




MEMORANDUM

Date: June 2, 2021

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

From: C.H. Huckelberry
County Administrator 

**Re: Requested Information regarding the Conservation Effluent Pool: City of Tucson
Santa Cruz River Heritage Project Application**

This memorandum responds to questions posed by the Board of Supervisors at their May 18, 2021 meeting concerning City of Tucson's application to use water from the Conservation Effluent Pool (CEP). City of Tucson requests an allocation of effluent from this pool for the Santa Cruz River Heritage Project located in downtown Tucson. The application was reviewed by staff and deemed complete and ready for Board action.

The Board continued the item until June 22 to allow the Board time to review the 2011 Implementing Intergovernmental Agreement (Attachment 1) regarding governance of the Pool, and staff to address questions concerning the City's application (Attachment 2). Mayor and Council approved the Santa Cruz Heritage request on May 18, 2021.

Background

In 2000, as part of the Sonoran Desert Conservation Plan, Pima County and City of Tucson recognized the need to set aside a source of water for use in riparian restoration, in light of the past losses of cottonwood, mesquite and other riparian vegetation along the Santa Cruz River and other streams. The 2000 Supplemental Intergovernmental Agreement between Pima County and the City of Tucson reserved up to 10,000 acre-feet of effluent per year for this purpose.

The 2000 Supplemental IGA directs effluent entitlements from Agua Nueva and Tres Rios Water Reclamation Facilities (metropolitan facilities) based on the Southern Arizona Water Rights Settlement Act (SAWRSA) and agreements with the City of Tucson and other water providers.

As shown in Figure 1, the Conservation Effluent Pool allocation is distributed following the SAWRSA legal obligation and prior to the distribution to the County and water providers.

The 2000 Supplemental IGA stated that the terms and conditions by which effluent would be made available to operators of riparian projects would be established in a subsequent

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agreement negotiated by the City and County. That agreement, called the Implementing Agreement, was not signed until 2011.

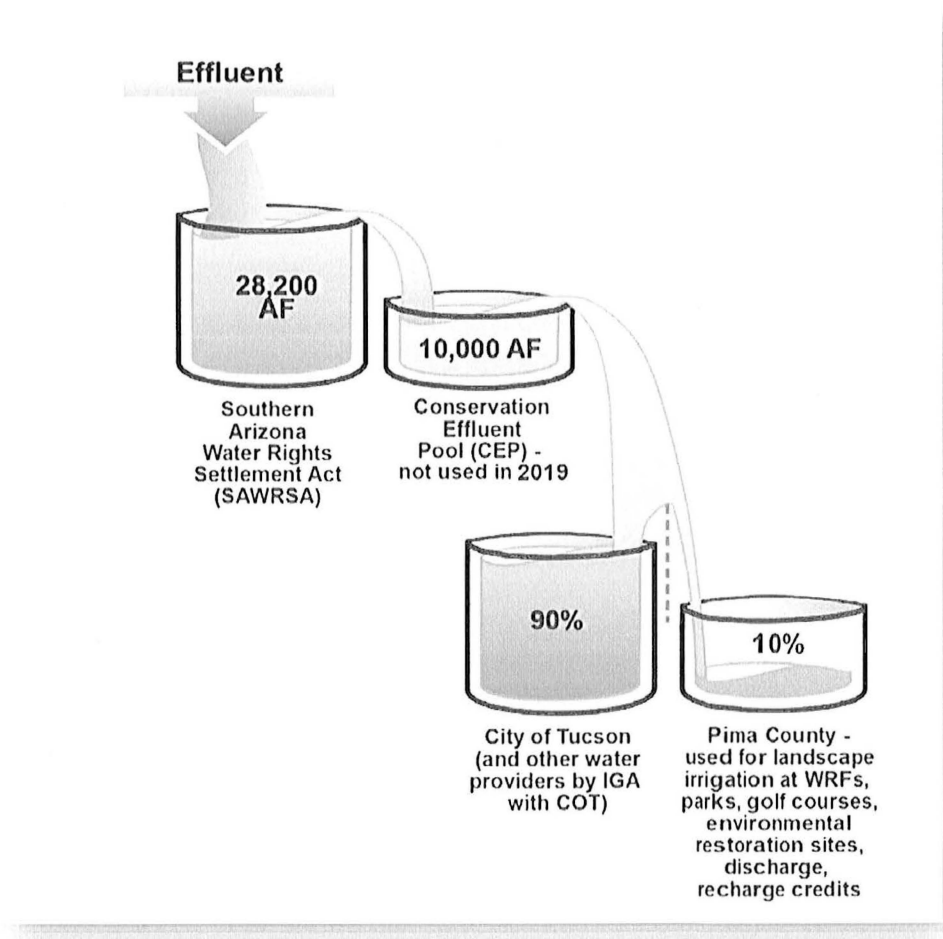


Figure 1. Effluent entitlement "buckets" from the 2000 IGA between City and County

Response to Questions

1. What does the 2011 Implementing Agreement say?

The 2011 Implementing Agreement provides the framework for administration of the CEP as allocations are made. It describes the roles of the Board of Supervisors and Mayor and Council, as well as the CEP Administrators appointed by the City Manager and County Administrator.

In the 2011 Implementing Agreement, City and County agreed that CEP allocations for riparian projects proceeding under the Endangered Species Act (ESA) would proceed upon submittal of the required evidence to CEP Administrators. Under the ESA, Pima County has successfully applied for an allocation of CEP to ensure sufficient flows in the Santa Cruz River downstream of the Agua Nueva facility. All other riparian projects not proceeding under the ESA, such as the Heritage Project, require a decision from the governing bodies of both City and County.

Project operators are required to identify the vegetation or wildlife habitat that is central to the purposes of their project, distinct from recharge or recreational uses. If approved, the operator is required to report water use annually to the CEP Administrators. The City Heritage CEP allocation would only offset natural water use (evapotranspiration) associated with vegetation and open water in the Santa Cruz River from Tucson's discharge point near 29th Street to Congress St.

2. Is Pima County giving storage credits to City of Tucson?

Storage credits are entitlements to pump from the aquifer that are granted from Arizona Department of Water Resources (ADWR) when an entity can show that infiltration of effluent possessed by that entity is recharging the aquifer at a permitted underground storage facility. Board approval of this request will not transfer any Pima County storage credits to the City of Tucson as a consequence of approving the Heritage Project. It will solely allow for up to 110 acre-feet per year to be allocated to the riparian project evapotranspiration prior to distribution of the remaining effluent to the County and water providers per the terms of the 2000 Supplemental Agreement.

CEP used in the way the City of Tucson proposes does not affect the ADWR's calculation of storage credits because: 1) the approval does not result in removing any effluent from the river; and 2) ADWR does not grant any storage credits for evapotranspiration.

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3. *What happens if the Board rejects the application?*

City of Tucson will in all likelihood continue to operate the Heritage project in order to store effluent underground and revitalize the river corridor downtown, regardless of the Board's decision. If the request is denied by the Board, the City will have to utilize their share of effluent to offset the amount of evapotranspiration from the water and riparian vegetation. Denial may effect approval of subsequent CEP projects that the County may want to undertake.

CHH/dym

Attachments

c: Jan Leshner, Chief Deputy County Administrator
Carmine DeBonis, Deputy County Administrator for Public Works
Yves Khawam, Assistant County Administrator for Public Works
Suzanne Shields, Director, Regional Flood Control District
Jackson Jenkins, Director, Regional Water Reclamation Department
Carla Blackwell, Director, Development Services
Linda Mayro, Director, Sustainability and Conservation
Kathy Chavez, Water Policy, Sustainability and Conservation
Julia Fonseca, Environmental Planning Manager, Sustainability and Conservation

ATTACHMENT 1

CONTRACT	
NO. 0103-T-143606-1210	
AMENDMENT NO. _____	
This number must appear on all invoices, correspondence and documents pertaining to this contract.	

INTERGOVERNMENTAL AGREEMENT
BETWEEN
PIMA COUNTY AND THE CITY OF TUCSON
FOR IMPLEMENTATION OF THE
CONSERVATION EFFLUENT POOL

This Intergovernmental Agreement defines the provisions for the use and allocation of Effluent and Reclaimed Water in the Conservation Effluent Pool for environmental restoration of Riparian Projects and is entered into by and between Pima County, a body politic and corporate of the State of Arizona (County), and the City of Tucson, Arizona, a municipal corporation (City).

