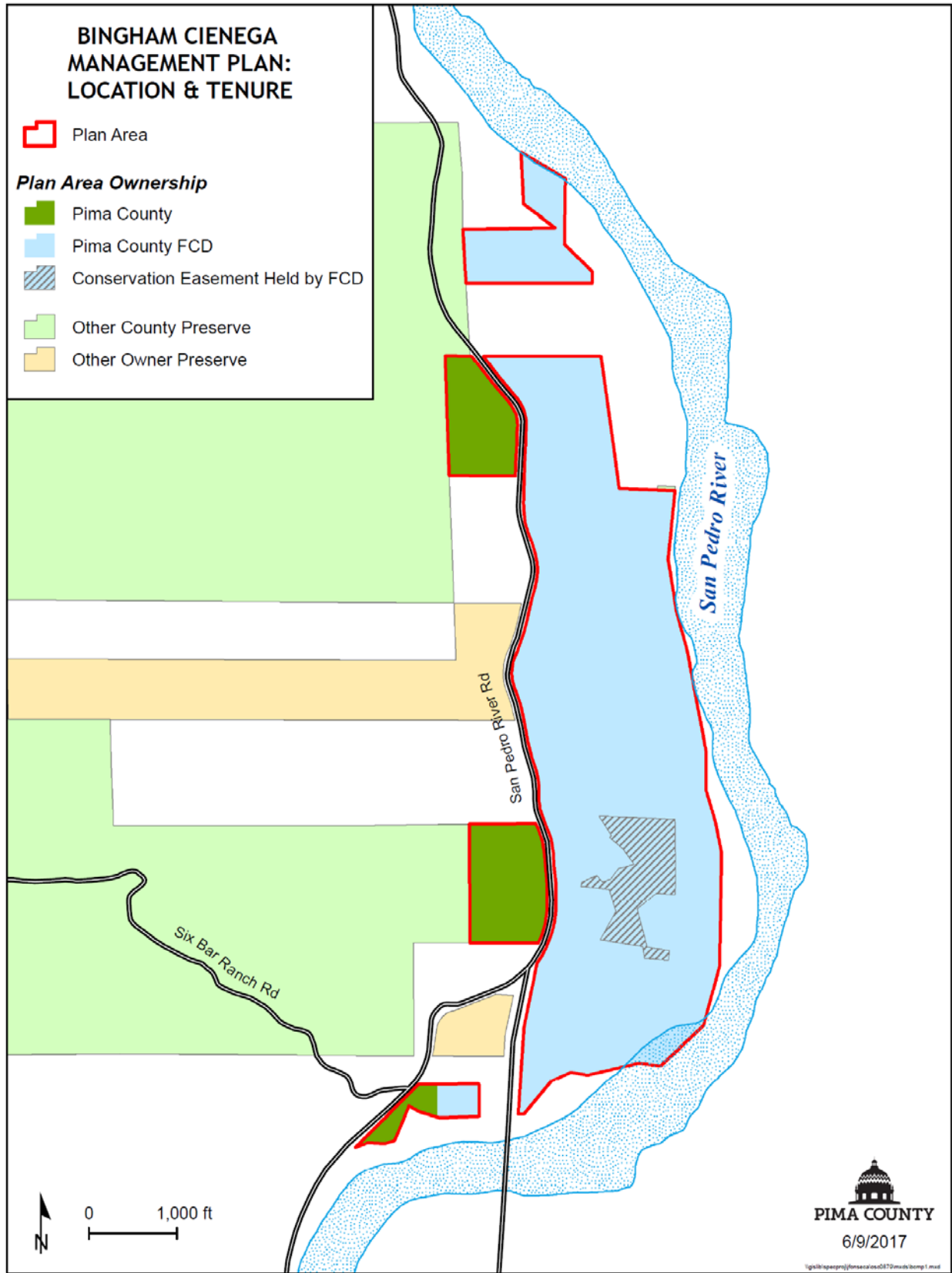


Figure 9. Map of the 405-acre Bingham Planning Area. The areas within the red line are now allocated, exclusive of the 19-acre life estate (shown in hatched).

6.3.1.1 Management Actions within the Bingham Planning Area

The following are actions that took place at Bingham from July 2018 - July 2019 (the most current reporting period).

Groundwater level monitoring. Depth to groundwater is measured quarterly at three wells in the planning area. At all three wells, depth to water decreased an average of 3.9 feet (10%) during the 2019 reporting period, thereby showing slightly improved groundwater conditions (Figure 10). Note that groundwater monitoring data is reported at the end of each quarter (typically in March, June, September and December).

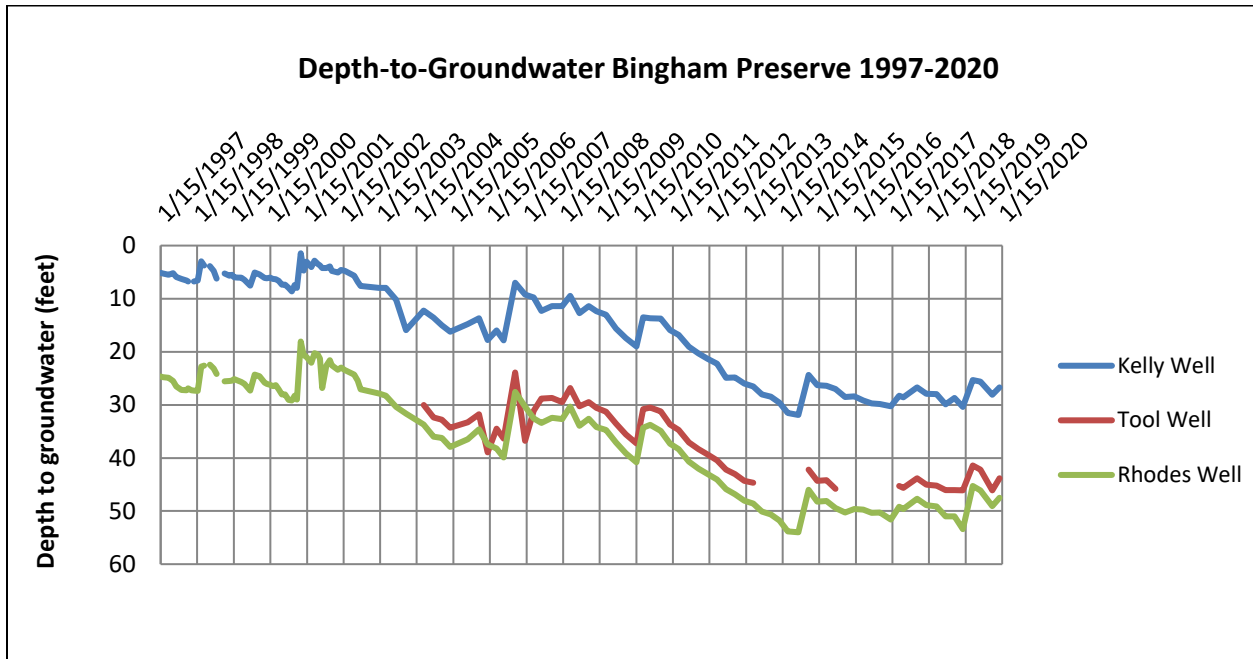


Figure 10. Depth to groundwater in feet below measuring point at three wells within or adjacent to the Bingham planning area from January 1997 through December 2019.

Precipitation. Precipitation was recorded daily at the Preserve. There were 35.5 inches of rainfall recorded during the reporting period, approximately double the average from 2007-2017 (17.1 inches; also a drought period), and above the longer-term average from 1999-2017 (22.8 inches).

Fire management. Fire management actions within the planning area during the reporting period, included annual maintenance of the established fire breaks and associated fire management infrastructure (Figure 11).

Water Station. No pumped water was discharged for fire response in 2019. The RFCD and NRPR plan to do the first testing of the water station in early 2020. Testing is important to assure proper operation of electronic pump safety switches. The location of the water fill station is shown in the map below (Water Fill Standpipe in Figure 11).

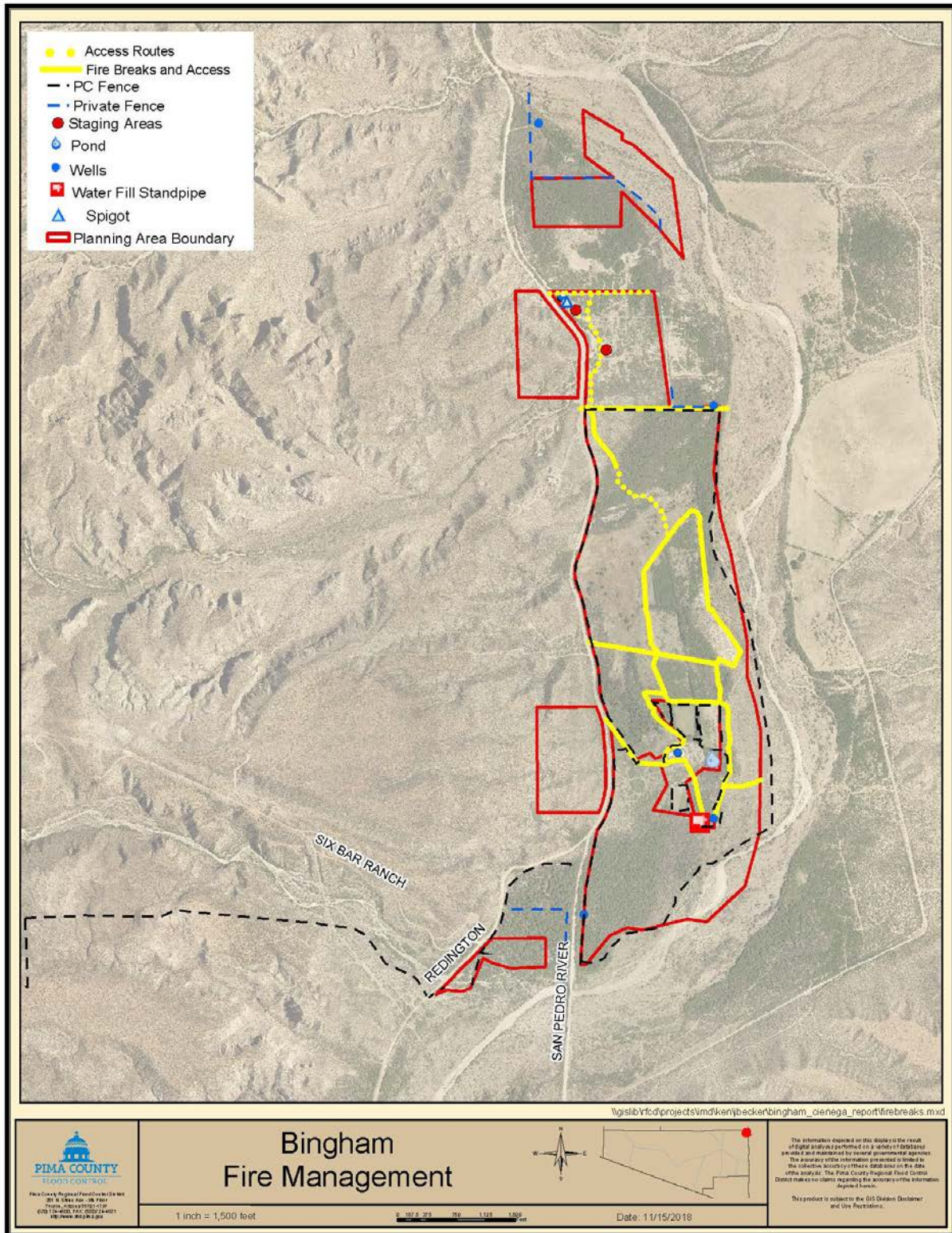


Figure 11. Bingham Planning Area fire management infrastructure map.

Fence maintenance. Perimeter fence repairs continued in 2019 and were required due to damage from fallen trees that died due to past wildfires and continuing drought. In 2019, the Arizona Conservation Corp returned to the Preserve for the fourth consecutive year to work on fences and to assist with fuels reduction efforts.

Remote Cameras. Two remote wildlife cameras were installed by RFCD and NRPR in 2018 for documenting feral pig egress through the Planning Area. Neighboring residential property owners work together to eliminate the feral pigs that move up and down the San Pedro corridor.

6.3.2 Cienega Corridor

6.3.2.1 Cienega Corridor Management Plan

Most of the Cienega Creek Natural Preserve (CCNP) was allocated as mitigation land in the March 2019 Annual Report submitted to U. S. Fish and Wildlife Service. The allocation triggered a two-year window to complete a MSCP-compliant management plan for planning area. The allocated land is largely owned by the RFCD and managed by NRPR.

Three Department Directors (NRPR, RFCD, OSC) have selected a broader area for the Cienega Corridor Management Plan than just the allocated portions of CCNP in order to satisfy other needs, including anticipated future allocation needs for the MSCP. The plan area excludes the Colossal Cave lease area, which has heavy recreational use. The planning area includes two private parcels (Wendt and Mumford) over which the County holds conservation easements, as well as the unallocated properties along Agua Verde Creek and at Empirita Ranch headquarters. Figure 12 shows the geographic scope of the proposed management plan.

Department Directors have approved a schedule and a description of the planning process and have identified a core team of staff (team). Resource staff with diverse expertise from all three departments are represented on the core team. The team has agreed to use The Nature Conservancy's framework for developing conservation strategies (callout box at right; <https://conservationbydesign.org/>). The team has selected conservation targets (species and ecosystem types that are high priorities for conservation; also called resource priorities) and is refining an understanding of conditions and threats. An initial workshop with subject matter experts was held November 2019, and another is planned for March 2020 to help vet the team's work, identify potential conservation strategies and stakeholders to assist with implementation.

Developing Strategies and Measures

- Target viability
- Critical threats
- Situation analysis
- Objectives & actions
- Measures

The core team has already addressed a number of administrative issues during the planning process, including:

- Pima County Real Property is inventorying existing easements for the County-managed lands in the planning area.
- OSC Cultural Resources staff are reviewing over 20 years of site steward reports for CCNP. Additionally, the County received a Certified Local Government grant through AZ SHPO and new cultural resource investigations will begin in spring 2020.
- RFCD is gathering additional water quality data at multiple locations.
- Union Pacific Railroad has agreed to work with RFCD to update the existing hazardous materials plan, which is outdated.
- NRPR will update the existing fire plan for CCNP.
- OSC is updating maps of threats identified for the region.
- NRPR is funding several workshops for subject matter experts.

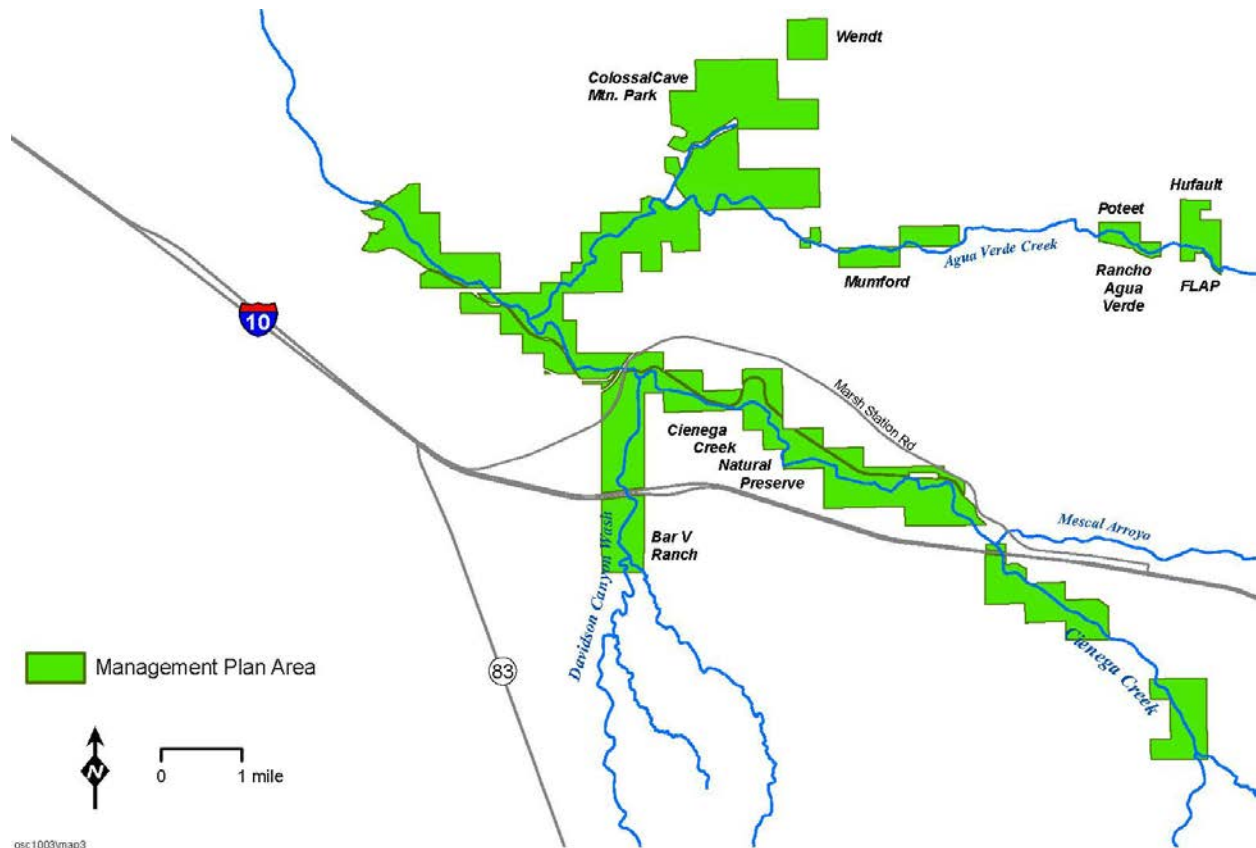


Figure 12. Cienega Corridor management plan area with individual properties labeled.