RECITALS

- A. The County and the City are empowered to enter into this Conservation Effluent Pool Agreement pursuant to A.R.S. §§ 11-951 through 954.
- B. This Agreement is subject to the provisions of the City of Tucson-Pima County Supplemental Intergovernmental Agreement Relating to Effluent No. 01-03-T-127199-0200 effective March 14, 2000 (Supplemental IGA), the June 26, 1979 Intergovernmental Agreement between the City and the County (1979 IGA), and other applicable laws of the State of Arizona, the County, and the City.
- C. The City is engaged in the development and operation of a Reclaimed Water system pursuant to the laws of the State of Arizona, involving the treatment of Effluent and the conveyance of Reclaimed Water.
- D. The County is engaged in the operation of wastewater treatment facilities that produce secondarily treated Effluent, a portion of which is delivered to the City Reclaimed Water system.
- E. The County and City agree that riparian areas in the Southwest are severely threatened and vulnerable and that the loss of riparian habitats will have far-reaching effects on native priority vulnerable plant and animal species.
- F. Having made that recognition, the County and City agreed in the Supplemental IGA that reasonable quantities of Effluent should be reserved for use in Riparian Projects.
- G. Pursuant to Section V of the Supplemental IGA, the City and County made up to five thousand (5,000) acre-feet of Metropolitan Effluent per year during the first five-year period after the effective date of the Supplemental IGA available for Riparian Projects, and up to ten thousand (10,000) acre-feet of Metropolitan Effluent per year thereafter. Following the Supplemental IGA's adoption, the City reached agreements with other

Water Providers to allocate effluent from the City to those Providers on a proportional basis to their contributions to the Metropolitan Effluent from their respective service areas. Those agreements require contribution to the Conservation Effluent Pool on a proportional basis, so that contributions to the Conservation Effluent Pool are currently made by the Town of Oro Valley and the Metropolitan Domestic Water Improvement District, in addition to the City and County.

- H. Pursuant to Section V of the Supplemental IGA, the County and City can agree to increase the amount of Effluent contributed to the Conservation Effluent Pool.
- I. Pursuant to Section V of the Supplemental IGA, Effluent will be contributed to the Conservation Effluent Pool after the United States has taken its SAWRSA Effluent. The County is entitled to use 10% of the Effluent from metropolitan-area treatment facilities after contribution of Effluent to the Conservation Effluent Pool, within the parameters established by the 1979 IGA and Supplemental IGA. Pursuant to the 1979 IGA and subject to the agreements the City has made with other Water Providers, the City owns the remaining effluent, which is available to the City within the parameters established by the 1979 IGA and Supplemental IGA.
- J. Pursuant to Section V of the Supplemental IGA, any Effluent assigned to a Water Provider shall bear its pro-rata share of the contribution to the Conservation Effluent Pool.
- K. Effluent in the Conservation Effluent Pool shall be available to any Operator for use on a Riparian Project. If the quantity of Effluent in the Conservation Effluent Pool is insufficient to meet the demand of Riparian Projects receiving Effluent, the Effluent shall be apportioned among the Riparian Projects.
- L. Pursuant to Section V of the Supplemental IGA, Effluent from the Conservation Effluent Pool shall be made available at no charge by the City to Operators not requiring Reclaimed Water. The Operator requiring effluent shall take delivery of the Effluent at the secondary treatment facility and shall be solely responsible for the expense of transporting the Effluent to the Riparian Project.
- M. Pursuant to Section V of the Supplemental IGA, the City shall produce and deliver Reclaimed Water to Riparian Projects on an interruptible basis and shall charge an Environmental Rate to be paid by Operators or beneficiaries of the Riparian Projects in accordance with the methodology described in Exhibit A of the Supplemental IGA. The City shall not be obligated to deliver Reclaimed Water if specific capital improvements are needed for the production or delivery of Reclaimed Water to a particular Riparian Project and the Operator fails to finance the costs of the capital improvements.
- N. Pursuant to Section V of the 2000 Supplemental IGA, Effluent from Metropolitan Area wastewater treatment facilities will be contributed to the Conservation Effluent Pool after the United States has taken its SAWRSA Effluent and before the County, the City, and other water utilities are entitled to exercise their rights to Effluent. Use of the Conservation Effluent Pool, however, shall not interfere with the rights of any Water Provider to use the Effluent to which it is entitled.

NOW, THEREFORE, in consideration of the mutual promises contained here, the County and City agree as follows:

AGREEMENT

Article I: Purpose

The purpose of this Conservation Effluent Pool Agreement is to set forth the terms, conditions, and responsibilities of the County and the City for the creation and maintenance of the Conservation Effluent Pool pursuant to Section V of the Supplemental IGA.

Article II: Definitions

The terms defined in Section III of the Supplemental IGA shall have the same meaning in this Agreement. In addition, the following terms are used in this Agreement

- 2.1 CEP Administrators: One person designated by the County Administrator and one person designated by the City Manager to assume those administrative responsibilities designated by this Agreement.
- 2.2 Conservation Pool Effluent: Effluent made available to Riparian Projects pursuant to Section V of the Supplemental IGA.
- 2.3 Critical Vegetation : Vegetation that is central to the purposes of a Proposed or Riparian Project.
- 2.4 Designated Riparian Project: a contiguous project located entirely within Pima County that is operated for purposes of environmental restoration and is accepted by the Governing Bodies of Pima County and the City of Tucson as a Riparian Project.
- 2.5 Governing Bodies: the members of the Pima County Board of Supervisors and the Mayor and Council Members of the City of Tucson.
- 2.6 ESA Riparian Project: a riparian project that is operated to comply with a Habitat Conservation Plan approved under Section 10 of the Endangered Species Act (the Act) or a mitigation project established by an Operator pursuant to Section 7 of the Act.
- 2.7 Operator: The City of Tucson, Pima County, and the Pima County Regional Flood Control District. Operator also includes the Town of Oro Valley, the Metropolitan Domestic Water Improvement District, or any other contributor to the Conservation Effluent Pool provided said contributor provides water service solely within areas where Pima County is the Clean Water Act Section 208 Designated Management Authority.

- 2.8 Managers: The City Manager and the County Administrator or their authorized representatives.

Article III: Administration

- 3.1. The CEP Administrators are authorized to administer the Conservation Effluent Pool on behalf of the respective Governing Bodies and to develop guidelines and administrative protocols to govern their administrative responsibilities.
- 3.2. The CEP Administrators shall maintain records of the information that they receive and produce in the course of administering the Conservation Effluent Pool.
- 3.3. Within twenty working days of receiving an application for Conservation Pool Effluent or an Operator's supplemental request for Conservation Pool Effluent, the CEP Administrators shall review the application for compliance with Article IV of this Agreement. If an application or supplemental request is incomplete, the CEP Administrators shall notify the applicant or Operator of the deficiencies in the application and take no further action on the application until it is complete.
- 3.4. The CEP Administrators shall monitor the progress of each Riparian Project. The CEP Administrators' authority under this Agreement includes, without limitation, the authority to: (i) determine whether a Riparian Project's Critical Vegetation is established; (ii) investigate the condition of each Riparian Project and the amount of water, including Effluent and Conservation Pool Effluent, being used by the project; (iii) request that an Operator present the condition and progress of a Riparian Project; and (iv) any other duty specified by this Agreement.
- 3.5. If demand for Conservation Pool Effluent exceeds 9,000 acre-feet per year (or 90% of the total volume of effluent contributed to the CEP), the CEP Administrators may, as appropriate: (i) recommend an increase to the Conservation Effluent Pool as provided in Section 5.4, below or (ii) recommend apportionment of Conservation Pool Effluent if demand exceeds supply.
- 3.6. The CEP Administrators shall report by May 31 of every year to the representatives of the County and City and to each Governing Body on the status of the Conservation Effluent Pool, including without limitation information contained in each Operator's Annual Report and the status and projected allocation of Conservation Pool Effluent to each Riparian Project for the following five calendar years.
- 3.7. The CEP Administrators shall develop a record retention policy regarding their regularly kept and maintained records.
- 3.8. Recommendations prepared pursuant to this Article shall discuss, as appropriate: (1) whether the proposed Riparian Project constitutes a Designated Riparian Project; (2), the amount of Conservation Pool Effluent the proposed Riparian Project requires to fulfill its goals; (3), a schedule for the delivery of Conservation Pool Effluent to the project; (4), the amount of Conservation Pool Effluent that should be allocated to the project.

- 3.9. The CEP Administrators shall confer as necessary and, within thirty days, jointly:
- 3.9.1. Determine whether a proposed Riparian Project qualifies as a Designated Riparian Project, an ESA Riparian Project, or does not qualify for an allocation of Conservation Pool Effluent; in cases where the CEP Administrators preliminarily determine that project qualifies as a Designated Riparian Project, the Administrators' recommendations shall be forwarded to their respective Governing Bodies for approval within 30 days of the CEP Administrators' conference.
 - 3.9.2. Allocate a determined amount of Conservation Pool Effluent to Riparian Projects;
 - 3.9.3. Reapportion Conservation Pool Effluent among Riparian Projects, should the total quantity of Conservation Pool Effluent be insufficient to meet the demand;
 - 3.9.4. Refuse to approve any proposed Designated Riparian Project if all Conservation Pool Effluent has been apportioned to Riparian Projects;
 - 3.9.5. Increase, decrease, or eliminate the amount of Conservation Pool Effluent a Riparian Project receives through allocation or apportionment.
 - 3.9.6. If the CEP Administrators and their respective Governing Bodies fail to reach agreement on an application for a Designated Riparian Project within 75 days, said application shall be considered to have been denied unless the Operator agrees to extend the time for a decision.

Article IV: Request for Conservation Pool Effluent

- 4.1 An Operator of a proposed Riparian Project requesting Conservation Pool Effluent shall file two written copies and two electronic copies of a request for Conservation Pool Effluent with the CEP Administrators. Along with contact information, the Operator shall include in the request the following information:
- 4.1.1 a description of the proposed Riparian Project specifying its location, goals, and the type of vegetation or wildlife the project will support, including the location and water demands of any Critical Vegetation or other habitat features as distinct from aquifer recharge or recreational uses of water;
 - 4.1.2 an initial characterization of the Project as either a Designated Riparian Project or an ESA Riparian Project. For all initial ESA Riparian Project characterizations, the Operator shall include all notifications and any issued permits from the United States Fish and Wildlife Service concerning the proposed Riparian Project for purposes of permitting under the Act;
 - 4.1.3 the proposed schedule the Operator will follow in developing and maintaining the proposed Riparian Project;
 - 4.1.4 the funding source the Operator will use to develop and maintain the proposed Riparian Project;

- 4.1.5 the total quantity of Effluent requested to accomplish the Operator's goals in developing and maintaining the proposed Riparian Project, including any anticipated change that will occur in the Effluent demand;
 - 4.1.6 whether the proposed Riparian Project requires Effluent or Reclaimed Water and the means by which that water resource will be measured and delivered to the project;
 - 4.1.7 the Operator's proposed ten-year schedule for accepting Conservation Pool Effluent at the proposed Riparian Project;
 - 4.1.8 the amount of perennial, intermittent, or ephemeral surface or subsurface water already available at the site of the proposed Riparian Project and the amount of water from those sources that the Operator plans to use to support the proposed project.
- 4.2 For a project that is either characterized by the Operator as a Designated Project or proposed by the CEP Administrators to be considered as a Designated Project, the CEP Administrators shall determine whether the proposed project constitutes a Designated Riparian Project. For a project that is characterized by the Operator as an ESA Riparian Project, the CEP Administrators shall approve the project as an ESA Riparian Project if it has been permitted pursuant to the Act, or in the discretion of the Administrators, has a reasonable presumption of obtaining such a permit in the future.
- 4.3 An Operator may file with the CEP Administrators two written copies and two electronic copies of a supplemental request for Conservation Pool Effluent for any approved or proposed Riparian Project if:
- 4.3.1 After the CEP Administrators' latest determination, the Operator or applicant receives notice from the United States Fish and Wildlife Service that the Secretary has approved a Section 10 or Section 7 plan incorporating the project; or
 - 4.3.2 More than one year has passed since the CEP Administrators' most recent determination concerning the project. If the supplemental request is from the Operator of a Riparian Project, the Operator must show that:
 - 4.3.2.1 a material increase in water demand is required to augment or expand the Riparian Project; or
 - 4.3.2.2 the amount of Conservation Effluent Pool allocated or apportioned to the project is insufficient to meet the project's goals.
- 4.4 In response to an apportionment need or a supplemental request for Conservation Pool Effluent, the CEP Administrators shall determine the amount and the delivery schedule of Conservation Pool Effluent that each Riparian Project requires to accomplish its goals.
- 4.5 No delivery schedule for accepting Conservation Pool Effluent shall be approved that allows a Riparian Project to take delivery of more than 12.5% of its annual allocation of Conservation Pool Effluent in any thirty-day period between April 1 and October 15 of any calendar year, except that, within one year of the date it first accepts Conservation

Pool Effluent, a Riparian Project may take delivery of up to 20% of its annual allocation of Conservation Pool Effluent in any thirty-day period.

- 4.6 With the exception of the City, the District, and the County, no Operator may receive more Conservation Pool Effluent, in the aggregate, for its riparian projects than the total amount of wastewater discharged to County wastewater reclamation facilities by users served by said Operator.

Article V: Conservation Pool Effluent Allocation and Apportionment; Quantity of Effluent Contributed to Conservation Effluent Pool

- 5.1 The parties established the priority of Effluent allocation in § 5.1.2 of the Supplemental IGA and nothing in this Agreement shall be construed as modifying that prioritization.
- 5.2 Each allocation of Conservation Pool Effluent to a Riparian Project is subject to reduction in the future as set forth in this Agreement and in Section V of the Supplemental IGA, including an Operator's failure to file a complete Annual Report as required in Article VII of this Agreement.
- 5.3 If demand is less than the total amount of Effluent annually contributed to the Conservation Effluent Pool, each Designated Riparian Project shall be allocated the full amount of Conservation Pool Effluent that the CEP Administrators determine is required to accomplish the project's goals.
- 5.4 If demand by Riparian Projects exceeds 90% of the total amount of Conservation Pool Effluent available in any calendar year, the CEP Administrators shall give notice to the Managers and to the Governing Bodies. Within thirty days, CEP Administrators shall meet to consider whether to increase the total quantity of Effluent annually contributed to the Conservation Effluent Pool. Within thirty days of meeting, the CEP Administrators shall forward copies of their recommendation, and the reasons therefore, to the Managers. If the CEP Administrators cannot reconcile their respective recommendations, they shall forward their separate recommendations to the Managers.
- 5.5 The Managers shall confer as necessary and may either jointly or individually issue a recommendation to their respective Governing Bodies regarding the proposed increase in the total quantity of Effluent contributed to the Conservation Effluent Pool.
- 5.6 If the Governing Bodies should decide to approve an increase in the amount of Effluent in the Conservation Effluent Pool by different amounts, the amount of Effluent in the Conservation Effluent Pool shall be increased by the lower amount while the Governing Bodies determine whether to reconcile their determinations.
- 5.7 A Governing Body may decline to increase the amount of Effluent in the Conservation Effluent Pool.
- 5.8 If any Governing Body declines to increase the quantity of contributed Conservation Pool Effluent, the CEP Administrators shall, within 90 days, give notice to the operators of each Riparian Project, investigate the condition of each Riparian Project and the amount of water, including Effluent and Conservation Pool Effluent, being used by the project, ,

and determine whether, and if so a manner in which to apportion the allocation of any Riparian Project and adjust Riparian Projects' acceptance schedule of Conservation Pool Effluent, as appropriate.

- 5.9 The CEP Administrators may apportion the Conservation Pool Effluent between all Riparian Projects as provided in this Agreement.
- 5.10 The CEP Administrators may decrease the allocation of Conservation Pool Effluent to any Riparian Project by up to:
 - 5.9.1 the amount of Conservation Pool Effluent a Riparian Project failed to utilize within the preceding twelve months according to the Riparian Project's acceptance schedule; and
 - 5.9.2 the amount of Conservation Pool Effluent the Operator stored underground during the preceding twelve-month period and failed to recover for on-site use.
- 5.10 If the CEP Administrators have made apportionments to the allocation of Conservation Pool Effluent to Riparian Projects and demand continues to exceed the total amount Conservation Pool Effluent, the CEP Administrators shall use the following principles to apportion the allocation of Conservation Pool Effluent to Riparian Projects:
 - 5.10.1 Unless all CEP Effluent is being used to establish Critical Vegetation at ESA Riparian Projects, the allocation of an ESA Riparian Project that uses Conservation Pool Effluent for unestablished Critical Vegetation shall not be decreased until the Administrators determine that the Critical Vegetation is established.
 - 5.10.2 The CEP Administrators may decrease the amount of Conservation Pool Effluent allocated within any twelve-month period to any Designated Riparian Project by up to 40% of the Riparian Project's maximum Conservation Pool Effluent usage.

Article VI: Receipt of Conservation Pool Effluent

- 6.1 No ESA Riparian Project shall receive delivery of CEP water before the issuance of the relevant permits from the United States Fish and Wildlife Service.
- 6.2 Any Riparian Project may receive allocated Conservation Pool Effluent from a County secondary wastewater treatment facility at no charge by the City to the Operator as provided in section 5.2 of the Supplemental IGA.
- 6.3 The Operator shall take delivery of the Conservation Pool Effluent from the wastewater treatment facility, other than Randolph Park Water Reclamation Facility, from which a delivery system may be most economically designed and constructed and that, under the priorities of subsections 5.1.2 and 9.1.2 of the Supplemental IGA, discharges a sufficient amount of Effluent, on a daily proportional flow, to meet the Riparian Project's delivery schedule. Provided, however, that such delivery of Conservation Effluent Pool will not interfere with any Water Provider's use of its Effluent, including the operation of the City's reclaimed water system.
- 6.4 Any Operator of an approved project with a Conservation Effluent Pool allocation may obtain Effluent pursuant to the terms of subsection 5.2.2 of the Supplemental IGA.

- 6.5 Each Operator of a Riparian Project shall file three copies of an Annual Report with the CEP Administrators by April 30 of each year. The Annual Report shall include the status of the Operator's Riparian Project, scope of project activities the Operator plans to carry out in the following calendar year, any changes to the Riparian Project's water consumption that occurred during the calendar year, any change to the water consumption the Operator anticipates to occur within the following year, any report the operator made to the Arizona Department of Water Resources regarding water recharged, stored, or recovered at the Riparian Project, and an update of any changes in status to the Operator's permits for its projects.
- 6.6 The Operator shall, through every fifth Annual Report, update its projected ten-year schedule for accepting Conservation Pool Effluent at the Riparian Project.
- 6.7 The Governing Bodies may forfeit all or part of an Operator's Conservation Effluent Pool allocation for failure to file the Annual Report.
- 6.8 An allocation of Conservation Pool Effluent to the Operator of a Riparian Project does not require the Operator to take delivery of any Conservation Pool Effluent, nor does it ensure that the Effluent will be available to the Operator in subsequent calendar years.

Article VII: Secondary Effluent Distribution Facilities Pool Effluent to a Riparian Project, the Operator is responsible for their construction.