6.3.2.2 Management Actions within the Cienega Corridor

Management actions within the Cienega Corridor focus heavily on the Cienega Creek Natural Preserve (CCNP) as it was the only property within the planning area allocated for mitigation in 2019. Additionally, CCNP has a history of intensive management as it represents one of the only remaining intact riparian system within the breadth of County conservation lands. Reporting on management actions will increase once the Cienega Corridor Management Plan is completed in 2021.

Groundwater level monitoring. Depth to groundwater is measured every six hours in eight wells along Cienega Creek and Davidson Canyon: six of the wells are monitored by PCRFC and two wells by ADWR (Figure 13). PCRFC staff measures two other wells biannually (January and June). Figure 14 displays the water level hydrographs for all ten wells since 1997. At three wells in the Upper Cienega Creek area, depth to water increased an average of 1.2 feet (1.7%) during the 2019 reporting period (through December 2019), thereby showing slightly degraded groundwater conditions. Two wells in the middle of the Preserve showed even more degraded groundwater conditions, with an average water level decline of 2.2 feet (8.5%) since January 2018. The downstream portion of Cienega Creek (below Pantano Dam) and Lower Davidson Canyon showed improved groundwater conditions, with average depth to water decreases of 7.0 feet (8.5%) and 2.3 feet (5.4%) respectively. Note that groundwater monitoring data is typically reported in January of each year.

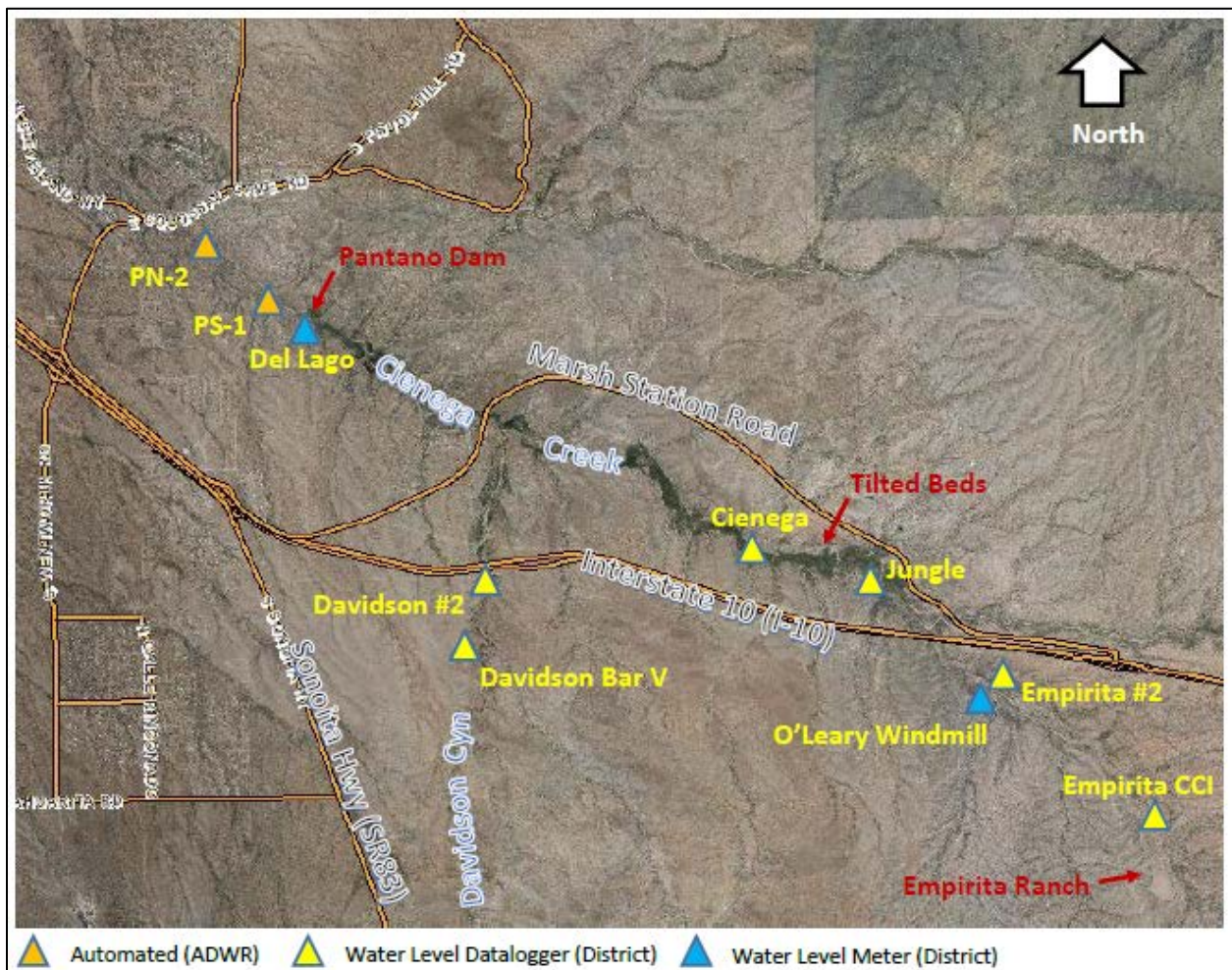


Figure 13. Groundwater monitoring wells within the Cienega Creek Natural Preserve: Upper wells are Empirita CCI, Empirita 2 & O’Leary; Middle Wells are Jungle & Cienega; Lower Wells are Del Lago, PS-1 & PN2; Lower Davidson Canyon wells are Davidson Bar V and Davidson #2

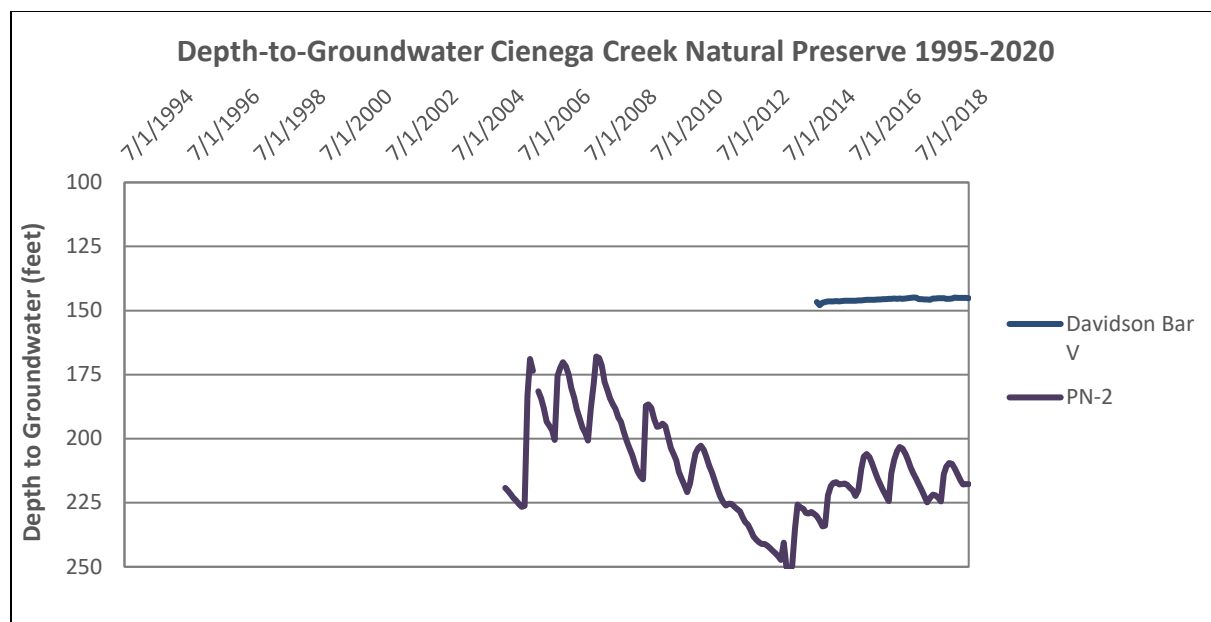
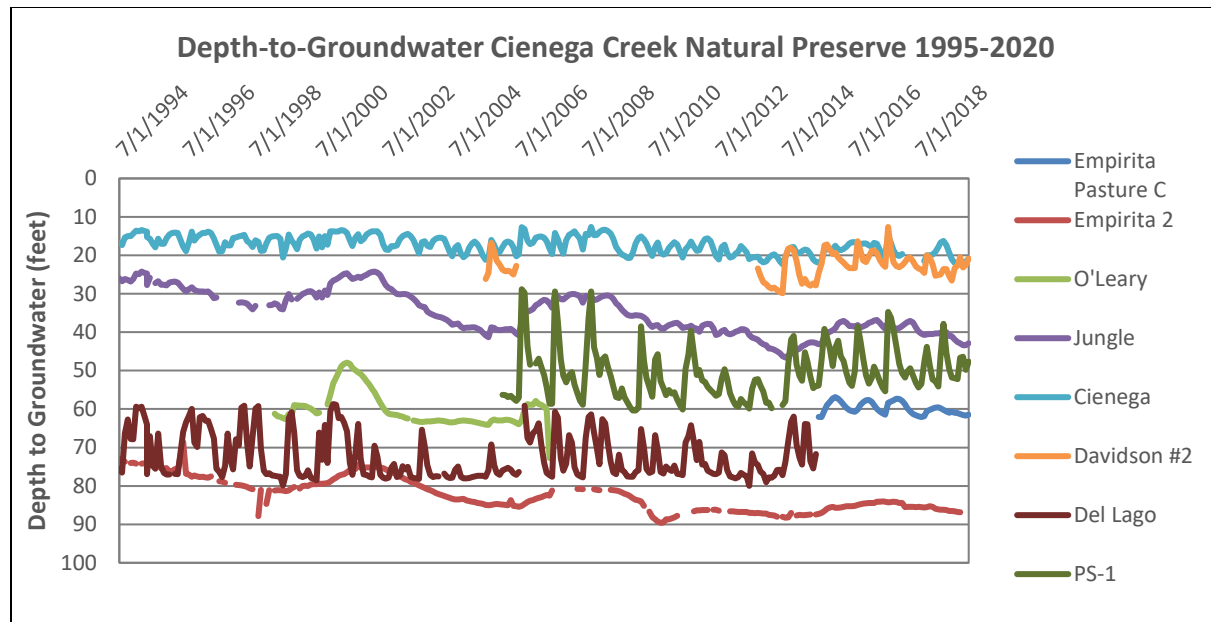


Figure 14. Depth to groundwater in feet below measuring point at ten wells within the Cienega Creek Natural Preserve from January 1997 to January 2020. Note the different y-axis scales between plots.

Precipitation. Precipitation is recorded instantaneously in gauges maintained by RFCD as part of its Automated Local Evaluation in Real Time (ALERT) network of sensors, throughout and surrounding the Preserve (Figure 15). Rainfall totals over the reporting period ranged from 8.63 inches in the downstream area (gauge 4220) to 21.74 inches at Davidson Canyon near Interstate 10 (gauge 4310), with an average of 12.98 inches reported from nine rain gauges (Figure 16). The overall average is 1.71 inches higher than the 10-year average (2010-2019) and 2.12 inches higher than the 20-year average (2000-2019) for this region. Note that a few gauges reported totals below their average, while a few other gauges reported well above their average.

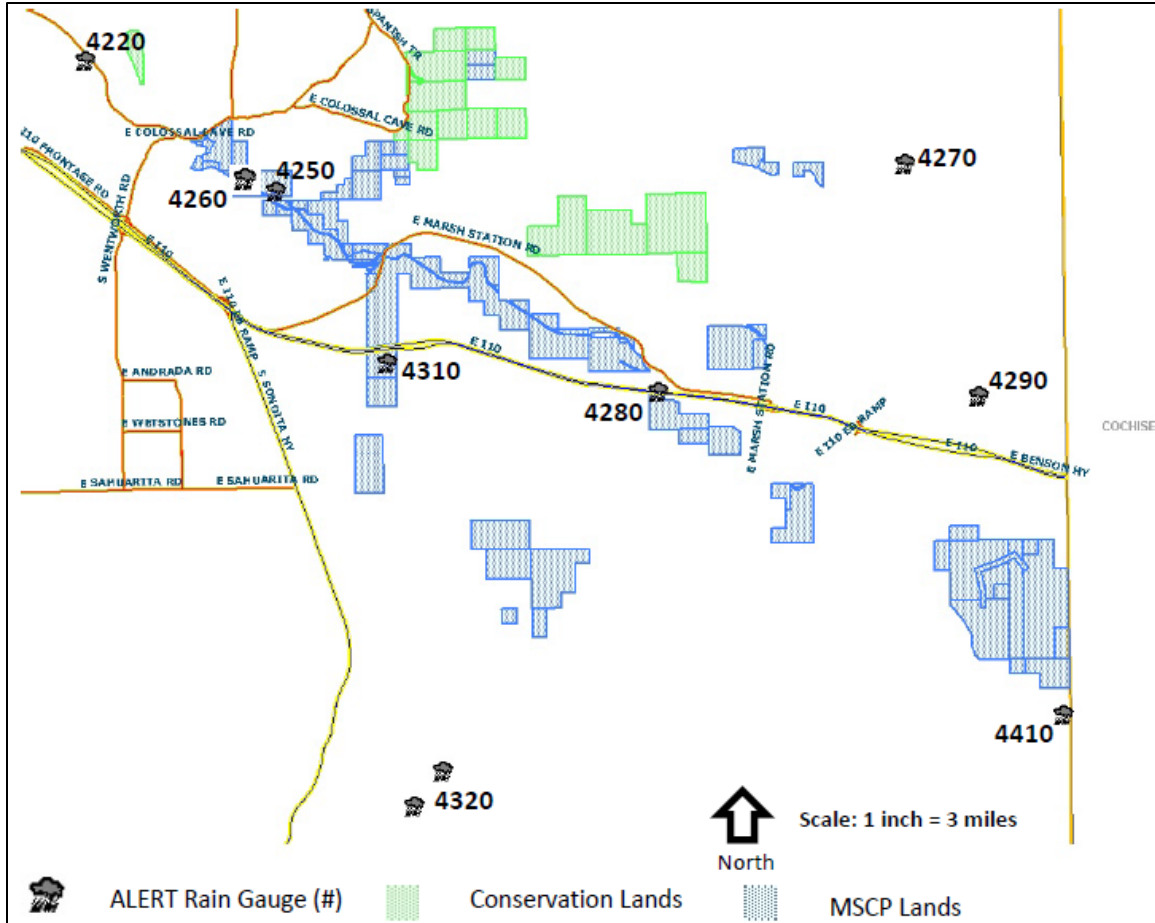


Figure 15. RFCD Rain Gauges (ALERT) located within and around the Cienega Corridor.

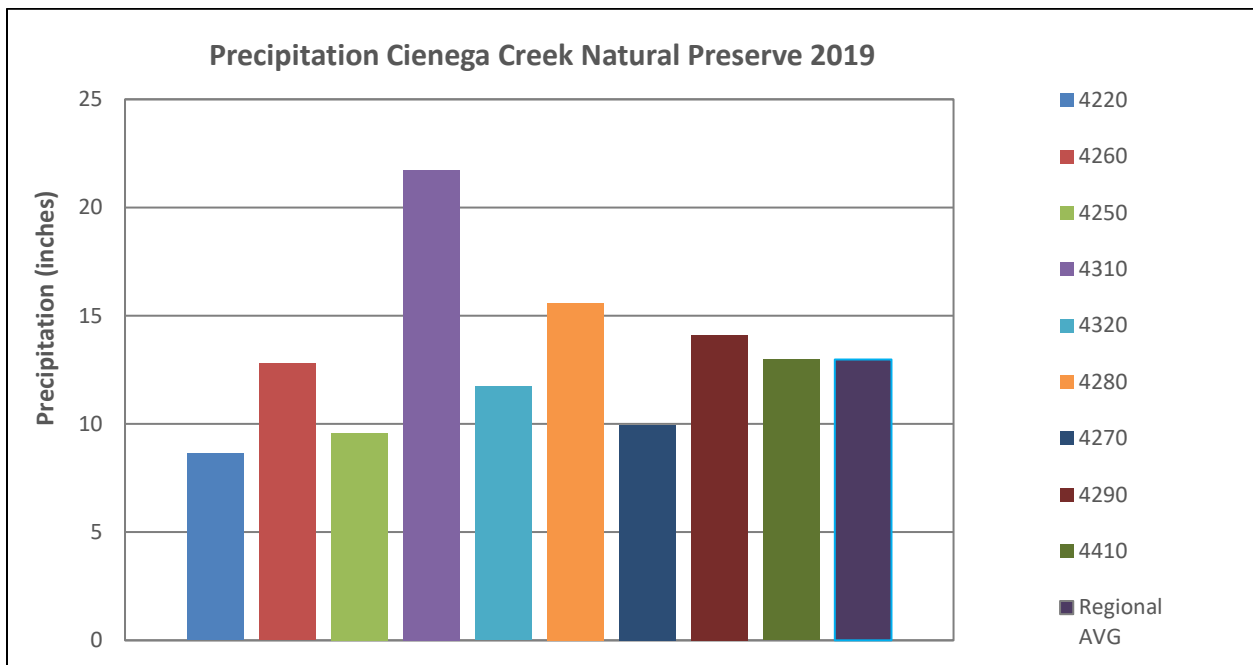


Figure 16. Cumulative rainfall in inches from January 1 – December 31, 2019 recorded by ten rain gauges within and nearby the Cienega Creek Natural Preserve.

Fencing. Staff have surveyed approximately 80 percent of the perimeter fencing around the CCNP. Initial inventories indicate that there is still substantial work to be done to repair the entire perimeter. Active cattle grazing occurs immediately outside the preserve boundary and staff occasionally observe and work with the surrounding ranchers to remove trespass cattle within the Preserve. The goal is to have the perimeter fence completely installed or repaired to a condition that will keep cattle out by end of 2021. NRPR is hiring new trades maintenance personnel which should allow for faster fence installation and maintenance. Staff has historically recorded fence monitoring and construction data via field notes; however, staff will begin using GIS to track maintenance activities in 2020 which should assist in the fence maintenance in the short and long term. Post and cable fencing are also being installed in key OHV access areas in the preserve. Staff regularly monitor the known OHV access points into the Preserve for incursions. Recently, OHV observations have decreased, suggesting OHV use within the preserve is down.

Fire Management. There are currently no active fire management activities taking place within the preserve. Staff continued to monitor fire access points as reflected in the fire management preplan for the Rincon Valley Fire District (original 2005, updated 2014), who are the first responders for the CCNP. Additionally, staff have recorded notes on areas with higher than normal fire fuel loading within the Preserve likely from the past drought cycle. Staff intend to develop a GIS shape file that would reflect approximate fire fuels loading within the Preserve. These data will be useful when the next generation of the CCNP fire management plans are developed.

Wildlife Cameras. NRPR's Environmental Education division is currently one of the groups/individuals that are monitoring motion-activated wildlife cameras within the Preserve. Photos from these cameras have not yet been utilized for any project; however, discussions are underway about applications of these monitoring data. RFCD has installed wildlife cameras at two locations along the Agua Verde drainage to monitor wildlife and trespass livestock use. Additionally, Sky Island Alliance regularly monitors wildlife tracking transects and monitors several cameras within the preserve.

Property Enforcement. RFCD pursued enforcement against a neighboring property owner who encroached onto one of the Agua Verde parcels. The violator was using a previously cleared area as a horse working area and had recently removed vegetation on RFCD land adjacent to their property boundary. Pima County Real Property sent a cease and desist letter in August 2019, and a new property boundary fence was installed in January 2020.

6.4 Land Management Activities and Planning: Unallocated Mitigation Lands

Staff from three Pima County departments undertook a wide range of management activities on unallocated lands that help to preserve the value of these lands to Covered Species and their habitats. Key highlights of these management actions are included here.

6.4.1 Land Management on Potential Mitigation Land

6.4.1.1 Lower Altar Valley Area (LAVA) Resource Management Plan

Pima County is continuing with development of the LAVA Resource Management Plan as discussed in the 2018 MSCP Annual Report. Resource priorities have been identified for biological, cultural, and recreational resources within the planning area. Multiple county staff are also participating in the planning process for the Altar Valley Conservation Alliance (AVCA) collaborative restoration project, including serving as chairs of several technical subcommittees. Outcomes from the AVCA planning effort will be combined with County priorities to develop the final list of priorities.

6.4.2 Invasive Species Control

In partnership with a variety of local, state, and federal organizations, Pima County staff from multiple departments are involved in the monitoring and management of invasive plant species across County lands. Buffelgrass (*Pennisetum ciliare*) treatment and eradication continues to be the primary focus of Pima County's invasive plant management efforts, but a variety of other invasive plant species are opportunistically monitored and treated, including giant reed (*Arundo donax*), Sahara mustard (*Brassica tournefortii*), and fountaingrass (*Pennisetum setaceum*). In 2019, Pima County staff, contractors, and volunteers mechanically removed or chemically treated approximately 1,470 acres of buffelgrass on County preserve lands. Pima County also treated and/or removed buffelgrass from approximately 10 miles of road right-of-ways. Additionally, RFCD staff working with Arizona Conservation Corps crews removed about 0.39 acres of fountaingrass from the District's Bear Canyon property (Santa Catalina foothills), as well as substantial areas of buffelgrass and Sahara mustard. The District's Diablo Estates open space, home to a Pima pineapple cactus population, also benefited from crews removing about 0.12 acres of buffelgrass from the site.

During 2019, Pima County also invested considerable resources in the management of invasive aquatic animal species on its conservation lands in order to benefit MSCP-covered species such as native fishes and frogs. Pima County partnered with the Arizona Game and Fish Department, University of Arizona, and the Bureau of Land Management to drain and dry Hospital Tank to remove all invasive species (Figure 17). This site had significant American bullfrog (*Lithobates catesbeianus*) and western mosquitofish (*Gambusia affinis*) infestations, which were impacting the extant Chiricahua Leopard Frog (CLF) population. The County provided equipment and labor to clean out this dirt tank subsequent to drying. Prior to this management action, the University of Arizona's David Hall and partners salvaged 4,539 Chiricahua leopard frogs and tadpoles from the tank before pumping it dry, and 227 of these tadpoles were relocated to nearby Goat Well Pond, on the County's Sands Ranch. The drying, cleaning out, and subsequent refilling of Hospital Tank during the 2019 monsoon season was a success, and David Hall's monitoring efforts confirmed that adult Chiricahua leopard frogs recolonized the site by September 2019, and no invasive species have been seen.

Pima County NRPR is renovating Agua Caliente Regional Park, including restoring the main pond (excavating, grading, and lining with a polymer liner) to enhance aesthetics while improving the historic character, improve water use efficiency and thus reduce groundwater pumping, and

improve wildlife habitat. Part of these efforts include removing all nonnative fish species with the ultimate goal of creating aquatic habitat suitable for use by MSCP-covered aquatic fish species, such as Gila topminnow and Gila chub.



Figure 17. The BLM, AZGFD, University of Arizona, and Pima County dried and cleaned Hospital Tank (shown here shortly before drying) on the County’s Sands Ranch to clean out the dirt tank and remove aquatic invasive species.

6.4.3 Habitat Restoration Activities

Both the NRPR and RFCD departments have staff who are focused on habitat restoration activities, and this section highlights several projects that were initiated or completed in 2019.

6.4.3.1 Trash Cleanup and Fence removals

In 2019, County staff worked with the Arizona Conservation Corps (AZCC) crews on many different land management and restoration projects. Crews removed 9,399 linear feet of interior barbed wire fence between three different open space properties, some of which included open-topped pipes (a hazard to birds and some other species; Figure 18). The fence removals were combined with the installation of 9,233 feet of wildlife-friendly fencing, and the repair of 1,954 feet of barbed wire fencing in order to prevent unauthorized access and illegal livestock grazing on District open space. Additionally, for one open space property containing Pima pineapple cactus, RFCD staff worked with a Pima County summer youth crew to remove

just under one 40-yard roll-off of trash, including tires, furniture, and miscellaneous waste. County staff also worked with the AZCC to remove substantial amounts of trash and other debris from other County lands, including Tucson Mountain and Desert Haven Parks.



Figure 18. Removing open-topped pipes (a wildlife-trapping hazard) and trash from a County property in the Brawley Wash area (February, 8, 2019 photo).

6.4.3.2 Northern Altar Watershed Area Project

Begun in 2016 in collaboration with the Altar Valley Conservation Alliance and the USFWS's Partners for Fish and Wildlife Program, Pima County's Northern Altar Valley Watershed Area (NAWA) project aims to restore native vegetation and hydrological function on abandoned agricultural lands at King 98 Ranch. In 2019, efforts focused on management of invasive plant species, and maintenance and repair of dirt berms and erosion-arresting rock structures (Figure 19). County staff continued to work with the Arizona Conservation Corps (removing 426 bags of invasive plants), as well as the Sonoran Desert Weedwackers (a volunteer group led by Pima County NRPR) to remove invasive vegetation from the site, including Johnson grass, Russian thistle, and buffelgrass (Figure 20). County staff continue to educate law enforcement (including Border Patrol), via direct communication and on site signage, about ongoing efforts to limit access to the area, protect nearby archaeological areas, and to prevent trespass grazing. Restoration efforts have contributed to substantial improvements in native vegetation species diversity and coverage, have reduced erosion and dust, and have increased water retention on

site. Pima County NRPR also contracted Quiet Creek Corporation in November 2019 to fly the NAWA site using a drone to monitor vegetation recovery.



Figure 19. NAWA rock structures after maintenance treatments, with water erosion flow paths evident around the left side of the structures.



Figure 20. Pima County NRPR continues to partner with the Arizona Conservation Corps to manage invasive plant species on the NAWA site. Piles of removed Russian thistle are evident on the right side of the berm.

6.4.3.3 Aquatic Species Management Plan

During 2019, Pima County's Aquatic Species Management Plan was approved by the USFWS (Appendix 6). This plan identifies a number of priority sites potentially suitable for translocation and population establishment of covered aquatic species. Included in these sites is a natural stream system on the County's M Diamond Ranch (Edgar Canyon) that the Arizona Game and Fish Department, in partnership with Pima County and the District, released Gila topminnow into during spring of 2019. Additionally, Pima County partnered with Friends of Tucson's Birthplace, AZGFD, and the USFWS to release Gila topminnow and plant Huachuca water umbel (both covered species) within a newly constructed canal (known as an acequia) at Mission Garden. This represents the first Covered Species translocation to be accomplished under the County's MSCP.

6.4.4 Open-space Infrastructure Mapping

Pima County NRPR spent considerable effort in 2019 to finalize mapping of key infrastructure features on all NRPR managed properties. "Phase I" effort involved mapping a wide range of features including water and electrical infrastructure, wells, fence corners, dirt stock tanks, buildings, dispersed camp areas, and signs. 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). Phase II, which will get underway in 2020, will focus on determining conditions for linear infrastructure features such as roads and fences.

6.4.5 Off-Highway Vehicle Management

Management of off-highway vehicular traffic is a continuing issue. Responding to illegal OHV use and illegal dumping, RFCD staff had 9,960 linear feet of OHV resistant fencing built, as well as six gates installed for controlled access along the west side of the Santa Cruz River along Silverbell Road (Ina Preserve), to protect potential mitigation lands and cultural resources in this area. (Figure 21). NRPR staff also worked to prevent OHV incursions into other County properties including Colossal Cave Mountain Park and Cienega Creek Natural Preserve.



Figure 21. OHV-resistant fencing installed during 2019 at the District’s Ina Preserve, along the Santa Cruz River to prevent ongoing and illegal incursions into the area. Note the two heavy cut-resistant cables.

6.4.6 Water Rights Management on Potential Mitigation Land

Claims to surface water are being adjudicated in the San Pedro watershed. 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. In 2017 and 2018, the Special Master accepted corrections proposed to the records for stockwatering claims. In 2019, the Special Master approved the County and RFCD’s remaining claims to surface water in the San Pedro watershed.

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 should be noted 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.

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 in the Edgar, Buehman, and Peck watersheds, and

along the San Pedro mainstem. Pima County will continue to protect our water rights at 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.

6.4.7 Adaptive Management

No reported adaptive management actions.

7 Monitoring

The Pima County Ecological Monitoring Program (PCEMP) is a key requirement of the MSCP and while it officially began at the time of permit issuance, many of the elements within this program have long received some degree of monitoring or data collection as important parts of Pima County's Sonoran Desert Conservation Plan (SDCP). The PCEMP's goals include monitoring a variety of parameters that are covered by five basic themes-- species, habitat, landscape pattern, threats, and climate. The MSCP is structured such that the many elements covered by the PCEMP are rolled out in a phased approach. A primary focus during the first few years includes completing first rounds of species monitoring, continuing with basic inventories of County preserves, setting up long-term soils and vegetation monitoring plots (i.e., habitat monitoring), and concentrating on water resources monitoring at springs and streams. The 2019 report highlights the PCEMP's non-species monitoring elements, with protocols developed for the habitat, landscape pattern, threats, and climate.

7.1 Property Inventories and Assessments

County staff continued property inventories and assessments in 2019 on potential mitigation lands. During these property assessments, staff record incidental observations of species of interest, threats, infrastructure issues, or other features of interest. Observations related to threats or resource damage were passed along to the appropriate Pima County managing department.

Pima County staff performed 59 individual visits to 35 properties from January through December 2019 (Figure 22). Staff visited Buehman Canyon Natural Preserve more than any other property (N=6). A key feature of property inventories was the collection of observations on Covered Species. Towards this end, staff made 623 separate observations, of which 136 (22%), 117 (19%), and 84 (13%) were of Arizona Bell's vireo, rufous-winged sparrow, and talussnail species, respectively (Table 7). Staff made observations on 16 of the 32 (50%) vertebrate and plant Covered Species. The Arizona Bell's vireo and rufous-winged sparrow were found at the most preserves (Table 8; N=7, 8).

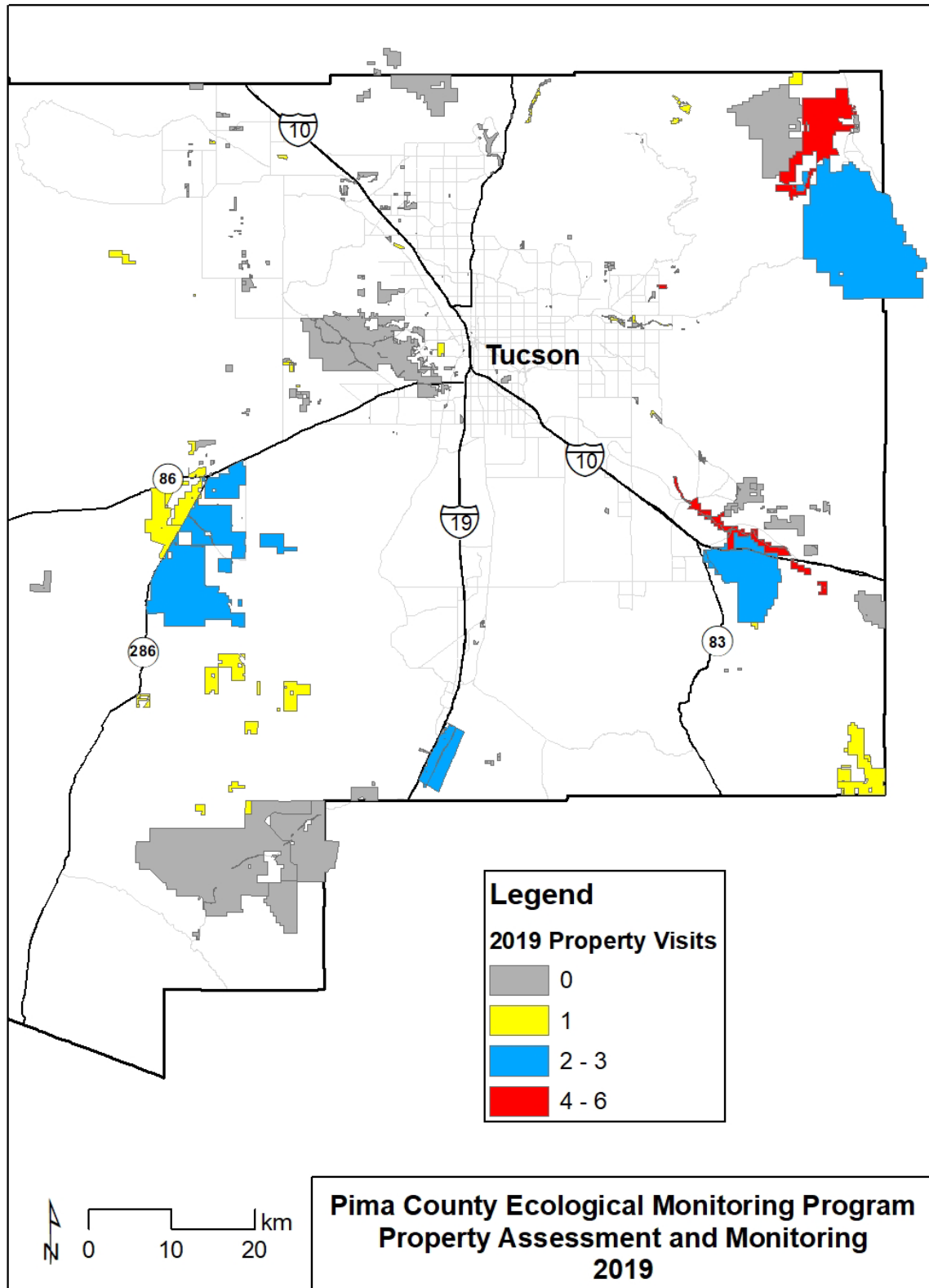


Figure 22. Number of property site visits in 2019 by PCEMP staff. Visits made by other Pima County staff are not reported here.