- 7.1 If facilities are required to deliver Conservation Pool Effluent to a Riparian Project, the Operator is responsible for their construction.
- 7.2 The Operator shall be responsible for designing, constructing, and financing the costs of necessary capital improvement, including paying all required permitting and inspection fees.
- 7.3 Delivery of Reclaimed Water using the delivery system of any reclaimed water provider is subject to the rules and delivery capacity of that reclaimed water provider and to Section V of the Supplemental IGA; this Agreement does not constitute a commitment of either party to deliver allocated Conservation Pool Effluent except at the outfall of the wastewater treatment plant as described in Article 6 of this Agreement.

Article VIII. Miscellaneous Terms

- 8.1 Term. The term of this Agreement shall continue concurrently with the Supplement IGA and shall be subject to termination by either party or its successors or assigns upon one year's prior written notice and based only upon the material breach of the provisions of this Agreement or the Supplemental IGA, or upon adoption of incompatible amendments to, or the termination of, the Supplemental IGA.
- 8.2 Mutual Indemnification. To the fullest extent permitted by law, each party agrees to defend, indemnify, and hold harmless the other party and the other party's officer, agents, and employees from all claims, losses, injury, damage, and causes of action arising out of, resulting from, or in any manner connected with this Conservation Effluent Pool

Agreement, but only to the extent such claim, loss, injury, damage, or cause of action is caused or contributed to by the negligent acts of the indemnifying party.

- 8.3 **Applicable Laws.** County and City shall comply with all federal, state and local laws, rules, regulations, standards, and Executive Orders, without limitation to those designated within this Conservation Effluent Pool Agreement. The laws and regulations of the State of Arizona shall govern the rights of the parties, the performance of this Conservation Effluent Pool Agreement and any disputes arising hereunder. Any action relating to this Conservation Effluent Pool Agreement shall be brought in an Arizona court in Pima County. Any changes in the governing laws, rules, and regulations during the terms of this Conservation Effluent Pool Agreement shall apply but do not require an amendment.
- 8.4 **Non-Discrimination.** Neither Party shall discriminate against any of the Parties' employees, clients, or any other individual in any way because of that person's age, creed, color, religion, sex, disability, or national origin in the course of carrying out the Party's duties pursuant to this Conservation Effluent Pool Agreement. The Parties shall comply with the provisions of Executive Order 75-5, as amended by Executive Order 99-4, which Executive Orders are incorporated into this Agreement by this reference as if set forth in full herein.
- 8.5 **ADA.** County and City shall comply with all applicable provisions of the Americans with Disabilities Act (Public Law 101-336, 42 U.S.C. §§ 12101-12213) and all applicable federal regulations under the Act, including 28 CFR Parts 35 and 36.
- 8.6 **Severability.** If any provision of this Agreement is held to be invalid or unenforceable, the remaining provisions shall continue to be valid and enforceable to the fullest extent permitted by law.
- 8.7 **Conflict of Interest.** This contract is subject to cancellation for conflict of interest pursuant to A.R.S. § 38-511, the pertinent provisions of which are incorporated herein by this reference.
- 8.8 **Non-Appropriation.** Notwithstanding any other provision in this Conservation Effluent Pool Agreement, this Agreement may be terminated if for any reason either the Tucson City Council or the Pima County Board of Supervisors does not appropriate sufficient monies for the purpose of maintaining this Agreement.
- 8.9 **Worker's Compensation.** Each party shall comply with the notice of A.R.S. § 23-1022(E). For purposes of A.R.S. § 23-1022, each party shall be considered the primary employer of all personnel currently or hereafter employed by that party, irrespective of the operations of protocol in place, and said party shall have the sole responsibility for the payment of Worker's Compensation benefits or other fringe benefits of its employees.
- 8.10 **Force Majeure.** In the event any Party is rendered unable, wholly or in part, by force majeure reasons to carry out its obligations under this Agreement, the obligations of both the County and the City so far as they are affected by such force majeure shall be suspended during the continuance of any inability so caused, but for no longer period. Such cause shall be so far as possible remedied with the best efforts of the disabled Party and with all reasonable dispatch. The term "force majeure" as employed in this

Agreement shall mean acts of God, strikes, lockouts or other industrial or labor disturbances, acts of the public enemy, wars, terrorism, blockades, insurrections, riots, epidemics, land slides, lightning, earthquakes, fires, storms, floods, washouts, droughts, unavoidable interruptions in electric power to drive pumps, interruptions by government not due to the fault of the Parties, including injunctions, civil disturbances, explosions, well collapses, breakage or accident to machinery or transmission facilities, or action or non-action by governmental bodies in approving or failing to act upon applications for approvals or permits which are not due to the negligence or willful action of the Parties. Nothing herein contained shall be construed as requiring either Party to settle a strike or labor dispute against its will. Nothing herein shall prohibit either Party at its own expense from using whatever self-help remedies may be available to it.

- 8.11 Notice. Notice to the Governing Bodies shall be delivered by personal delivery and addressed as follows:

City of Tucson:

City Clerk
255 W Alameda
Tucson AZ 85701

Pima County:

Clerk of the Board of Supervisors
130 W Congress, 5th Floor.
Tucson AZ 85701

Notice to the Parties shall be delivered by certified mail, return receipt requested, or shall be delivered by personal delivery, including by facsimile with electronic receipt. Notices shall be addressed to the parties as follows:

City of Tucson:

Director
Tucson Water Department
P.O. Box 27210
Tucson AZ 85726

Pima County:

Director
Regional Wastewater Reclamation Dept.
201 N Stone
Tucson AZ 85701

With a Copy to:

City Attorney
City of Tucson
P.O. Box 27210
Tucson AZ 85726


With a Copy to:

County Attorney's Office, Civil Div.
32 N Stone, 21st Flr.
Tucson AZ 85701

- 8.12 Entire Agreement. This document constitutes the entire agreement between the parties pertaining to the subject matter hereof, and all prior or contemporaneous agreements and understandings, oral or written, are hereby superseded and merged herein. This Agreement may be modified, amended, altered, or extended only by a written amendment signed by the parties.

IN WITNESS WHEREOF, the County has caused this Intergovernmental Agreement to be executed by the Chair of its Board of Supervisors, upon resolution of the Board and attested to by the Clerk of the Board, and the City of Tucson has caused this Intergovernmental Agreement to be executed by the Mayor, upon resolution of the Mayor and Council, and attested to by the City Clerk.

CITY OF TUCSON


Robert E. Walkup, Mayor

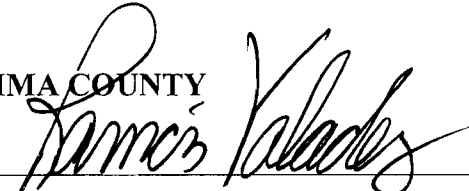
Date: January 25, 2011

ATTEST:


Roger Randolph
City Clerk

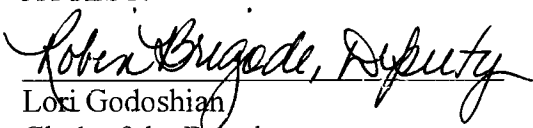
Date: January 25, 2011

PIMA COUNTY


Ramon Valadez, Chairman
Board of Supervisors

DEC 14 2010

ATTEST:



Lori Godoshian
Clerk of the Board

Date: DEC 14 2010

APPROVED AS TO CONTENT:


Jeff Biggs

City of Tucson
Director of Tucson Water


Michael Gritzuk

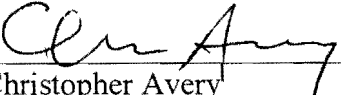
Pima County
Director of Regional Wastewater
Reclamation Department

APPROVED AS TO FORM

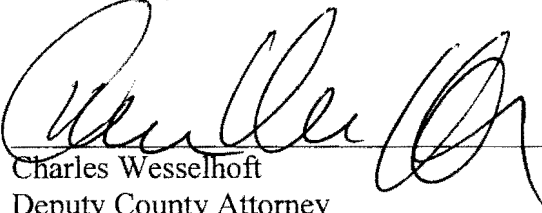
The foregoing Intergovernmental Agreement between Pima County and the City of Tucson has been reviewed pursuant to A.R.S. §11-952 by the undersigned, who have determined that it is in the proper form and is within the powers and authority granted under the laws of the State of Arizona to those parties to the Intergovernmental Agreement represented by the undersigned.

City of Tucson

Pima County



Christopher Avery
Principal Assistant City Attorney



Charles Wesselhoft
Deputy County Attorney

RESOLUTION NO. 2010 - 302

**RESOLUTION OF THE PIMA COUNTY BOARD OF
SUPERVISORS APPROVING AND AUTHORIZING
THE EXECUTION OF AN INTERGOVERNMENTAL
AGREEMENT BETWEEN PIMA COUNTY AND
THE CITY OF TUCSON
FOR THE CREATION AND OPERATION OF
THE CONSERVATION EFFLUENT POOL**

WHEREAS, Pima County (the “County”) and the City of Tucson (“City”) wish to enter into a cooperative agreement to define provisions for the use and allocation of effluent and reclaimed water for restoration of riparian habitat; and

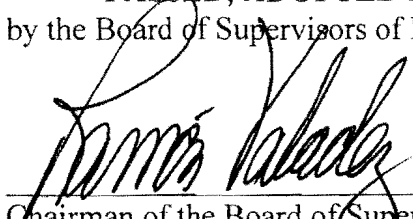
WHEREAS, it is necessary for the parties to establish an intergovernmental agreement in order to carry out the intent of the parties and define the roles and responsibilities regarding the intended cooperative effort;

NOW, THEREFORE, UPON MOTION DULY MADE, SECONDED AND CARRIED, BE IT RESOLVED THAT:

1. The intergovernmental agreement between Pima County and the City of Tucson for the establishment and maintenance of the City/County Conservation Effluent Pool is hereby approved.
2. The Chairman of the Board is hereby authorized and directed to sign the intergovernmental agreement for the Pima County Board of Supervisors.
3. The various officers and employees of Pima County are hereby authorized and directed to perform all acts necessary and desirable to give effect to this Resolution.