Table 7. Number of observations of Covered Species in 2019 and since the Section 10 permit was acquired in June 2016. 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. Chiricahua leopard frog, lowland leopard frog, fish, and bat reported numbers represent the number of observations, rather than the number of individuals.

Taxon Group	Species	Number of observations in 2019	Total number of observations since June 2016
Plants	Huachuca water umbel	0	0
	Needle-spined pineapple cactus	11	592
	Pima pineapple cactus	70	617
	Tumamoc globeberry	9	56
Mammals	Merriam's mouse	0	0
	Lesser long-nosed bat	0	0
	Mexican long-tongued bat	0	23
	California leaf-nosed bat	0	3
	Townsend's big-eared bat	1	19
	Western red bat	0	0
	Western yellow bat	0	0
Birds	Abert's towhee	50	143
	Arizona Bell's vireo	136	418
	Cactus ferruginous pygmy owl	1	25
	Rufous-winged sparrow	117	313
	Southwestern willow flycatcher	0	0
	Swainson's hawk	25	46
	Western burrowing owl	0	1
	Western yellow-billed cuckoo	1	60
Fishes	Desert sucker	0	0
	Sonora sucker	0	0
	Gila chub	0	8
	Gila topminnow	14	19
	Longfin dace	26	107
Reptiles	Desert box turtle	0	2
	Giant spotted whiptail	1	30
	Groundsnake (valley form)	0	0
	Northern Mexican gartersnake	0	0
	Sonoran desert tortoise	18	696
Tucson shovel-nosed snake	0	0	
Amphibians	Lowland leopard frog	57	214
	Chiricahua leopard frog	2	94
Invertebrates	Talussnail species	84	890
Total observations		623	4376

Table 8. Covered Species and Pima County properties where each has been found since the Section 10 permit was acquired in June 2016. Properties where species were observed in 2019 are shown in BOLD and new property records are shown in RED. 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
Plants	Needle-spined pineapple cactus	A7 Ranch Bar V Ranch Buehman Canyon Cienega Creek Natural Preserve Cienega Corridor Colossal Cave Mountain Park Empirita Ranch M Diamond Ranch Six Bar Ranch
	Pima pineapple cactus	Bar V Ranch Canoa Ranch Diablo Village Estates Diamond Bell Ranch Elephant Head Sec. 15 Mitigation lands Marley Ranch Rancho Seco Sopori Ranch Southeast Regional Park South Wilmot LLC
	Tumamoc Globeberry	Buckelew Properties Painted Hills Preserve* Morkis Property
Mammals	Mexican long-tongued bat	A7 Ranch Buehman Canyon Cienega Creek Natural Preserve Colossal Cave Mountain Park
	California leaf-nosed bat	Rancho Seco Tucson Mountain Park
	Townsend's big-eared bat	Buehman Canyon Colossal Cave Mountain Park Marley Ranch M Diamond Ranch Old Hayhook Ranch Oracle Ridge Rancho Seco Tucson Mountain Park

	Species	Property
Birds	Abert's Towhee	Bar V Ranch Bingham Cienega Brawley Wash/Manville-Garcia Buehman Canyon Colossal Cave Mountain Park Cienega Creek Natural Preserve FLAP Los Morteros M Diamond Ranch MHPERP Rancho Fundoshi Tanque Verde Creek Tortolita Mountain Park Tumamoc West Branch Preserve
	Arizona Bell's Vireo	A7 Ranch Agua Caliente Regional Park Agua Verde Creek Bar V Ranch Bingham Cienega Buehman Canyon Catalina Regional Park Cienega Creek Natural Preserve Clyne Ranch Colossal Cave Mountain Park Empirita Ranch FLAP Marley Ranch M Diamond Ranch MHPERP Rancho Fundoshi Rancho Seco Sands Ranch Six Bar Ranch Sopori Ranch Tanque Verde Creek Tortolita Mountain Park Verdugo West Branch Preserve

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	Species	Property
Birds cont.	Cactus ferruginous pygmy-owl	Diamond Bell Ranch Lord's Ranch Marley Ranch Old Hayhook Ranch
	Rufous-winged sparrow	A7 Ranch Buckelew Properties Cienega Creek Natural Preserve Colossal Cave Mountain Park Canoa Ranch Catalina Regional Park Cienega Creek Natural Preserve Cienega Corridor Colossal Cave Mountain Park Diamond Bell Ranch Elephant Head Sec. 15 Mitigation Lands FLAP Kings 98 Ranch M Diamond Ranch Marley Ranch Morkis Property Old Hayhook Ranch Rancho Seco Sopori Ranch Tucson Mountain Park Tumamoc Verdugo West Branch Preserve
	Swainson's hawk	Bar V Ranch Buckelew Properties Cienega Creek Natural Preserve Clyne Ranch Empirita Ranch Rancho Seco Sands Ranch Six Bar Ranch Sopori Ranch Verdugo
	Western burrowing owl	Bingham Cienega

	Species	Property
Birds cont.	Western yellow-billed cuckoo	Bingham Cienega Buehman Canyon Cienega Creek Natural Preserve M Diamond Ranch Tanque Verde Creek
	Gila chub	Cienega Creek Natural Preserve
Fish	Longfin dace	A7 Ranch Buehman Canyon Cienega Creek Natural Preserve
	Gila topminnow	Cienega Creek Natural Preserve M Diamond Ranch
Reptiles	Desert box turtle	Cienega Creek Natural Preserve
	Giant spotted whiptail	A7 Ranch Buehman Canyon Diamond Bell Ranch Empirita Ranch M Diamond Ranch Rancho Fundoshi Six Bar Ranch Tanque Verde Creek
	Sonoran desert tortoise	A7 Ranch Agua Verde Creek Preserve Bar V Ranch Carpenter Ranch Cienega Creek Natural Preserve Cienega Corridor Cochie Canyon Diamond Bell Ranch FLAP M Diamond Ranch Marley Ranch McKenzie Ranch Morkis Property Old Hayhook Ranch Rancho Seco Serguson Donation Six Bar Ranch Sweetwater Preserve Tucson Mountain Park Tesoro Nueve Ranch

	Species	Property
Amphibians	Lowland leopard frog	A7 Ranch Bingham Cienega Buehman Canyon Catalina Regional Park Cienega Creek Natural Preserve M Diamond Ranch Oracle Ridge Six Bar Ranch
	Chiricahua leopard frog	Clyne Ranch Sands Ranch

	Species	Property
Invertebrates	Talussnail species	A7 Ranch Buehman Canyon Cienega Creek Natural Preserve Old Hayhook Ranch Kidwell Donation Los Morteros Marley Ranch M Diamond Ranch Oracle Ridge Rancho Fundoshi Rancho Seco Six Bar Ranch Tortolita Mountain Park Tucson Mountain Park

* denotes species observed directly adjacent to County properties.

7.2 Species Monitoring

The MSCP identified species-level monitoring elements for 15 of 44 covered species (see Appendix Q of the MSCP). These species-specific monitoring commitments are staged at particular intervals (e.g., yellow-billed cuckoos are monitored every three years). The PCEMP did not have any species monitoring protocols that were due during 2019, though staff implemented repeated (required) monitoring for Chiricahua leopard frogs and additional (not required) monitoring for native fishes and aquatic invasive species. Below, we also discuss several updates that relate to ongoing species monitoring (both required and ‘above and beyond’ efforts). Furthermore, County staff developed and finalized a number of required protocols during 2019 that address the habitats of covered species and various threats that could impact covered species and/or their habitats. These include monitoring protocols covering the bat, aquatic invasive species, invasive plant species, off-highway vehicle impacts, uplands vegetation and soils, surface water/spring and seeps, and climate monitoring elements. Short narratives discussing each submitted element are included below, while additional information containing full monitoring protocols and results can be found in respective appendices.

7.2.1 Required Monitoring – first round completed

7.2.1.1 Bats

Pima County worked with Tucson Audubon Society and bat biologist Sandy Wolf to monitor roost conditions and occupancy for four species of cave and mine roosting bats at 10 sites on County preserves during 2018; those species are the lesser long-nosed bat (*Leptonycteris yerbabuena*; currently no known roosts on County lands), Mexican long-tongued bat (*Choeronycteris mexicana*), California leaf-nosed bat (*Macrotus californicus*), and pale Townsend’s big-eared bat (*Corynorhinus townsendii pallescens*). Of the sites monitored in 2018, only three sites were recommended for inclusion as long-term monitoring sites (Table 9, Figure

23). These sites will be monitored again in 2021, aligned with the regular three-year monitoring interval. The final report and monitoring protocol was completed during 2019 (Appendix 7).

Table 9. Bat species documented at monitoring sites on Pima County preserve lands in 2018 and 2021 monitoring site recommendations (extracted from 2021 Proposed Bat Monitoring Protocol and 2018 Monitoring Report – Appendix 7). Some site names have been censored due to species sensitivity.

Site Name	Covered Species	Non-Covered Species	Site Substitution	Justification
2018 Monitoring Results				
Karen’s Cave	Mexican long-tongued bat	N/A	No	Monitor as part of census of all known CHME roosts in Cienega Creek Natural Preserve
Mine site #1	Townsend’s big-eared bat	Cave myotis Big brown bat	No	Reliable maternity colony
Arkenstone Cave	Mexican long-tongued bat	N/A	No	Monitor as part of census of all known CHME roosts in Colossal Cave Mountain Park
Colossal Cave	Townsend’s big-eared bat	Cave myotis	No	Recent maternity colony for COTO; accessible site
Mine site #2	California leaf-nosed bat	N/A	No	Important winter roost
Mine site #3	N/A	Cave myotis*	Yes	Large roost of probable cave myotis; inaccessible
Mine site #4	N/A	Cave myotis*	Yes	Large roost of cave myotis; inaccessible
Mine Complex #5	California leaf-nosed bat	Cave myotis*	Yes	Small numbers of MACA; unstable site structure
Mine site #6	N/A	Cave myotis	Yes	No recent evidence for covered species use; frequent visitation
Mine site #7	N/A	N/A	Yes	Beehive – no internal survey
Proposed Substitutions				
Cienega Creek CHME roosts	Mexican long-tongued bat	Any other species	In lieu of dropped sites	Assess condition and occupancy of ~14 soil piping features
Colossal Cave CHME roosts	Mexican long-tongued bat	Any other species	In lieu of dropped sites	Assess condition and occupancy of ~9 rock and mine features

*Bats were not captured at these sites, but based on acoustic and trapping (at mine site #4) data collected in previous years by Pima County Natural Resources, Parks and Recreation staff, as well as exit behavior observed in this monitoring, the majority of bats observed at these sites are assumed to be cave myotis.

In addition to the repeated monitoring sites identified above, Pima County will inventory known bat habitat features within Cienega Creek Natural Preserve and Colossal Cave Mountain Park in 2020 with the goal of assessing Mexican long-tongued bat use of these features. These features were last rigorously monitored in 1996 (Carter and Peachey 1996), with only sporadic incidental staff visitation since then. This effort is timed one year early to align with the planning process for the Cienega Corridor Resource Management Plan to be completed by March 1, 2021.

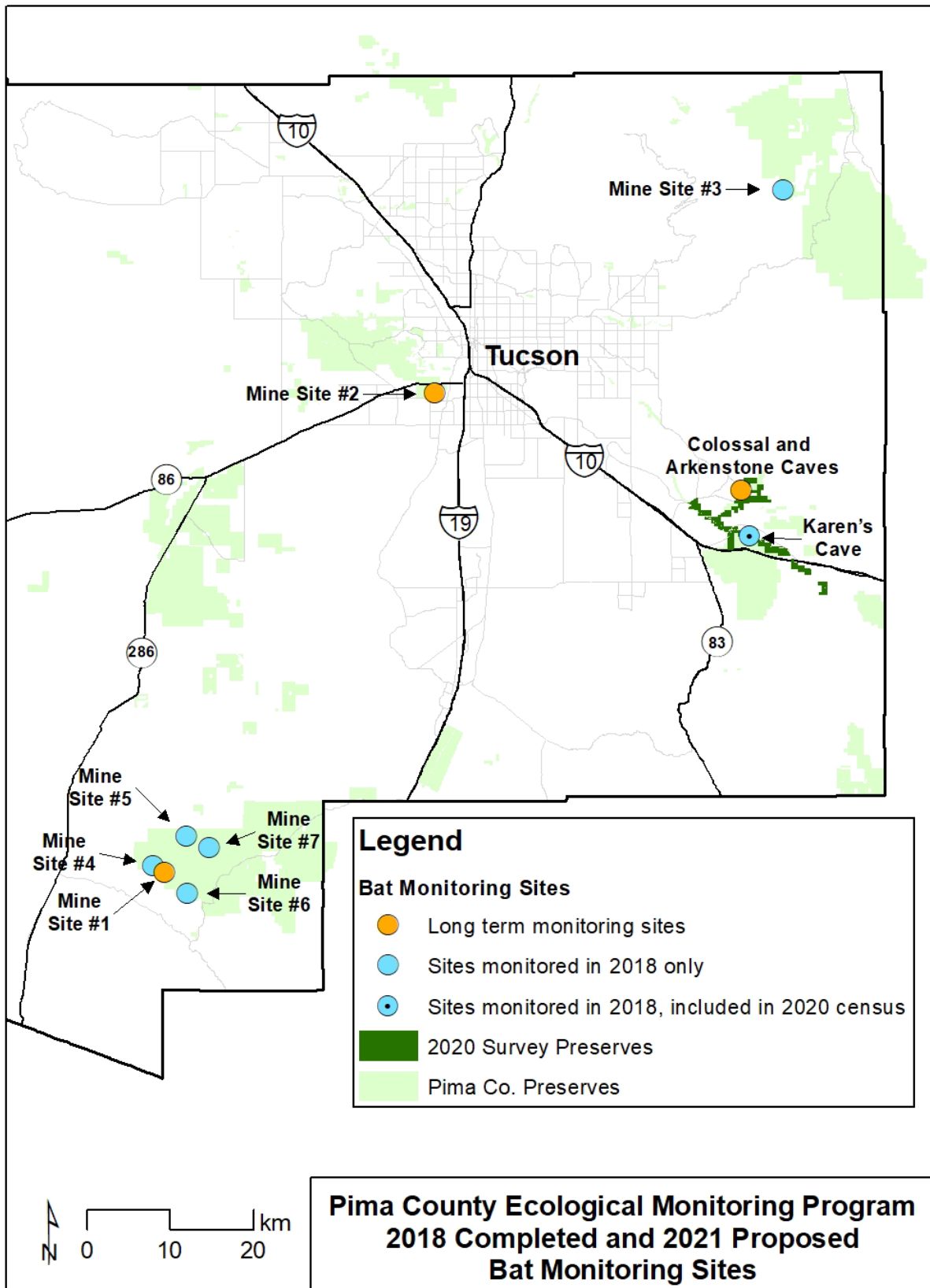


Figure 23. Bat monitoring sites on Pima County conservation lands. Long-term sites denote those sites surveyed in 2018 that were recommended to be surveyed again during the 2021 bat monitoring effort.

7.2.1.2 Chiricahua leopard frogs

Pima County continues to work with University of Arizona wildlife biologist David Hall, and his field crew, to manage and monitor the two sites known to be occupied by Chiricahua leopard frogs (CLF) on Pima County. Also, at any sites where Chiricahua leopard frogs (CLF) have established (through either natural recolonization or translocation), the County has committed to monitoring annually for the first three years, followed by every three years thereafter. CLF colonized one site, Hospital Tank (a dirt stock tank on Clyne Ranch) in 2016, and colonized Goat Well Pond (a constructed wildlife pond that the County and other partners built on Sands Ranch) in 2018. County staff and partners continue to monitor both sites for the presence of aquatic invasive species and CLF status. County staff identified several large leopard frog tadpoles (likely CLF) at a third site, a small spring on Clyne Ranch, during June of 2019. Two black-necked gartersnakes were also observed in the spring foraging on tadpoles. David Hall's field crew did not confirm occupancy of this site by CLF during a follow-up survey in August 2019. County staff will assess this site during wet-dry mapping in June of 2020.

7.2.1.3 Native Fish

County staff monitored native fish species at multiple locations during 2019. The County participated in efforts, coordinated by Sonoran Institute, to monitor fish at established transects in the effluent-derived portions of the middle Santa Cruz River in the Tucson area. These efforts confirmed that Gila topminnow continue to occupy this part of the middle Santa Cruz River. County staff also teamed with and were trained by Arizona Game and Fish Department staff (fish biologist Ross Timmons) in proper fish monitoring and aquatic invasive species surveillance techniques at the County's Cienega Creek Natural Preserve. In addition to monitoring data collection, this collaboration supported the County's goal of building capacity internally to track the status of nonnative aquatic species, and occupancy of native species in this important riparian system. No nonnative species were found, while substantial numbers of Gila topminnow and longfin dace were noted.

Arizona Game and Fish's native fish program worked with Pima County and the Regional Flood Control District to release 542 Gila topminnow into a stream on the District's Edgar Canyon (on M Diamond Ranch) in April of 2019, with the goal of establishing a new population of this endangered fish (Figure 24). This was the first translocation of an MSCP-covered species under the County's MSCP and Aquatic Species Management Plan. Follow-up monitoring by AZGFD in September indicated the topminnow were successfully reproducing and were occupying almost the entire 300 meter stretch of aquatic habitat.



Figure 24. Arizona Game and Fish biologist Tony Robinson (Gila River Basin Native Fishes Conservation Program) releases Gila topminnow into Edgar Canyon on the County's M Diamond Ranch.

In June of 2019, Pima County partnered with AZGFD, USFWS, and Friends of Tucson's Birthplace to release Gila topminnow into a mock reproduction of an irrigation canal (funded by a USFWS Partners for Fish and Wildlife Grant, and the Southwestern Foundation for Education and Historical Preservation (Figure 25). Additionally, collaboration with the County's native plant nursery and the Desert Botanical Garden in Phoenix led to planting four clumps of endangered Huachuca water umbel in the riparian margins of this water feature (Figure 26). These endangered species translocations were the second and third to occur under the MSCP and associated Aquatic Species Management Plan. Observations throughout 2019 show that the topminnow and umbel are thriving, and native species such as Sonoran Desert toads have successfully reproduced in the canal. Monitoring the status of the topminnow and umbel, as well as for the presence and subsequent management of nonnative species such as bullfrogs, will be a regular need.



Figure 25. Volunteers introducing Gila topminnow into the Mission Garden acequia (AZ Daily Star photo).



Figure 26. One of four clumps of endangered Huachuca water umbel planted at Mission Garden under the County’s MSCP.

7.2.2 Required Monitoring – data acquisition and monitoring plan development

7.2.2.1 Pima Pineapple Cactus

PCEMP staff collaborated with Dr. Aaron Flesch (University of Arizona) to determine if distance sampling was a suitable method to monitor Pima Pineapple Cactus (PPC) populations in 2017 (see 2017 MSCP Annual Report). In September 2019, an updated version of that manuscript was accepted and published in the journal *Plant Ecology* (Flesch et al. 2019). This updated manuscript incorporated 2017 census-based population estimates from other partners on five of the eleven sites used in the distance sampling investigation, which subsequently reduced the overall percent bias of our distance sampling estimate relative to census-based population estimates across all sampled sites from an 11.4% to only a 2.3% underestimate. These results suggest that distance sampling can quite accurately estimate PPC population estimates across large areas where the species occurs. This is the first peer-reviewed publication to come out of the PCEMP.

In 2018, USFWS staff approved Pima County’s request to complete inventories of PPC populations on County preserve lands through 2019 (S. Richardson, personal communication, 29 January 2018) and delay implementation of the PPC monitoring protocol until 2022. In 2019, PCEMP staff searched additional properties within PPC habitat to identify moderate- to high-density populations that could be utilized for distance sampling plots. Staff and volunteers spent three field days surveying portions of the County’s Diamond Bell Ranch, resulting in 47

new PPC observed in 2019. Staff have identified several more areas on the County's Sopori Ranch and Rancho Seco that need to be surveyed in 2020 prior to finalizing prospective distance sampling plot locations.

7.2.3 Species Monitoring Not Required

7.2.3.1 Talussnails

County staff continued to assist University of Arizona's Drs. Aaron Flesch and Hans-Werner Herrmann on their AZGFD-funded project seeking to better understand the distribution of talussnails, including the Sonoran talussnail. County staff also assisted AZGFD invertebrate biologist Jeff Sorensen in surveying for terrestrial snails on two County properties. During 2019, County staff surveyed six County properties resulting in eight observations of live talussnails. Staff vouchered many of these snails (for eventual accession into an invertebrate museum collection), including taking samples of tissue for later genetic analyses with an ultimate goal of better understanding talussnail species distribution. Included in these observations were live Sonoran talussnails found on Tumamoc Hill during a talussnail survey of the County's Tumamoc property and adjacent Tumamoc Hill, the first documented in that location in over 50 years!

Pima County graciously accepted a donation of land in 2019 that included some mountainous land contiguous with the County's Bar V Ranch. An assessment of this land yielded documentation of several live Total Wreck talussnails, a covered species, the first to be documented on Pima County land (Figure 27).



Figure 27. Total Wreck talussnail, *Sonorella imperatrix*, located in the Empire Mountains on a 2019 land donation accepted by Pima County.

7.2.3.2 Pima County Native Plant Nursery – covered plant species propagation

Pima County's Native Plant Nursery grows thousands of pollinator and wildlife-friendly native plants for planting on County parks, road right of ways, and many other County projects. In many cases, plants are grown from seeds that are sourced from near the project area, a process providing the best-adapted and ecologically-appropriate plants for a given site. The Nursery works with a variety of plant species of conservation concern, including three species covered under the MSCP – Tumamoc globeberry, Huachuca water umbel, and Pima pineapple cactus. The Nursery also propagates the Arizona eryngo, a species of conservation concern not covered by the MSCP.

Tumamoc Globeberry. The Nursery currently has 38 mature globeberry vines that it has grown from seed. Globeberry plants are currently being distributed with palo verde trees and other appropriate 'nurse plants' for planting on various County projects such as parks and road right-of-ways. Future efforts may include more detailed follow-up monitoring and study of these planted globeberry.

Huachuca water umbel. Partnering with the Arizona Sonora Desert Museum and the Desert Botanical Garden in Phoenix, the Nursery has been growing clones of Huachuca water umbel that are representative of strains that would have historically been in this area. The Nursery currently has 20 mature clumps of clones, some of which will be planted in a restored wetlands area at the County's Agua Caliente Regional Park. Clones grown at the Nursery were also planted in 2019 in an educational representation of a wetland and canal feature, at Mission Garden (see Section 7.2.1.3).

Pima pineapple cactus. The Nursery has been trying to determine best practices for re-location and transplanting of individual salvaged cactus, as well as germination and growth of the species. The Nursery currently has 64 seedlings of various sizes that have been grown from known origin seeds from County lands and which may be the subjects of future transplanting studies. Additionally the Nursery has three mature cacti for educational and display purposes. In the future, staff may collaborate on documentation and archiving of relevant data, results, and best practices.

Arizona eryngo. Nursery staff have been collaborating with the Arizona Sonora Desert Museum and others to restore it to appropriate habitat on County lands (see Section 7.9.1). The Nursery is achieving high success rates with growing this species; they have plants that were grown from seed that are producing flowers. The Nursery currently has 150 seedlings (part of germination trials), 130 potted immature individuals, and 12 mature individuals that are ready to be transplanted into Agua Caliente Regional Park and Canoa Ranch.

7.3 Habitat Monitoring

The MSCP identified several habitat elements suited for long-term monitoring: vegetation and soils, surface and groundwater resources, caves and mines, and talus deposits. These elements represent many of the habitats utilized by MSCP covered species. Understanding how these habitat resources change over the lifetime of the MSCP may help explain species populations trends observed over the 30-year term of the permit and may also be an index for the status of other species which the County does not have explicit monitoring efforts.

7.3.1 Long-term Vegetation and Soils Monitoring Plots

In 2019, the County continued its collaboration with the National Park Service's (NPS) Sonoran Desert (SODN) Inventory and Monitoring Program and Tucson Audubon Society (TAS) to establish 21 new long-term vegetation and soils monitoring plots (Figures 28, 29). This adds to the 44 plots that were completed in 2017 and 2018 for a total of 65 and allows the County to remain slightly ahead of its targeted plan to set up 20 monitoring plots per year for the first five years. Soil samples collected during the 2019 season have not yet been analyzed.



Figure 28. National Park Service and Tucson Audubon field staff monitoring vegetation on the County's Six Bar Ranch.

PCEMP staff has formalized the final Uplands Vegetation and Soils Monitoring Protocol (Appendix 8). This protocol addresses 1) the spatial and temporal scope of the County's Uplands Vegetation and Soils monitoring efforts, 2) the process and considerations used to generate the possible sample frame and monitoring plot locations, and 3) the approach for long-term data management. The NPS SODN monitoring protocol thoroughly describes the field methodology, therefore the PCEMP protocol simply explains how that protocol was applied to monitoring on County conservation lands. New monitoring plots will continue to be established through 2021. The final 100 monitoring plot locations will be included in the 2021 annual report, submitted in March 2022.

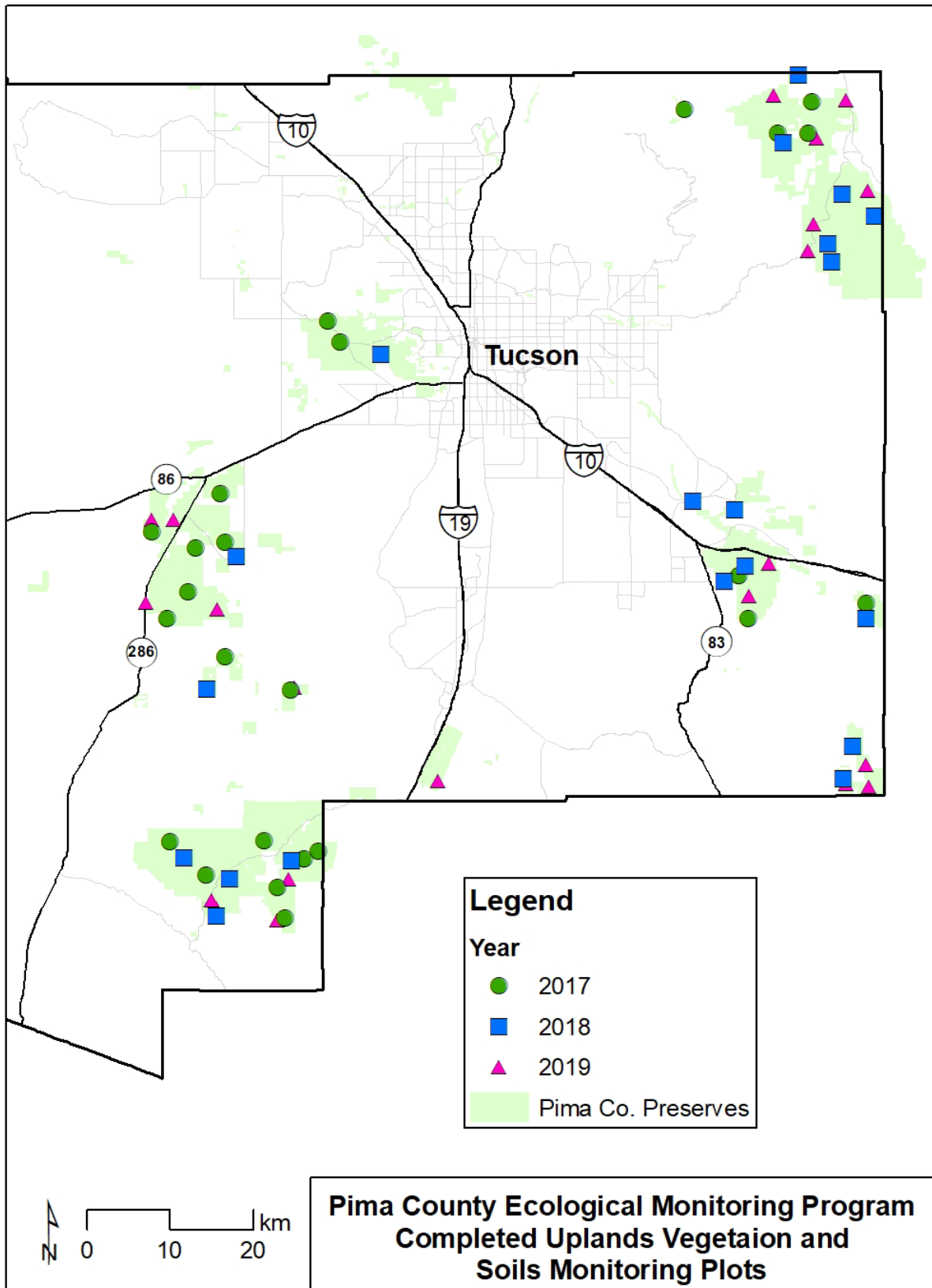


Figure 29. Completed vegetation and soils monitoring plots in partnership with the National Park Service, Sonoran Desert Inventory and Monitoring Network and the Tucson Audubon Society, 2017-2019.

Additionally, County Range Management program staff continued annual rangeland monitoring efforts of long-term ecological trend and condition. These efforts inventory vegetation and soils composition and structure and assess rangeland health at the scale of ecological sites. In 2019, staff monitored 16 of 41 permanent transects across the 15 working ranches and established 17 new inventory transects on the M Diamond and Tesoro Nueve Ranches (Figure 30). Some of these new transects will become “key areas” or transects monitored regularly on a two to five year rotation to detect any significant changes in vegetation trend and condition. This monitoring effort determines whether livestock grazing management practices are meeting the goals and objectives found in the County’s Range Standards and Guidelines(Pima County 2010).

Rangeland health assessments are conducted at the time of initial inventory and again every 10 years or as needed. The monitoring protocols applied are found in the Pima County Rangeland Management Standards and Guidelines (Pima County 2010).



Figure 30. Pima County Range and Conservation staff with consultant Dan Robinett of Robinett Rangeland Resources LLC monitoring vegetation on the County’s Tesoro Nueve Ranch, November 2019.

7.3.2 Water Resources

Perennial surface waters and their associated riparian vegetation make up a relatively small area across Pima County preserves, but are critical to maintaining ecologically functioning landscapes with their complete suite of native flora and fauna (including many of the MSCP covered species). Pima County has long monitored the status of these water sources, primarily during the hottest and driest period of the year before the onset of the summer monsoons. For example, in collaboration with the Pima Association of Governments, Pima County has been tracking surface water at the Cienega Creek Natural Preserve since the 1980s. The County has

committed to monitor three water resource elements: 1) seeps and springs, 2) shallow groundwater, and 3) perennial streams.

7.3.2.1 Springs and Seeps

In 2019, PCEMP staff finalized the Springs and Streams Monitoring Protocol which describes the geographic extent of aquatic monitoring sites, specific aquatic features in detail, monitoring schedule and methods for monitoring the extent of surface water on County conservation lands (Appendix 9). This protocol identifies seven springs to be monitored biennially, two to be monitored every five years, and another two to be monitored opportunistically (Figure 31).