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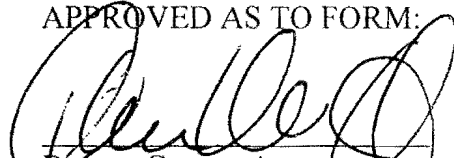
PASSED, ADOPTED AND APPROVED this 14th day of Dec., 2010
by the Board of Supervisors of Pima County.


Chairman of the Board of Supervisors
DEC 14 2010

ATTEST:


Clerk of the Board of Supervisors

APPROVED AS TO FORM:


Deputy County Attorney
CHARLES WESSELHOFT

ATTACHMENT 2

Conservation Effluent Pool User Application for the Santa Cruz River Heritage Project

Date: 03/24/2021

Contact Information

<u>Name of Operator:</u> City of Tucson	Phone #: 520-837-2088
<u>Address:</u> 310 W. Alameda St. P.O. Box 27210 Tucson, AZ 85726	
<u>Point of Contact:</u> John Kmiec, Tucson Water Deputy Director	

Is this project a: Designated Riparian Project

Describe the amount of perennial, intermittent, or ephemeral surface or subsurface water already available at the site of the proposed Riparian Project and the amount of water from those sources that the Operator plans to use to support the proposed project.

The proposed Riparian Project is the Santa Cruz River Heritage Project, which began operations in June 2019.

The Santa Cruz River (SCR) is an ephemeral river that runs north through downtown Tucson. No longer a perennial river, due to decades of intense ground water pumping, the SCR only flows in the Tucson downtown area after heavy rain events, usually during monsoon season (June - September). These heavy rains bring large amounts of water peaking in 2018 just below 6,000 cubic feet per second (Figure 1). Ephemeral flows support some minimal vegetation areas within the Santa Cruz but are insufficient to support riparian habitats.

Tucson Water began discharging Class A reclaimed water from the Tucson Water Reclaimed Water System in June 2019 to support newly established areas of aquatic and riparian habitat in the project area. The maximum flow rate of reclaimed water available is 1,950 gpm.

Figure 2 is an aerial photo of the project area taken prior to commencement of reclaimed water discharge. Figure 3 is an artist's rendering of the project area shortly after commencement of reclaimed water discharge. Figure 4 is an artist's rendering of the project area after 10 years of reclaimed water discharges.

Describe whether the proposed Riparian Project requires Effluent or Reclaimed Water and the means by which that water resource will be measured and delivered to the project.

The Riparian Project will require reclaimed water delivered via the existing Tucson Water Reclaimed Water System. Tucson Water is supplementing the SCR flow from 29th St. to Congress St. for a distance of 1.57 miles (Figure 5) with a maximum of 3,150 AF/YR of Class A reclaimed water (maximum flow rate of 1,950 gpm).

The intent of this project is to safely and effectively deliver reclaimed water directly into the SCR through a control valve and metering station that dechlorinates the water prior to its release. Water from the Tucson Water Reclaimed Water System will be measured utilizing a magnetic flow meter at a control valve station prior to discharging to the river. Operation and management of the Riparian Project will be conducted by Tucson Water staff.

Describe the Operator's 10-year schedule for accepting Conservation Pool Effluent at the proposed Riparian Project.

Tucson Water is requesting that a maximum of 110 AF/YR of effluent from the Conservation Effluent Pool (CEP) be assigned to cover the evapotranspiration of the Riparian Project.

Year 1

Operations began as of June 24, 2019. From commencement of operations through December 31, 2019 Tucson Water calculated project evapotranspiration usage was 52 AF. This is the volume of CEP Tucson Water requests retroactively for year 1.

Years 2-10

Future requests will be based on annual vegetation surveys and open water evaporation losses calculated using the Cooley Method. Annual CEP requests will be made by January 31st of the following year.

It is expected that the Riparian Project will operate continuously except:

1. If reclaimed water supply is not available during summer peak demand for reclaimed water;
2. When the de minimis discharge location is in use (Cross Cut Road Discharge Facility APP # P-103225);
3. When maintenance is required in the river channel.

Provide a general description of the proposed Riparian Project, specifying its location, goals, and the type of vegetation or wildlife the project will support. Include the location (pdf map requested) and CEP water demands of any Critical Vegetation or other habitat features as distinct from aquifer recharge or recreational uses of water.

Location:

The Riparian Project will span a 1.57 mile stretch of the SCR from 29th Street/Silverlake Road to Congress St. The outfall location is located approximately ¼ mile north of Silverlake Road along the SCR. The address associated with this parcel location is 1580 South Santa Cruz Lane, Tucson, AZ 85713. The site lies within the NW 1/4 of Section 23, T14S, R13E. The general project location is shown in Figure 5. The treatment facility and outfall location are within a 5-acre parcel owned by Tucson Water that includes undeveloped land, a Tucson Water well site, and underground potable water piping located on the eastern side of the SCR.

Goals:

The Riparian Project goals are to provide critical habitat for wildlife and native vegetation, while creating an attractive downtown water feature to enhance quality of life for residents and visitors. This public amenity will also encourage economic development and support cultural and historical preservation while making efficient use of available water resources.

Adding a perennial stream to an otherwise dry riverbed has already created a preservation area that provides a sanctuary for wildlife as shown in Figures 6 and 7. The photos demonstrate a remarkable transformation of the riverbed after just a few months of reclaimed water discharges. This new riparian habitat is visible from the Pima County “Loop” bike path.

Type of vegetation or wildlife:

The addition of water in the SCR will facilitate riparian restoration. Although the water itself creates a nexus for riparian restoration, appropriate restoration management is also necessary. Unmanaged growth of certain types of vegetation (e.g. non-native species) in the SCR can result in adverse impacts to the hydraulic capacity of the river, as well as threaten the viability of structures such as bridges that cross the river. Tucson Water has hired the ecology and environmental firm Harris Environmental to survey vegetation, determine a native plant species palette, and create a maintenance plan for long-term vegetation monitoring and control. Additionally, Tucson Water is working with the Pima County Regional Flood Control District (PCRFD) as well as other stakeholders to assist in providing an environment conducive to riparian restoration throughout the life of the project.

The baseline vegetation survey conducted in June 2018 by Harris Environmental before the Riparian Project started operating showed relatively low plant diversity and high non-native cover. It is anticipated that the water release and follow up re-vegetation efforts will increase plant diversity and native cover which will be documented with annual vegetation surveys as required by the maintenance plan.

Since commencement of the project in June 2019, the area around the project outfall has seen a significant improvement in riparian habitat. In addition, the distribution of a local native seed mix and seed collected from native plants of interest downstream of Pima County's Agua Nueva Water Reclamation Facility has diversified the existing plant cover. Initial seeding was completed between July 2020 through August 2020 along a 1.4 mile stretch from the Riparian Project Outfall in 10-foot swatches on both sides of the channel (wetted banks) and covered about 3.5 acres of seeding. The total ecological area supported by the Riparian Project flow is equal to 34 acres of riparian and aquatic habitat that supports native fish and wildlife (Figure 5).

The 2020 pre-monsoon vegetation survey provided by Harris Environmental is shown in Appendix A. This survey demonstrates the progress made in increasing riparian habitat and plant diversity since the baseline survey was completed. After the 2020 pre-monsoon vegetation survey was completed, PCRFCFCD performed channel sediment removal within the boundaries of the Riparian Project. The sediment removal project completed by PCRFCFCD required removal of 85,000 cubic feet of sediment from the SCR between Silverlake Rd. and Cushing Street.

It is estimated that approximately 25% of the vegetation remains following the sediment removal project. Although this stretch of the SCR will be closely managed according to flood control standards, the wildlife and vegetation results are expected to attain comparable results to other similar in-channel projects along the SCR. These two projects are called the Santa Cruz River Managed Underground Storage Facility and the Lower Santa Cruz River Managed Project. At these downstream sites, the release of effluent to the SCR from the Agua Nueva and Tres Rios Water Reclamation Facilities has created an environment that supports mature trees and vegetation, birds, fish, and invertebrates.

Current surveys and studies of the river completed by University of Arizona biologist Michael Bogan show the following findings of wildlife and vegetation in the Riparian Project reach:

- At least 151 unique bird species, including wading birds such as green herons, great egrets, killdeer, and spotted sandpipers
- Amphibians, reptiles, and fish –
 - Checkered garter snake, Sonoran Desert toad, Great Plains toad, and Red-Spotted toad (all native species); American bullfrog (non-native species); and the endangered Gila topminnow
- At least 90 species of aquatic invertebrates–
 - dragonflies and damselflies, caddisflies, mayflies, true flies, snails, and water beetles
- Riparian Vegetation –
 - Cattails, Nutsedges, Duckweed, Speedwell, Mesquite, Palo Verde, Desert Broom, Tamarisk (non-native species)

Tucson Water has established a partnership with Arizona Fish and Wildlife, Arizona Game and Fish, and the University of Arizona to monitor the aquatic wildlife in the channel. Other partners such as the Sonoran Institute and the Audubon Society have high interest in the area and are conducting their own surveys of wildlife and bird species.

Anticipated CEP water demands are discussed in the next section.

What is the total quantity and annual amount (in acre feet) of Effluent requested to accomplish the Operator's goals in the developing and maintaining the proposed Riparian Project, including any anticipated change that will occur in Effluent demand.

Tucson Water is requesting up to 110 AF/YR of effluent from the CEP to support the riparian project goals. The amount requested annually will vary due to operational and maintenance constraints and vegetation growth.

At this time, it is uncertain how the project will evolve. Year one was a special case which will be described below. In years 2 – 10 annual vegetation surveys will be performed to monitor vegetation growth; the estimated evapotranspiration rate will change based on type and density of the vegetation. Each year Tucson Water will request a volume of water from the CEP based on evapotranspiration estimates quantified from vegetation transects, open water area, and ariel photography analysis.

A method to quantify evaporation on an annual basis has been established. The vegetation density and open water area are calculated from a georeferenced ariel photograph generated from an annual drone aircraft flyover. The annual image file is uploaded into a geographic information system (GIS) as a layer, which is used to delineated vegetation and open water areas with polygons. The consultant matches the polygons to the referenced pre-monsoon inventory survey, which identified location of vegetation types from mapping transects. Referenced average evapotranspiration rates for each plant class is multiplied by the delineated vegetative area to calculate volume. The open water polygon area is utilized to calculate volume of evaporation using the Cooley Method. Due to a lack of information this method was not used to estimate evapotranspiration for 2019. Instead, 110 AF was prorated over the time the project was operating (172 days) for a total of 52 AF.

Table 1 illustrates the 2020 initial water budget and the associated evapotranspiration rates for the Riparian Project using the method described above. Referenced average evapotranspiration rates utilized for each plant class are footnoted in Table 1. These ET rates are average rates taken from the referenced studies listed in Table 1. and will remain constant.

Table 1. 2020 Conservation Effluent Pool Water Budget

Species	Evaporation Rate (ft/yr)	* Evapotranspiration (ft/yr)	** Vegetation Area (ft ²)	Annual Evaporation (AF/Y)
Grass	0	0.98	57,434.72	1.30
Trees	0	1.97	68,653.93	3.10
Shrubs	0	2.62	20,720.63	1.25
Cattails/Wetlands Plants	0	8.61	12,698.42	2.51
Total Phreatophytes		14.19	159,507.69	8.16
Open Water	5.6 - 7.1	0	139,085	18 - 23
Potential Min Annual Evap Rate				26.16 AF/Y
Potential Max Annual Evap Rate				31.16 AF/Y

Note: * Evapotranspiration rates based on reference:

United States, Congress, Geological Survey, et al. *Studies of Consumptive Use Of Water by Phreatophytes And Hydrophytes Near Yuma, Arizona*, United States Government Printing Office, 1968.

Williams, David G, and Russell L Scott. *Vegetation-Hydrology Interactions, Dynamics of Riparian Plant Water Use*. Southwest Watershed Research Center, USDA-Agriculture Research Service, 15 Apr. 2009.

** Vegetation area from 2020 post monsoon vegetation survey and post sediment removal plant survey

Please note that in May 2020, PCRFCFCD performed sediment removal from the reach of the SCR channel where the Riparian Project operates. Based on the 2020 post monsoon survey, Harris Environmental estimated 75% of vegetation was removed during the sediment removal operation.

Please describe the design and construction schedule the Operator will follow in developing the proposed Riparian Project.

The intent of this project is to safely and effectively deliver reclaimed water directly into the SCR through a valve control station that dechlorinates the water prior to its release. This water will support the designated Riparian Project and environmental restoration. The area around the outfall is lined with rip rap to reduce the velocity of flow and to encourage growth of cattail. A consultant will monitor and advise on the vegetation of the Riparian Project throughout the life of the project. The project comprises 34 acres of the SCR channel (Figure 5). The most recent vegetation survey report provided by the hired consultant (conducted pre-sediment removal) is provided in Appendix A.

General riparian restoration schedule is as follows:

2018 Post-Monsoon Plant Survey – November 2018

Construction Start - January 2019

River Water Release Dedication – June 24, 2019

2019 Post-Monsoon Plant Survey – November 2019

Seeding and Planting – July 2020 through August 2020

2020 Pre-Monsoon Plant Survey – June through July 2020

2020 Post-Monsoon Plant Survey – October 2020

Stocking of Gila Topminnow – October 26, 2020

January 2021 – 2029 – Submit Annual Report with CEP request

2021 – 2029 Pre-Monsoon Plant Survey – June through July 2021

2021 – 2029 Post-Monsoon Plant Survey – October 2021

2021 – 2029 – Riparian Project annual inspections

Schedule has been dependent on PCRFCFCD maintenance activities, seasonal rains, and the success of seeding and planting of wetlands plants. The consultant has supported active and passive re-vegetation and distributed 75 lbs. of a customized native seed mix and selected wetland plants from local vendors along the Riparian Project reach. At this time, there are no additional plans to seed or plant but instead to let the natural vegetation growth occur. On October 26, 2020 the Arizona Game and Fish Department and the U.S.

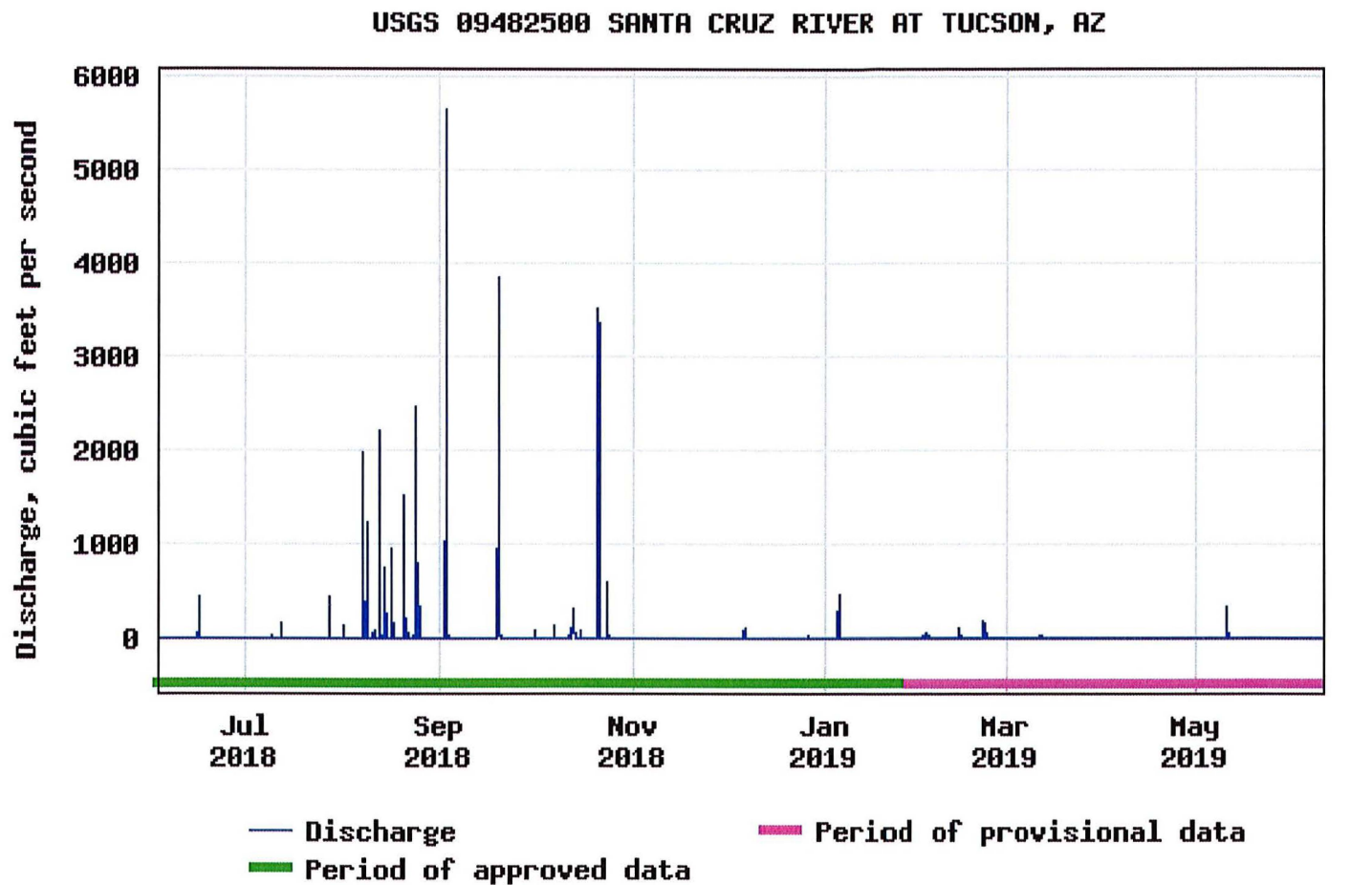
Fish and Wildlife Service released 500 Gila Topminnow into the Riparian Project reach. The flow and open water are crucial elements to maintaining the vegetation and wildlife in the area. The amount of vegetation will be impacted by several factors including natural forces such as floods. Evapotranspiration is requested from the CEP to assist with maintaining the riparian and aquatic habitat along the entire reach of the project.