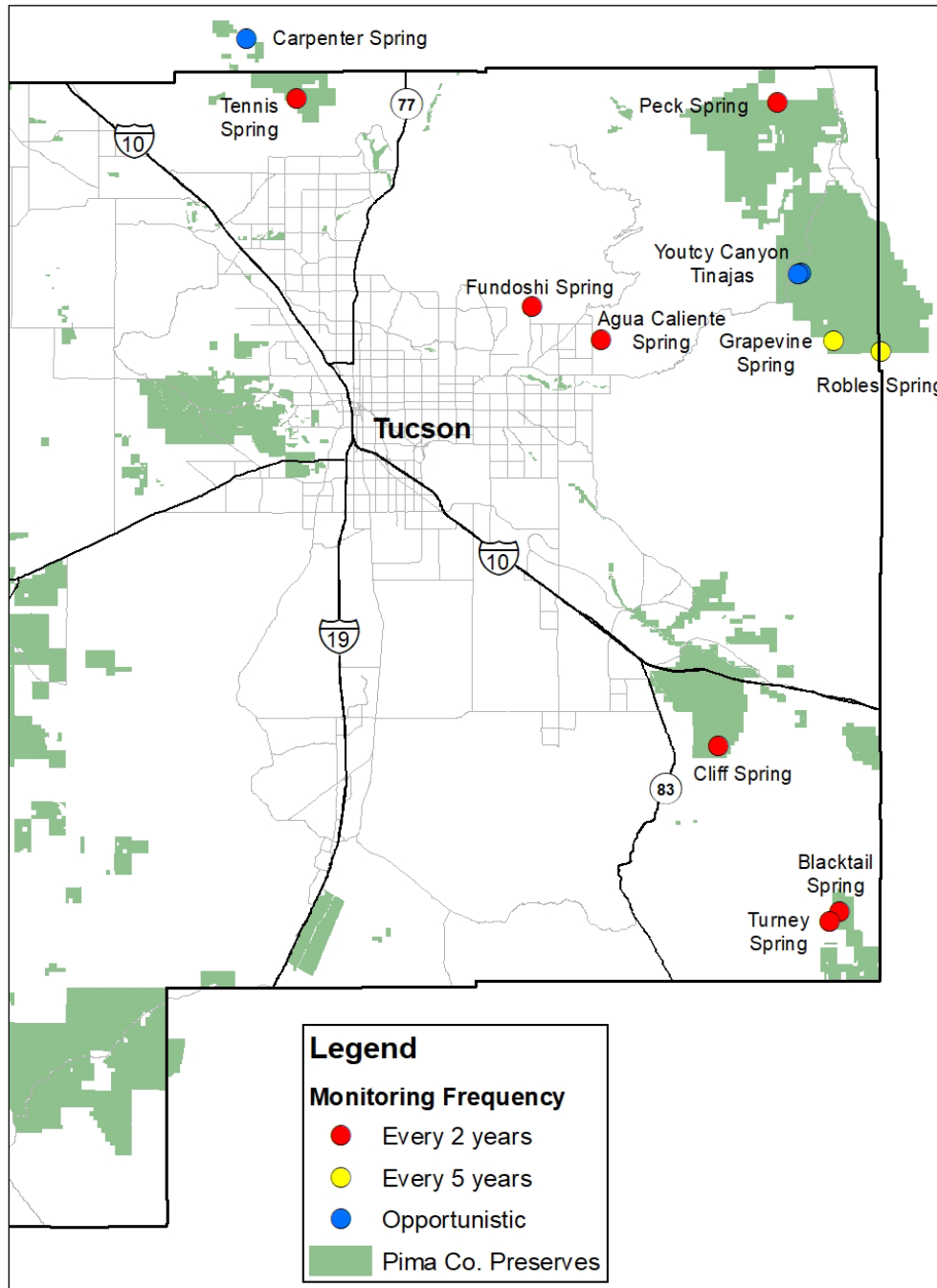


Figure 31. Springs identified in the Springs and Streams Monitoring Protocol.

7.3.2.2 Shallow Groundwater

In 2019, the Pima County Regional Flood Control District (RFCD) further expanded its network of groundwater monitoring sites by installing piezometers in wells in Buehman and Edgar Canyons within the San Pedro River watershed (Figure 32). These represent the first piezometers that the County has installed on conservation properties within this watershed, with the goal of linking annual surface water monitoring efforts to fluctuations in shallow groundwater. The installed sensors log depth to water four times per day to track both daily and monthly fluctuations, and data will be downloaded twice per year along with all other monitoring wells going forward. Groundwater monitoring actions and data for wells located on allocated mitigation properties are reported in Section 6.3.

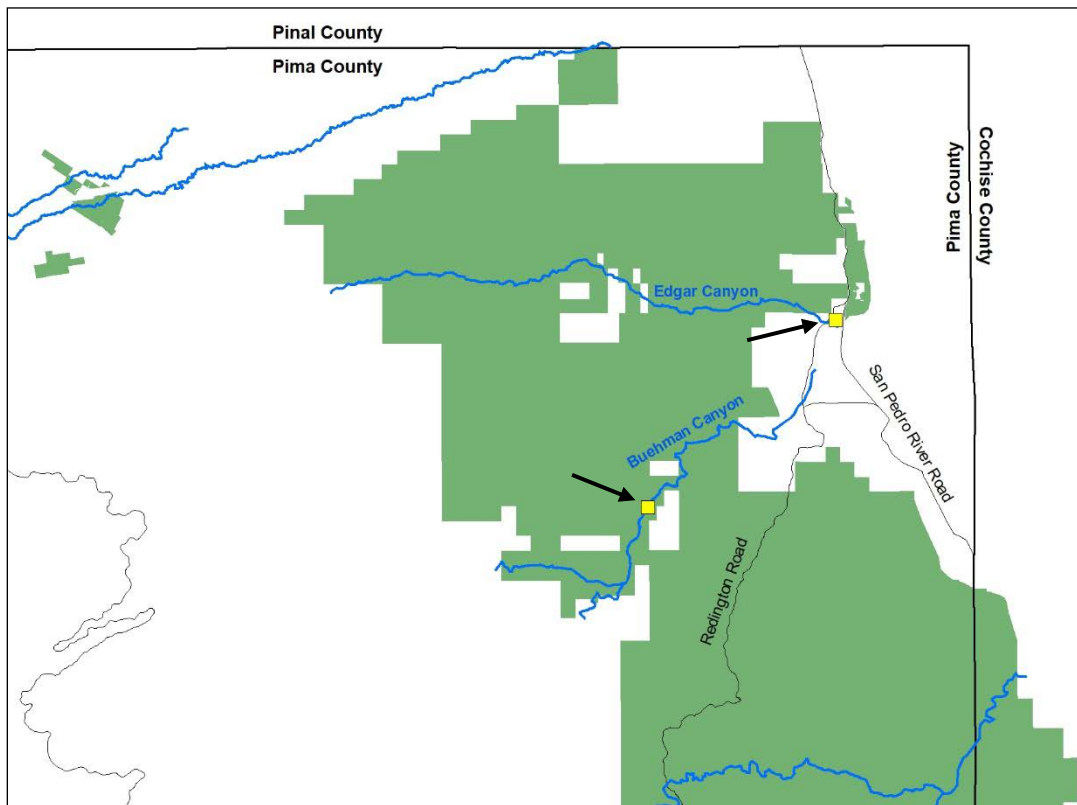


Figure 32. Location of newly installed piezometers in wells along Buehman and Edgar Canyons (yellow squares).

7.3.2.3 Perennial Streams

PCEMP staff monitor the extent of surface water available in the perennial and intermittent stream systems on County conservation lands either annually or quarterly (Figure 33). For those streams monitored only annually, this effort typically occurs pre-monsoon, in early June, which represents the driest time of year.

October 2018 – March 2019 saw considerably above average rainfall in eastern Pima County (Tucson Airport = 166% of normal). Staff decided that capturing the extent of surface flow in regularly monitored drainages after an above average winter was important in better understanding the hydrologic resources on County conservation lands. In March of 2019, staff identified the extent of surface flow of a select subset of annually surveyed streams. In general,

perennial streams were flowing heavily, with the extent of surface flow at or above previously observed June flow levels for all features. Drainages within the San Pedro River watershed (Buehman/Bullock and Espiritu/Bolt canyons, Geesaman and Gibb washes) were flowing continuously from the Coronado National Forest property boundary to the bottom of their respective drainages on County managed lands. These observations confirmed that streamflow along these stretches can be robust and extensive even when not in direct response to surface runoff from recent precipitation events. This one-time effort represented flexibility of the water resources monitoring element of the PCEMP, and staff may repeat this effort in future above-average precipitation years if warranted.

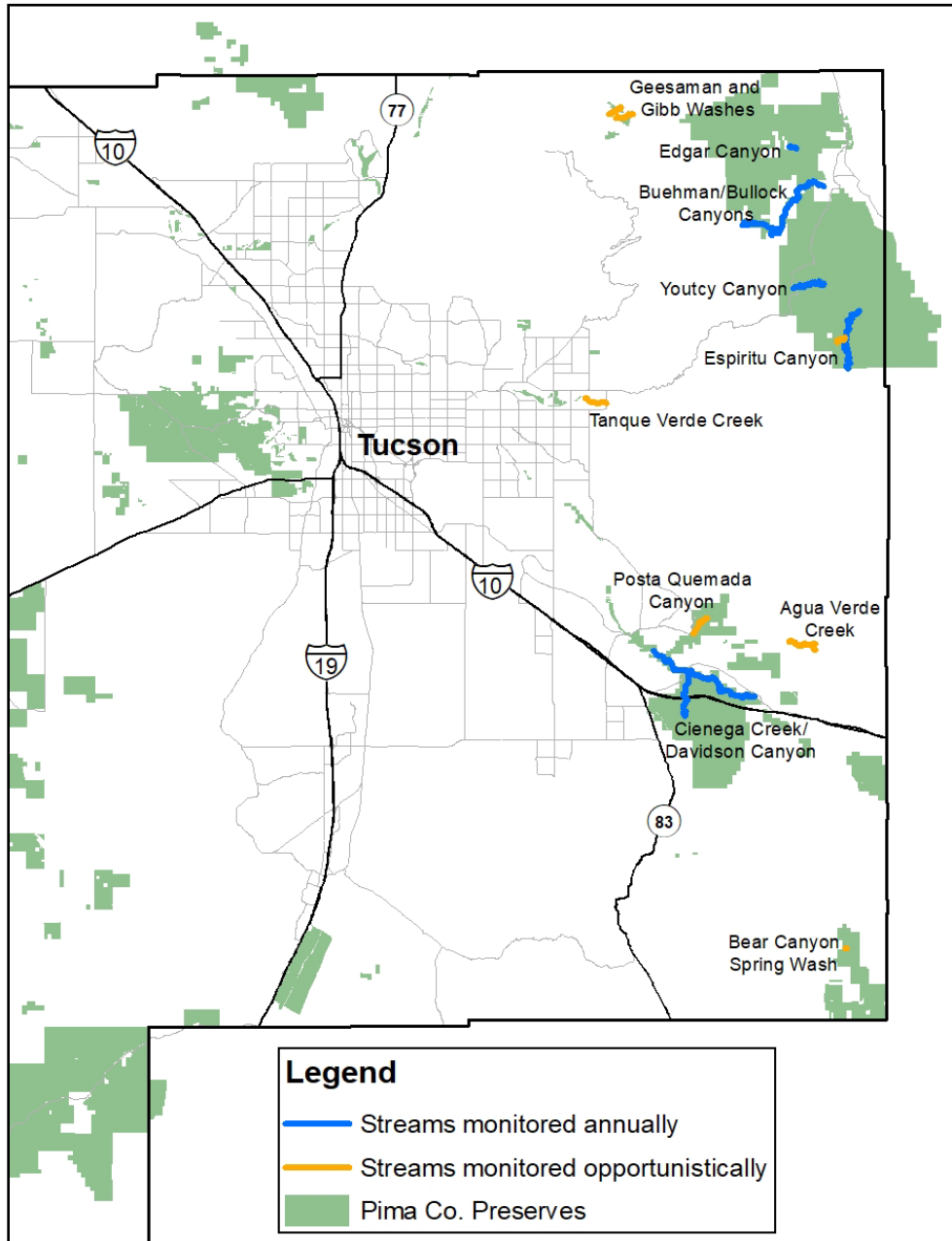


Figure 33. Stream reaches identified in the Springs and Streams Monitoring Protocol.

In addition, PCEMP staff finalized the Springs and Streams Monitoring Protocol (Appendix 9), which identifies five stream reaches to be monitored annually and another seven to be monitored opportunistically (Figure 33).

7.4 Landscape Pattern Monitoring

Landscape pattern monitoring includes assessing changes in elements such as land-cover types, land uses, landscape-scale fragmentation, and road proliferation across the entire MSCP permit area. Broad-scale analyses also require utilizing additional data sources, such as remotely sensed data, to detect repeated change across large spatial scales. The section below describes the PCEMP Landscape Pattern Monitoring Protocol development in more detail.

7.4.1 Landscape Pattern Monitoring Protocol Development

The MSCP defined a list of landscape-level components to be monitored through both retrospective and prospective methods including the extent of the built environment, changes in land cover type and extent, linear distance and location of new roads and sewer pipes, and the extent and location of potential future development (MCSPP Appendix Q, Table A-1). The Landscape Pattern Monitoring Protocol defines a general purpose and specific objectives, as well as the geographic scope and implementation timeline for implementation for each monitoring component (Table 10, Appendix 10). Additionally, the protocol describes the data sources, analysis methods, and specific summary products associated with each monitoring component. Pima County acquired its Section 10 permit from the USFWS in July 2016, so the baseline for all landscape pattern analyses will be based on imagery or data that is as close to that date as possible. Successive year analyses will be compared back to the permit baseline to establish trends over time.

Table 10. Purpose and monitoring frequency for Landscape Pattern monitoring component protocols.

Protocol	Frequency	Purpose
Built environment	Updated as CIP projects occur	Establish new reference layer for more accurate baseline; Maintain reference layer for determining when County projects require mitigation.
National Land Cover Dataset (NLCD)	As NLCD products are released	Detect changes in regional land cover and land use using 2016 baseline to understand trends; monitor and report certain changed circumstances
Sewer analysis	5 years	Establish 2016 baseline; detect changes that may shape future land use patterns or fragment habitat in CLS for decennial review
Regional road network	5 years	Detect changes from 2016 baseline that may shape future land use or fragment habitat in CLS for decennial review
Effluent-reduction analysis for Santa Cruz River	5 years	Detect changes in aquatic or riparian habitat for covered species and evaluate in relation to effluent discharge and other factors
Large wildland fire impacts	5 years	Detect changes in land cover on County preserves that may be related to fires exceeding 1000 acres in size for changed circumstances affecting covered species
Future development	≤10 years	Project how and where future development may affect land cover that support the habitat of covered species for decennial review

7.5 Threats Monitoring

7.5.1 Invasive Species

The threat that nonnative invasive species pose to the integrity of native biota and ecological processes is not unique to County conservation lands. Invasive species are an omnipresent and ever-growing threat to the ecological function of landscapes everywhere. Pima County staff in multiple departments are taking direct action as well as working with a variety of partners in the form of nonnative species identification, removal, monitoring, and restoration. The County's ecological monitoring program includes elements that address invasive species and the threats that they pose to Covered Species and their habitats on County lands.

7.5.1.1 Invasive Plant Species

Invasive plants can threaten Covered Species' habitats by displacing native plants, and altering ecosystem structure and function. The MSCP specifically calls out several invasive species of concern, including buffelgrass, fountaingrass, Lehmann's lovegrass, and African sumac (MSCP Appendix O, Table A.2). The monitoring approach outlined in the MSCP includes developing a database for recording observations of 15-20 of the most important invasive species, and collecting data on these species at long-term vegetation monitoring plots. In 2019, PCEMP developed an invasive plant monitoring protocol (Appendix 11). The protocol identifies over 20 invasive plant species (including the aforementioned species) that will be monitored at long-term monitoring plots. To help detect emerging invasive plants that are new to Pima County, or to detect new populations of species already in the region, the protocol also described how data may be collected across Pima County conservation lands generally and opportunistically as incidental observations. Furthermore, the protocol identifies external data sources that may also be utilized. These data will be stored and shared with managers in other County departments via an internal database to promote communication and coordination of invasive plant control actions. Recommendations to assist managers with prioritizing management actions are also included in the protocol.

7.5.1.2 Aquatic Invasive Species

Many of Pima County's MSCP-covered species are either aquatic, or are otherwise closely tied to aquatic and/or riparian habitats. Consequently, ensuring the ecological integrity of these aquatic and riparian systems on Pima County's preserve lands is a critical objective. One particularly devastating threat, universal to many aquatic systems throughout the Southwest, is the occurrence of aquatic invasive species and their often-detrimental impact to the continued survival of native aquatic species. Pima County's aquatic invasive species monitoring protocol (Appendix 12) identifies key sites and attributes for a number of important native and nonnative species, discusses modes of data collection and data management, and provides guidance to land managers within Pima County to inform decisions related to resource allocation towards managing aquatic invasive species (Figure 34).

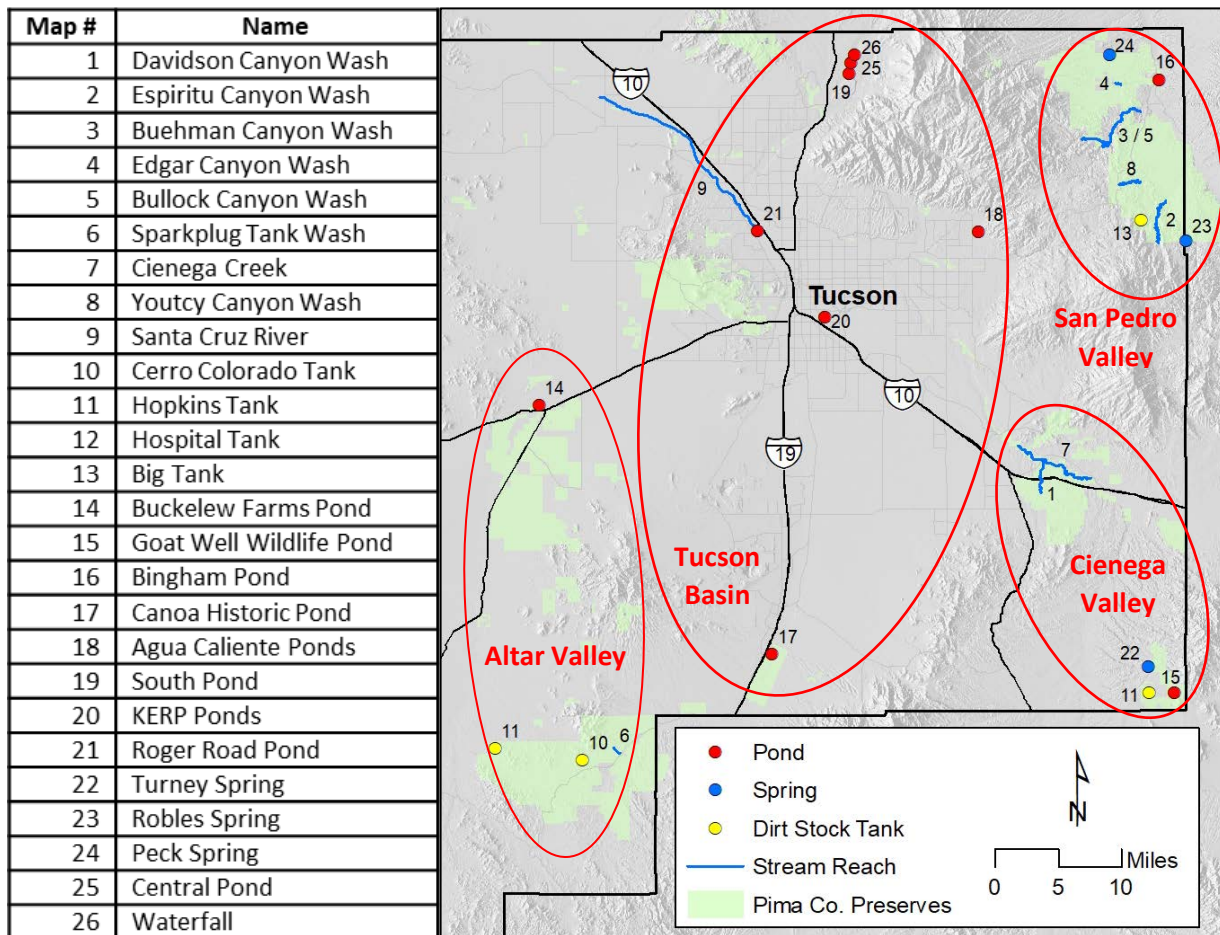


Figure 34. Key sites at which Pima County will monitor for the presence of aquatic invasive species.

7.5.2 Off-Highway Vehicle Impacts

The use of off-highway vehicles (OHV) is a continually growing form of outdoor recreation enjoyed by many across the West’s open lands. However, when OHV users do not adhere to posted rules and regulations, OHVs use may pose a substantial and detrimental impact to Covered Species and their habitats. Pima County does not permit use of motorized vehicles on trails, cross-country, or on unsurfaced roadways that have been posted or signed as Pima County parks and recreation areas (Pima County Parks Rules, Ch. 4, Sec. 040; https://webcms.pima.gov/UserFiles/Servers/Server_6/File/Government/Natural%20Resources%20Parks%20and%20Recreation/Rules/Park_Rules.pdf). The County fee lands on many County ranches have access agreements with AZGFD which allow use of motorized vehicles, including OHV use on dirt roads that are currently in use, unless marked otherwise as closed. Staff have developed a protocol about how to collect and report OHV incidental observations collected during other field monitoring elements or property inventories as required by the MSCP (Appendix 13).

7.6 Climate Monitoring

Climate is a primary driver of natural processes, and understanding whether forecasted changes in climate over the 30-year duration of the MSCP have occurred will help PCEMP staff interpret any observed trends in species- and habitat-level monitoring elements. The MSCP

originally identified precipitation as the key climate component to monitor due to its importance in systems that are water limited and due to its spatial variability and subsequent challenge to model accurately.

In 2019, PCEMP staff developed the Climate Monitoring protocol (Appendix 14), which identifies metrics that will be monitored, geographic and temporal scope, methods for data analysis, and long-term climate data-storage processes. The County proposes to monitor seasonal and annual precipitation using precipitation estimates from the freely available Parameter-elevation Regressions on Independent Slopes Model (PRISM) and long-term drought status using the Standardized Precipitation-Evapotranspiration Index (SPEI). Precipitation will be summarized at the local-scale for each of the final 100 Uplands Vegetation and Soils monitoring plot locations, and at the regional-scale for defined climate regions (roughly correlating with major watersheds) and vegetation and soils elevational strata (roughly correlated with biomes).

These data will greatly improve the interpretation of other PCEMP monitoring elements, specifically any observed changes in vegetation composition and structure on upland vegetation and soils monitoring plots. This protocol also proposes methods for summarizing a pre-permit (July 2016) climate baseline against which to compare future climate monitoring data and trend analyses.

7.7 Other Monitoring Elements

In addition to required monitoring efforts discussed above, County staff made progress on the additional elements described below:

7.7.1 Geodatabase Development

Pima County staff have continued with database development and data-sharing efforts, including implementing the Incidental Observation field form as discussed in the 2018 annual report. This form utilized the Collector for ArcGIS software and ruggedized, GPS-enabled tablets to collect observations on MSCP covered species, invasive species, threats, cultural resource sites, and infrastructure needs. Those observations are then subject to a quality control and post-processing effort before being transferred to the appropriate department (e.g. covered species observations transferred to PCEMP staff). This effort has increased accuracy and reduced redundancy in field data collection and reporting on County conservation lands. Field staff from all three departments (OSC, NRPR, RFCD) have received training on the form and will begin utilizing as field equipment becomes available.

PCEMP staff have also designed the framework for the covered and invasive species database as identified in the MSCP. The MSCP initially identified separate covered and invasive species databases; however, we are proposing to house all species observations (covered, non-covered, and invasive) in a single geodatabase to increase efficiency and simplify future analyses. Attributes for each species observation will include identification information (taxa, species, type of observation, and number observed) in addition to field observation notes. These data will be populated from several sources, including the Incidental Observation field form, PCEMP species monitoring protocols, and external partner/database observations, and will be

attributed to identify the data source. Externally acquired data will be vetted as appropriate, especially for data from citizen science platforms (e.g. eBird, iNaturalist, iMapInvasives).

7.8 Science and Technical Advisory Team

The PCEMP Science and Technical Advisory Team (STAT) met in spring of 2019 for a half-day meeting at the NPS Desert Research Learning Center, adjacent to Saguaro National Park. STAT reviewed protocols included in the 2018 annual report and discussed elements to be included in the 2019 annual report. STAT members provided valuable input towards the direction of several protocols, including invasive species and landscape pattern.

Additionally, STAT members have reviewed the 2019 annual report monitoring chapter and specific monitoring protocols completed in 2019 (uplands vegetation and soils, springs and streams, bats, invasive species, landscape pattern, climate).

7.9 Non-MSCP Covered Species

7.9.1 Arizona Eryngo

The Arizona eryngo (*Eryngium sparganophyllum*) is currently being reviewed for potential listing after USFWS concluded that a petition to list it presented substantial evidence showing that it may warrant listing. In 2019, Pima County Regional Flood Control District (RFCD) granted permission to Dr. Max Li Yue (University of Arizona) to study the life history and population structure of this plant on property owned by RFCD (one of the two known wild populations in the United States), under the terms of a USFWS Section 6 grant to Dr. Li. As part of that grant, Pima County provided a report on land use history based on interpretation of aerial imagery to USFWS. In addition, District staff provided information important to the conservation of this plant species, including a map of its distribution on RFCD land and answers to questions about land management. The RFCD is also considering establishing populations of Arizona eryngo in other areas of suitable habitat on RFCD land.

Dr. Li has collaborated with County staff, including the Native Plant Nursery, and these research and monitoring efforts have included transplanting Arizona eryngo on two County properties. Individual plants transplanted to Agua Caliente Regional Park successfully flowered and produced seeds in 2019. Dr. Li and nursery staff also have ongoing germination trials for this species.

7.10 Changes to PCEMP Protocols and Timing

7.10.1 Bat Monitoring Sites

Subsequent to reviewing the County's bat monitoring results, USFWS staff agreed with Pima County's proposal to drop some sites and front-load the next required round of bat monitoring (scheduled to be held during 2021) to include an updated assessment of the use of soil piping cavities and rock/mine features by Mexican long-tongued bats during early summer of 2020 at Cienega Creek Natural Preserve and Colossal Cave Mountain Park (Figure 23). Monitoring these features would be an update to the assessment completed by Carter and Peachey (1996). This effort also supports the biological planning component of the upcoming Cienega Corridor Management Plan for these newly allocated MSCP mitigation lands. The remaining bat

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monitoring sites to be kept will be monitored next during 2021 (S. Richardson, personal communication, 21 October 2019).

8 Changed or Unforeseen Circumstances

Changed circumstances are scenarios that could affect Covered Species (Table 7.1 of the MSCP) and are differentiated from unforeseen circumstances (Table 7.2 of the MSCP) in that the latter cannot reasonably be anticipated.

8.1 Changed Circumstances

Changed circumstances are those “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).

As discussed with the USFWS Tucson Field Office, we report changed circumstances for the 2019 calendar year (Table 11). USFWS has proposed critical habitat for Bearded Chinchweed; if approved, this would be a changed circumstance with little practical effect on MSCP activities given this species’ location high in the Santa Rita Mountains (populations and proposed critical habitat elsewhere are not located in Pima County).

A comparison of baseline conditions on the lower San Pedro River June 2016 to June 2019 shows reduction in perennial flow length near San Manuel, just north of the Pima County line (Figure 35). The San Pedro River in Pima County remains dry as well.

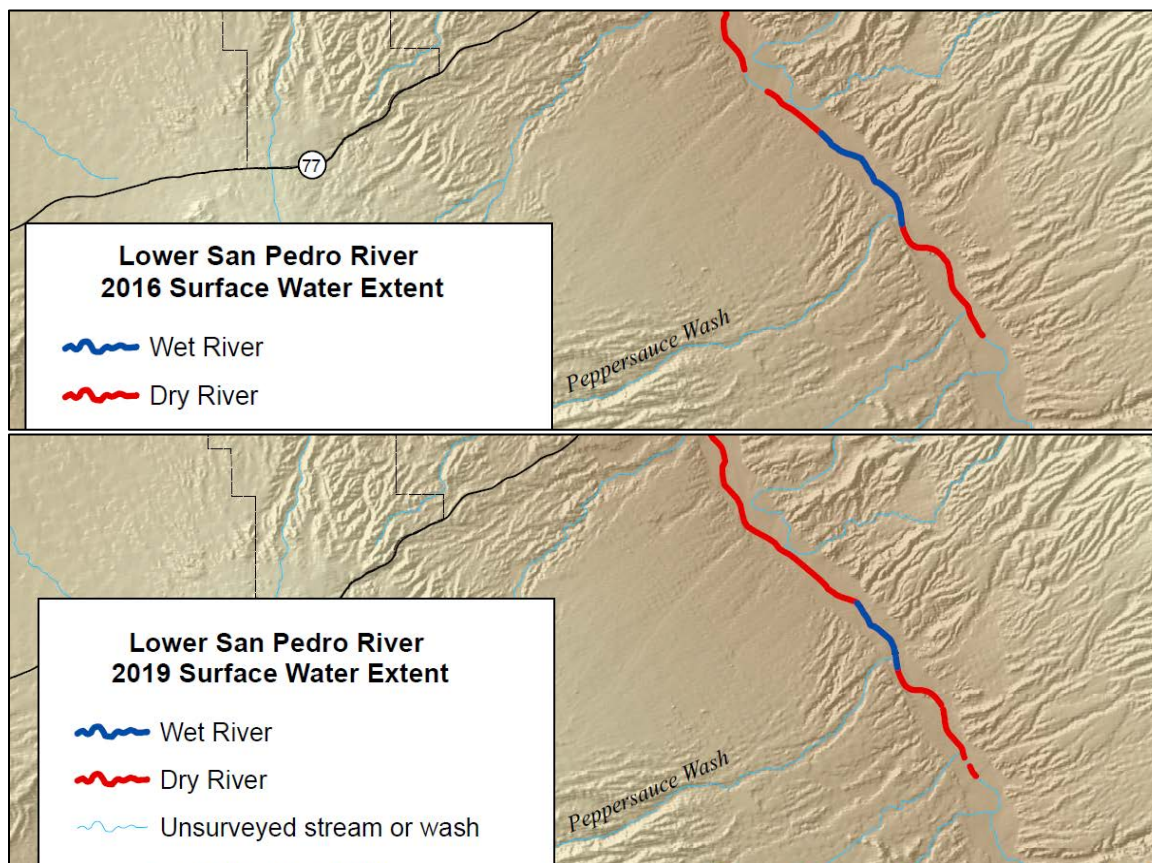


Figure 35. Change in San Pedro perennial flow reach just north of Pima County

Some changed circumstances cannot be fully evaluated until new ecological monitoring programs 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.

One example of a changed circumstance that would be evaluated at a later date is vegetation change along the effluent-dependent Santa Cruz River downstream of Tucson, in Pima County. Thanks to monitoring that has been performed by RFCD, we know that length of effluent flow during June has fluctuated from 22.1 miles in 2016, to as low as 21.4 miles in 2017. According to the most recent Pima County Effluent Generation Report, 2018 effluent discharges were reduced by nearly 4000 acre-feet from CY 2016 conditions. This may have eliminated some aquatic habitat near Agua Nueva for topminnow as a consequence, but cooperative surveys with Sonoran Institute and Arizona Game and Fish Department in 2019 confirmed that aquatic vegetation and topminnow have persisted in the remaining flow reach. Length and volume of effluent discharged to the Santa Cruz River are not the only factors that affect vegetation and other habitat for covered species, but it serves as an indicator. When Pima County implements the landscape pattern monitoring in the upcoming years, we will have a basis for reporting whether a changed circumstances has occurred to the riparian forest along the river.

Table 11. Status of changed circumstances during the 2019 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)
Invasive aquatic species (Chinese mystery snail at Columbus Park pond) enter other aquatic sites from non-Central Arizona Project sources.	Unknown but observed during 2019	Photograph located by County staff in observation reported by citizen scientist on inaturalist.org	Notified AZGFD. County staff conducted field survey and found none, but will report on future observations.
Desiccation of other groundwater-dependent riparian systems	Yes	TNC data for lower San Pedro River near San Manuel	Notified TNC
Designation of critical habitat for Bearded Chinchweed (<i>Pectis imberba</i>), a species that is not covered under the permit	Yes	USFWS announcement	Limited to occupied habitat outside the permit area. No potential for County take, so no County action

8.2 Unforeseen Circumstances

The USFWS did not identify any unforeseen circumstances that affect covered species or their habitats in 2019.

9 Fiscal Year Funding

9.1 Expenditures

Pima County spent over \$3,000,000 in services to implement the MSCP in FY2019 (Table 12). 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 2019, except for the Sheriff’s estimate, which is based on calendar year 2019 visits to potential mitigation land addresses.