Please describe the funding source(s) the Operator will use to develop and maintain the proposed Riparian Project.

Water fees will provide sufficient financial capability to meet the estimated costs for construction, operation, maintenance, closure, and post closure of the Riparian Project

Figures

Figure 1



Graph courtesy of the U.S. Geological Survey

Figure 2

Aerial – Prior to start of Heritage Project



Figure 3

Current render of Heritage Project



Figure 4

A Projection – 10 years after start of Heritage Project



Figure 5 – Riparian Project Area



Figure 6 - Riparian Outfall June 2020



Figure 7 - Riparian Outfall October 2020



Appendix A

2020 Pre-Monsoon Vegetation Survey



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Project Background

Harris Environmental has documented changes in vegetation assemblage and structure within the Heritage Project area (i.e., between 29th St/Silverlake Rd and Cushing St) of the Santa Cruz River (SCR) during pre- and post-monsoon periods since 2018. The primary goal of this work is to provide insight into the vegetation changes that occur within the Heritage Project area, which may be influenced by various conditions such as water flow, flood control measures, re-seeding, and general ecological changes over time. The SCR provides riparian habitat for numerous flora and fauna, and perennial water flow along the Heritage Project area contributes to this important habitat type in the arid desert. Harris Environmental has been involved in ongoing discussions with City of Tucson Water (COT) and Pima County about Heritage Project activities, wildlife salvage, and vegetation management in this area. This report summarizes our findings from the annual pre-monsoon vegetation inventory survey for 2020.

The major abiotic changes that have occurred along the Heritage Project reach since our last report, which discussed the status of vegetation after the monsoon in 2019, are the continued discharge of reclaimed water from the outfall just downstream from the 29th St/Silverlake Rd bridge and the extensive removal of sediment for flood control measures. Water flow was introduced in June 2019, and perennial water has thus been present in the channel for over one year (with periodic interruptions for maintenance and sediment removal). One objective of this survey was to assess whether wetland species have taken hold along the wetted reach. Another was to document the vegetation – primarily woody species and bunch grasses – that were eliminated as a result of sediment removal. We provide here an updated plant inventory, vegetation maps, and a summary of how many individuals (woody vegetation) or patches (grasses) of each plant species were removed, with particular attention to the native versus non-native composition of the remaining assemblage.

Introduction

A project-wide plant inventory was conducted over several days between 24 June 2020 and 6 July 2020 to produce a list of all plant species identified prior to the onset of monsoon. The final plant list for all surveys conducted (pre- and post-monsoon 2018-2019 and pre-monsoon 2020) is included as Appendix A. The list includes information on plant status (e.g., native, non-native), type (e.g., herb, cactus, shrub, tree), and life history (e.g., annual, perennial). Species that have been present only since flow was reintroduced (post-monsoon 2019) are listed in bold, those that were present in the pre-monsoon survey in 2019 but not 2020 are listed in gray. All other species



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are listed in un-bolded black font. We have also included a comparison of the counts of woody plants and patches of certain bunch grasses that were inventoried within the SCR channel (i.e., below the level of the soil cement) during the pre-monsoon period in 2019 and 2020 (Appendix B). This is to demonstrate the approximate quantities of each species that either died during the previous year or were eliminated as a result of sediment removal from flood control measures. Note that percentages are approximations based on occurrences of individuals (for woody species) and patches (for grasses and forbs) rather than total percent cover.

Methods

Harris Environmental collected vegetation data using a Global Information System (GIS) framework to develop maps of existing vegetation and current conditions along the project reach. A combination of tablets with aerial imagery and Global Positioning System (GPS) units were used in the field to collect data necessary to map vegetation communities. Vegetation maps were created to depict vegetation within the project area (Appendix C). All large, woody tree species present within the project area (i.e., within the main channel and along the overbank) were documented using a digital georeferenced map. Each map depicts all woody species (e.g., trees and shrubs) and cacti present within the Heritage Project area. Large bunchgrasses (e.g., buffelgrass [*Pennisetum ciliare*] and blue panicum [*Panicum antidotale*]) are also depicted, and patches are represented by a single icon. The maps therefore document the rough location and occurrence of these species but do not quantify their density or extent.

Results

A total of 67 species were identified in the 2020 pre-monsoon inventory survey (compared with 75 in the 2019 pre-monsoon inventory survey), 70% ($n = 47$) of which were native, down from 73% in 2019 (Appendix A). Of the 20 non-native species observed, eight (8) were woody shrubs or trees (compared with seven (7) in 2019), seven (7) were grasses (compared with eight (8) in 2019) (Appendix A). Four (4) were annual herbaceous species, and one (1), red yucca, was a decorative herbaceous perennial. Athel tamarisk (*Tamarix aphylla*) was the most common non-native tree species, though there were approximately 47% fewer individuals in the channel in 2020 than in 2019 (Appendix B). Extensive monoculture mats of buffelgrass, an invasive bunchgrass, remained common, though the number of patches was reduced by 29% since 2019 (Appendix B).

Overall, approximately 54% of the individual trees, shrubs, and patches of bunch grasses that were present in 2019 remained in the channel in 2020 (e.g., 46% died or were eliminated during



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sediment removal) (Appendix B). Of the species reduced by 50% or more, nine (9) were native, and six (6) were non-native. Velvet mesquite (*Prosopis velutina*), a native, non-native athel tamarisk (*Tamarix aphylla*), and Mexican palo verde (*Parkinsonia aculeata*), widely considered naturalized (i.e., an introduced species that has adapted and reproduces successfully in its new environment) were the most abundant tree species within the Heritage Project area in both 2019 and 2020, though their percentages within the channel were reduced by 31%, 53%, and 55%, respectively (Appendix B). Singlewhorl burrobrush (*Hymenoclea monogyra*) was the most common shrub, followed by native desert broom (*Baccharis sarothroides*). However, much of each of these species were eliminated between 2019 and 2020. Less than a quarter (24%) of the singlewhorl burrobrush from 2019 remained in 2020 (Appendix B).

Discussion

Overall species composition was similar to that documented in the 2019 pre-monsoon inventory survey, though the overall number of species was lower ($n = 75$ in 2019, $n = 67$ in 2020) and the percentage of native species was slightly lower (73% in 2019 versus 70% in 2020). Sixteen (16) species were found in the pre-monsoon surveys in 2019 but not in 2020, 12 of which were herbaceous, forbs, or grasses that may have been eliminated during sediment removal. Surveys in 2021 may reveal whether these species will return, though it is not unusual for fluctuations in species composition to occur from year to year. This is particularly true along a waterway, where seasonal flooding, variation in water availability, and environmental stochasticity are high.

Of the eight (8) species that were found in the 2020 pre-monsoon survey that were not present in the 2019 pre-monsoon survey, two (2) had not been documented before (Chinaberry tree [*Melia azedarach*], a non-native tree, and yerba mansa [*Anemopsis californica*], a native forb). Two wetland species that have persisted since the 2019 post-monsoon survey and have thus benefitted from perennial flow are southern cattail (*Typha domingensis*) and watercress (*Nasturtium officinale*). Several non-native grasses that are known to crowd out other species continue to dominate the channel. The number of patches of buffelgrass, a particularly virulent invasive, was only reduced by 29% (Appendix B). The number of patches of Johnson grass (*Sorghum halepense*) dropped from five (5) in 2019 to two (2) in 2020 (Appendix B). These two grass species thrive in disturbed ground and could easily return with more vigor forming larger monocultures than before. This is true for many non-native species, which tend to be colonizers and therefore may become established more quickly than natives after sediment removal and ground disturbance. Continued vegetation surveys will reveal the assemblage and extent of native and non-native species along the Heritage Project area.



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Appendix A: Santa Cruz River Heritage Project, Pre-monsoon Plant Inventory 2020

***Bolded species** have been present only since the 2019 post-monsoon survey, and **gray species** were present in the pre-monsoon survey in 2019 but not 2020.