Table 12. 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 2018-June 2019.

Department	Expenditure (thousands of dollars)
County Administrator	77
Communications	0
Development Services	124
Regional Flood Control District	559
Information Technology	210
Natural Resources, Parks and Recreation	1,467
Public Works Administration (Real Property)	230
Sheriff’s Department	15
Office of Sustainability and Conservation	677
Transportation	208
MSCP and Section 10 Program Total	\$3,567

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. In 2019, several IT staff from NRPR and RFCD were moved to IT, but remain involved in MSCP support. Health Department’s role in implementing the topminnow program is not reflected here but has minimal budget implications, as topminnow merely add another tool to the vector control alternatives. Communications also contributed toward the MSCP effort but did not provide an estimate.

Highlights from the reporting period for the departments listed in Table 12 include:

- The **County Administrator’s Office** explored options to acquire additional lands in 2019 and assisted with donations.
- **Communications** helped provide publicity for the Certificate of Coverage program, the Gila topminnow reintroductions, fish monitoring at Cienega Creek, and other activities.
- **Development Services** continued to administer various avoidance and minimization measures embedded in existing ordinances.

- **Information Technology** department provided assistance in preparing the MSCP and supporting ecological data collection. This year's budget reflects three staff who were shifted from NRPR to IT.
- **Sheriff's Department** enforced laws on mitigation lands and provided search and rescue at levels similar to last year.
- **Department of Transportation** minimized impacts along roadways using Environmentally Sensitive road design and Environmental Assessment and Mitigation Reports.
- **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. Key staffing changes included hiring Mathew Jewell for a 6-month period as the Range program assistant to help Vanessa Prileson with range program monitoring. In addition, the Natural Resources Division created a new trades group, who work on a variety of projects on NRPR managed lands. During 2019, key projects included demolition of the Javelina House and Double-wide trailer at Carpenter Ranch and maintenance of the Ramsey Well, Sands Ranch, to benefit wildlife.
- **Regional Flood Control District** fulfills a key role in minimizing effects on habitat for riparian species and supports management of mitigation land, including the allocated land at Bingham and Cienega Corridor.
- **Office of Sustainability and Conservation** supports the land managers with information and monitoring data, and administers the Certificate of Coverage Program. Amanda Webb joined OSC in 2019 to fill a vacant position. Cultural resource staff also support management of lands, and this is now reflected in the budget.

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) a Compliance Monitoring Fee (\$2450.00). When any of the eligible types of residential subdivision, commercial, or industrial 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 2019 calendar year, the Certificate of Coverage Program generated a total of \$2,880.00 in revenue (all of it derived from Application Fee receipts for four residential subdivision projects). Compliance Monitoring Fees were not collected as none of these projects 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

Pima County Regional Flood Control District was awarded a \$340,000 grant from the Arizona Department of Fire and Forestry for invasive plant species treatment and monitoring, to be

implemented beginning in 2020. Ongoing ecosystem restoration work on retired agricultural fields on the County's King 98 Ranch continues to be supported by the USFWS Partners for Fish and Wildlife program as well as other partners including the Altar Valley Conservation Alliance.

Pima County also benefitted from partnerships with a number of organizations, some of which received grants to improve habitat or monitor species or their habitats. For example, Pima County saw its first translocation of an MSCP-covered species, the Gila topminnow and Huachuca water umbel, into an aquatic feature that was built on County land (Mission Garden) using grant monies received by the managers of the site, Friends of Tucson's Birthplace, from the USFWS Partners for Fish and Wildlife program and the Southwestern Foundation for Education and Historical Preservation. Other examples are described in relevant sections of this report.

10 Other Land 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. Other land transactions can affect the pool of lands available to offset future impacts, therefore we report on significant changes here. We use the addition or release of MSCP restrictive covenants to County-owned fee land to mark when lands are added to or subtracted from the body of potential mitigation lands under the Section 10 permit. Each addition or release is subject to review by U. S. Fish and Wildlife Service. Approval of an MSCP covenant indicates that the property is eligible for future allocation as compensation.

During 2019, the portfolio of potential mitigation lands increased by approximately 250 acres (Figure 36) due to MSCP restrictive covenants. Subsequent to review by ALWT and USFWS, the County Board of Supervisors and Flood Control District Board of Directors placed MSCP restrictive covenants on 254 acres and released covenants from 3.31 acres (Appendix 15).

Several donations of land were accepted into the County's preserve network in 2019, including the Kidwell donation adjacent to Bar V Ranch, which contains a population of the Total Wreck talussnail, an MSCP-covered species. We will consider encumbering such donations with covenants in future years. We consider lands that are encumbered with MSCP covenants as potential mitigation land.

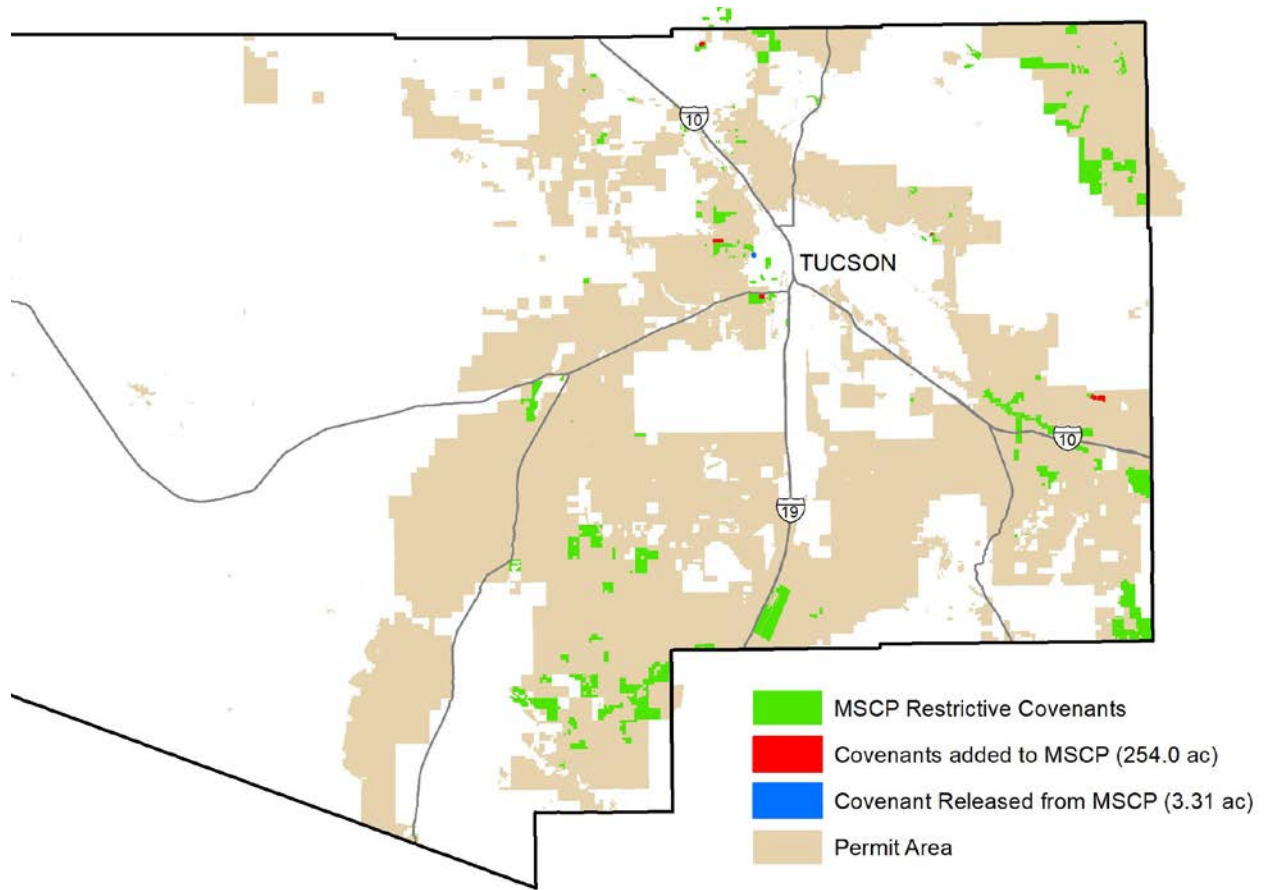


Figure 36. MSCP potential mitigation land additions and releases during 2019.

11 Partnerships

11.1 Arizona Conservation Corps

Pima County's NRPR and RFCD have utilized the services of AZCC for a number of years to assist with management of potential MSCP mitigation lands. Youth from southern Arizona work with County staff to construct and repair fences, remove unnecessary fences and open-topped pipes, remove invasive species, plant native species, and clean up wildcat dumps. Pima County open space lands that benefited from the AZCC in 2019, included Roger Road Nodal Park, Tucson Mountain Park, Bear Canyon, Morkis and Diablo Estates open space, and other RFCD-managed floodplain lands in the Brawley Wash area.

11.2 Altar Valley Conservation Alliance (AVCA)

Pima County's NRPR, as well as RFCD staff, work closely with AVCA on moving forward a variety of landscape level land restoration efforts in the Altar Valley, including on County ranches. For example, AVCA is a partner in the County's efforts to restore retired and degraded agricultural fields on the County's King98 Ranch. AVCA is also working with Pima County on the Lower Altar Valley Area (LAVA) resource management planning process, which includes a variety of County properties and ranches in this area.

11.3 Arizona Land and Water Trust (ALWT)

This year, ALWT helped Pima County secure a donation of land in the Empire Mountains from the Margaret Kidwell Revocable Trust; the property is adjacent to Bar V Ranch. Pima County has an agreement with the ALWT to provide services to Pima County as a third-party beneficiary for MSCP and Conservation Land restrictive covenants. ALWT evaluated the MSCP biennial inspection reports provided to them in 2019, with no additional information being required. ALWT also reviewed and approved a detailed list of "green light" activities that are permitted under the MSCP covenants without further review or approval by ALWT.

11.4 University of Arizona

In 2019, Pima County continued to support University of Arizona's study on the distribution and ecology of the Sonoran talussnail and other talussnail species. County staff completed protocol-based talussnail surveys at six sites, and collected talussnail vouchers for later genetic analyses. David Hall, University of Arizona wildlife biologist, and his crew led aquatic invasive species monitoring and control efforts at important sites occupied by Chiricahua leopard frogs on County lands. County staff also received valuable discussion and guidance on the development of the County's climate monitoring protocol from Drs. Michael Crimmins and Ben McMahan, scientists on the Climate Assessment for the Southwest (CLIMAS) research team.

11.5 Arizona Game and Fish Department

In 2019, Pima County conferred with AZGFD on several new sites for native aquatic species establishment per our Aquatic Species Management Plan. AZGFD established Gila topminnow at Edgar Canyon and Mission Gardens. Pima County participated in discussions with Bureau of Reclamation and AZGFD regarding the impacts of an Interstate 11 alternative, and provided a briefing on the MSCP.

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

The Cienega Watershed Partnership (CWP) received a grant from the Bureau of Reclamation (BOR) to evaluate potential sites for remediation of erosion or other water quality issues. We worked with CWP and Watershed Management Group (WMG) to evaluate sites in the Cienega Creek Natural Preserve and in Bar V, but it appears the project will not be implemented at this time. Instead, WMG will use a different grant to accomplish some work in 2020.

U. S. Bureau of Reclamation provided Pima County with results from a downscaled climate model that generated runoff and temperature scenarios for various watersheds and elevations in eastern Pima County. These are being used in the Cienega Corridor planning.

11.7 The Nature Conservancy

In 2019, The Nature Conservancy provided conservation planning guidance to the Cienega Corridor Management Plan core team. With their help, Pima County is utilizing the Open Standards for Conservation for the first time, which is an internationally used, open source of templates and guides for conservation practitioners. Pima County contributed wet-dry monitoring data to the Nature Conservancy's annual San Pedro monitoring effort. Additionally, Nature Conservancy provides depth to groundwater measurements for a well adjacent to the Bingham Preserve.

11.8 National Park Service

Pima County continued its cooperative agreement with the Sonoran Desert Inventory and Monitoring Network (SODN) of the NPS, based in Tucson. The County uses a soils and vegetation monitoring protocol for County lands that is currently in use across federal lands managed by multiple agencies near or adjacent to County lands (allowing meaningful comparisons across a larger scope).

11.9 Tucson Audubon Society

Tucson Audubon Society continues to assist in the implementation of the NPS soils and vegetation monitoring protocols on County lands as well as to monitor and to develop monitoring protocols for cave and mine-dwelling MSCP covered bat species on County preserves. Together we have launched a new effort to detect bat occupancy at Agua Caliente Park during winter months. At least nine species of bat were detected in February 2019, including MSCP-covered yellow bats.

11.10 Northern Arizona University

Dr. Clare Aslan, Northern Arizona University conservation biologist, studied how habitat fragmentation may impact native pollinator visitation and subsequent fruit set in Pima pineapple cactus, using RFCD's Diablo Estates property as one of her sites with an 'intermediate' level of fragmentation. Dr. Aslan documented four native pollinator species visiting flowers at Diablo Estates, with *Diadasia* sp. cactus bees being the most important pollinators. Cactus at the unfragmented site, Buenos Aires National Wildlife Refuge, had higher fruit set rates, a greater diversity of documented pollinator species visiting flowers, and higher visitation rates than cactus growing in more fragmented areas, including Diablo Estates.

11.10 Coalition for Sonoran Desert Protection

The Coalition has launched an effort to design improved wildlife crossings of Interstate 10 in a “critical landscape connection” between the Santa Rita and Rincon Mountains. This work will proceed in 2020 under a grant from Arizona Game and Fish Department. Cameras will be used to identify species using the existing underpasses.

11.11 Arizona-Sonora Desert Museum (ASDM)

Pima County staff meet quarterly with ASDM staff for updates on new species of exotic invaders. We share successful treatment options, new technologies (i.e., Green up maps), and learn what is being done so we can more efficiently cooperate within our regional Weed Management Area for greater success. ASDM staff worked with NRPR and Pima County GIS staff to create and test mobile data collection solutions for managing invasive plants.

11.12 Pima Association of Governments

PAG hosted a workshop to support the development of a management plan for the allocated properties, and continued organizing the quarterly wet-dry mapping along Cienega Creek. They maintain webpages with Cienega Creek data and provided an update of findings from 2019.

12 Prospective Issues

- Pima County OSC continues to develop procedures to address use of County-owned potential mitigation lands subject to restrictive covenants. The County consults with the USFWS and ALWT on those aspects that pertain to potential modification or release of restrictions, as well as any new properties which may be encumbered with covenants in the future.
- USFWS agreed to consider species enhancement credits for aquatic species establishments but no framework for such credits yet exists.
- The USFWS may list Arizona eryngo in future years. Pima County does not intend to amend the Section 10 permit to include the species at this time.
- Pima County understands USFWS and AZGFD are working on a safe harbor agreement for masked bobwhite. In the event that the distribution of the species shifts, Pima County will evaluate the potential need for covering incidental take.
- Pima County is working to minimize the potential impacts of the SunZia power line, and to secure compensation for the mitigation value of impacted lands on A7 and M Diamond Ranches.
- Pima County will continue to work with AZGFD and others regarding potential native species introductions, such as those described in the aquatic species management plan.
- Pima County is evaluating the potential use of the safe harbor agreement for pupfish.
- USFWS assistance may be needed to continue streamlining Section 7 for additional federal agencies such as Federal Emergency Management Agency in light of the County's MSCP.
- Pima County and USFWS are discussing coverage for infrastructure that is built by developers on County land (including ROW) to County standards.
- Pima County will update the built environment layer using the land use-land cover model developed by RFCD based on 2015 data to improve the accuracy of habitat take calculations for CIP projects in the future.
- Pima County seeks a long-term agreement with ASLD to accomplish species monitoring on County-leased State Trust Lands.
- Based on a review of future CIP projects listed in Appendix 3 and a pending Certificate of Coverage for a solar project, Pima County's mitigation obligations are anticipated to increase substantially. Additional properties will need to be allocated in the near future.

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 (RFCD); Finance; Transportation; Environmental Quality; Real Property; Office of Sustainability; Health Department; and Public Works Administration.

We are grateful to the Science Technical Advisory Team, particularly S. Lowery , C. Campbell, and D. Swann, G. Bodner, for their advice and reviews of monitoring protocols this year. AZGFD, University of Arizona, USFS, NPS, and USFWS staff also contributed advice regarding data collection and analysis methods throughout the year. AZGFD and USFWS also provided much useful information on the aquatic species management plan.

We also appreciate the information shared by AZGFD, University of Arizona, Pima County and RFCD staff, and others for reviewing monitoring protocols and evaluating changed circumstances.

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

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