Family	Genus species	Common Name	Status	Type	Form	Pre-mon. 2018	Post-mon. 2018	Pre-mon. 2019	Post-mon. 2019	Pre-mon. 2020
Amaranthaceae	<i>Amaranthus spp.</i>	pigweed	native	annual	herb				X	
Anacardiaceae	<i>Pistacia chinensis</i>	Chinese pistache	non-native	perennial	tree	X	X	X	X	X
Anacardiaceae	<i>Rhus lancea</i>	African sumac	non-native	perennial	tree	X	X	X		X
Apiaceae	<i>Conium maculatum</i>	poison hemlock	non-native	biennial	herb	X	X			
Apocynaceae	<i>Sarcostemma cynanchoides</i>	fringed twinevine	native	perennial	herb			X		
Asparagaceae	<i>Agave spp.</i>	agave	native	perennial	shrub	X	X	X		X
Asparagaceae	<i>Hesperaloe parviflora</i>	red yucca	non-native	perennial	herb			X		X
Asteraceae	<i>Ambrosia confertiflora</i>	wealeaf bur ragweed	native	perennial	forb/herb	X		X	X	
Asteraceae	<i>Baccharis salicifolia</i>	seep willow	native	perennial	shrub	X	X	X		
Asteraceae	<i>Baccharis sarothroides</i>	desert broom	native	perennial	shrub	X	X	X	X	X
Asteraceae	<i>Baileya multiradiata</i>	desert marigold	native	perennial	herb	X	X	X	X	X
Asteraceae	<i>Bebbia juncea</i>	sweetbush	native	perennial	shrub				X	
Asteraceae	<i>Centaurea melitensis</i>	Maltese starthistle	non-native	annual	herb			X		X
Asteraceae	<i>Conyza canadensis</i>	Canadian horseweed	native	annual	herb			X	X	
Asteraceae	<i>Encelia farinosa</i>	brittlebush	native	perennial	shrub	X	X	X	X	X
Asteraceae	<i>Helianthus spp.</i>	sunflower	native	annual	herb			X	X	X
Asteraceae	<i>Hymenoclea monogyra</i>	singlewhorl burrobrush	native	perennial	shrub	X	X	X	X	X
Asteraceae	<i>Isocoma tenuisecta</i>	burroweed	native	perennial	forb/herb	X	X	X		X
Asteraceae	<i>Laennecia coulteri</i>	Coulter's horseweed	native	annual	forb/herb	X	X	X		X
Asteraceae	<i>Rudbeckia hirta</i>	black-eyed Susan	native	annual	forb/herb				X	
Asteraceae	<i>Taraxacum officinale</i>	common dandelion	non-native	annual	forb/herb				X	
Asteraceae	<i>Thymophylla pentachaeta</i>	five needle pricklyleaf	native	perennial	forb/herb	X		X		
Asteraceae	<i>Verbesina encelioides</i>	golden crownbeard	native	annual	forb/herb	X		X	X	X
Asteraceae	<i>Xanthium strumarium</i>	rough cocklebur	native	annual	herb	X	X	X	X	X
Bignoniaceae	<i>Chilopsis linearis</i>	desert willow	native	perennial	shrub/tree	X	X	X		X



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Family	Genus species	Common Name	Status	Type	Form	Pre-mon. 2018	Post-mon. 2018	Pre-mon. 2019	Post-mon. 2019	Pre-mon. 2020
Boraginaceae	<i>Cordia parvifolia</i>	littleleaf cordia	native	perennial	shrub		X			X
Boraginaceae	<i>Cryptantha spp.</i>	Cryptantha	native	annual	forb/herb			X		X
Boraginaceae	<i>Phacelia spp.</i>	scorpionweed	native	annual	forb/herb		X			X
Brassicaceae	<i>Brassica tournefortii</i>	Sahara mustard	non-native	annual	forb/herb			X		
Brassicaceae	<i>Lepidium spp.</i>	pepperweed	native	annual	herb	X	X	X		X
Brassicaceae	<i>Matthiola longipetala</i>	night-scented stock	non-native	annual	forb/herb		X			
Brassicaceae	<i>Nasturtium officinale</i>	watercress	non-native	annual	herb				X	X
Brassicaceae	<i>Sisymbrium irio</i>	London rocket	non-native	annual	herb			X		X
Cactaceae	<i>Carnegiea gigantea</i>	Saguaro cactus	native	perennial	cactus			X		X
Cactaceae	<i>Cylindropuntia bigelovii</i>	teddybear cholla	native	perennial	cactus			X		X
Cactaceae	<i>Cylindropuntia fulgida</i>	chainfruit/jumping cholla	native	perennial	cactus	X	X	X		X
Cactaceae	<i>Cylindropuntia spinosior</i>	walkingstick cactus	native	perennial	cactus	X	X	X	X	X
Cactaceae	<i>Ferocactus spp.</i>	barrel cactus	native	perennial	cactus					X
Cactaceae	<i>Ferocactus wislizeni</i>	fishhook barrel cactus	native	perennial	cactus	X	X	X	X	X
Cactaceae	<i>Opuntia engelmannii</i>	Engelmann's pricklypear	native	perennial	cactus	X	X	X	X	X
Cactaceae	<i>Opuntia santa-rita</i>	Santa Rita pricklypear	native	perennial	cactus	X	X	X		X
Cannabaceae	<i>Cannabis sativa</i>	hemp	non-native	annual	herb	X				
Capparaceae	<i>Polanisia dodecandra</i>	redwhisker clammyweed	native	annual	herb	X		X		
Chenopodiaceae	<i>Atriplex canescens</i>	fourwing saltbush	native	perennial	shrub	X	X	X	X	X
Chenopodiaceae	<i>Atriplex elegans</i>	wheelscale saltbush	native	perennial	herb	X	X	X	X	
Chenopodiaceae	<i>Chenopodium berlandieri</i>	pitseed goosefoot	native	annual	herb	X	X	X	X	X
Chenopodiaceae	<i>Chenopodium fremontii</i>	Fremont's goosefoot	native	annual	forb/herb	X		X	X	
Chenopodiaceae	<i>Salsola tragus</i>	Russian thistle	non-native	annual	herb	X	X	X	X	X
Cyperaceae	<i>Cyperus spp.</i>	unknown nutsedge	native	annual	sedge		X			
Euphorbiaceae	<i>Chamaesyce hyssopifolia</i>	hyssopleaf sandmat	native	perennial	herb	X				
Euphorbiaceae	<i>Chamaesyce micromera</i>	Sonoran sandmat	native	annual	herb	X	X		X	
Euphorbiaceae	<i>Chamaesyce spp.</i>	sandmat	native	annual	herb	X	X			
Fabaceae	<i>Acacia constricta</i>	white-thorn acacia	native	perennial	shrub	X	X	X	X	X
Fabaceae	<i>Acacia greggii</i>	catclaw acacia	native	perennial	shrub	X	X	X	X	X



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Family	Genus species	Common Name	Status	Type	Form	Pre-mon. 2018	Post-mon. 2018	Pre-mon. 2019	Post-mon. 2019	Pre-mon. 2020
Fabaceae	<i>Acacia salicina</i>	willow acacia	non-native	perennial	tree	X	X		X	
Fabaceae	<i>Astragalus allochrous</i>	halfmoon milkvetch	native	perennial	forb/herb			X		
Fabaceae	<i>Astragalus spp.</i>	milkvetch	native	perennial	herb	X		X		
Fabaceae	<i>Caesalpinia glauca</i>	hog potato	native	perennial	forb/herb		X			
Fabaceae	<i>Parkinsonia aculeata</i>	Mexican paloverde	native	perennial	tree	X	X	X	X	X
Fabaceae	<i>Parkinsonia florida</i>	blue palo verde	native	perennial	tree	X	X	X	X	X
Fabaceae	<i>Prosopis velutina</i>	velvet mesquite	native	perennial	tree	X	X	X	X	X
Fabaceae	<i>Prosopis spp.</i>	exotic mesquite	non-native	perennial	tree	X	X	X	X	X
Fabaceae	<i>Senna artemisioides ssp. filifolia</i>	threadleaf senna	non-native	perennial	shrub			X		X
Fabaceae	<i>Senna covesii</i>	desert senna	native	perennial	herb	X	X	X	X	X
Geraniaceae	<i>Erodium texanum</i>	Texas stork's bill	native	annual	forb/herb		X			
Hydrophyllaceae	<i>Nama hispidum</i>	bristly nama	native	annual	forb/herb	X		X		
Juglandaceae	<i>Juglans major</i>	Arizona walnut	native	perennial	tree		X	X		
Lamiaceae	<i>Teucrium cubense var. dendum</i>	small coastal germander	native	perennial	forb/herb	X	X			
Liliaceae	<i>Dasyllirion wheeleri</i>	common sotol	native	perennial	shrub	X	X	X		X
Liliaceae	<i>Nolina microcarpa</i>	beargrass	native	perennial	shrub	X	X	X		X
Loasaceae	<i>Mentzelia multiflora</i>	Adonis blazing star	native	perennial	herb			X	X	X
Malvaceae	<i>Malva parviflora</i>	cheeseweed mallow	non-native	annual	forb/herb		X			
Malvaceae	<i>Sphaeralcea ambigua</i>	desert globemallow	native	perennial	herb	X	X	X	X	X
Meliaceae	<i>Melia azedarach</i>	Chinaberry tree	non-native	perennial	tree					X
Nyctaginaceae	<i>Boerhavia coccinea</i>	scarlet spiderling	native	perennial	forb/herb	X				
Nyctaginaceae	<i>Boerhavia coulteri</i>	Coulter's spiderling	native	perennial	grass	X				
Poaceae	<i>Aristida purpurea</i>	purple three-awn	native	perennial	grass	X	X	X	X	X
Poaceae	<i>Bothriochloa ischaemum</i>	yellow bluestem	non-native	perennial	grass	X				
Poaceae	<i>Bouteloua aristidoides</i>	needle grama	native	annual	grass				X	X
Poaceae	<i>Chloris virgata</i>	feather finger grass	native	annual	grass				X	
Poaceae	<i>Cynodon dactylon</i>	Bermuda grass	non-native	perennial	grass	X	X	X	X	X



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Family	Genus species	Common Name	Status	Type	Form	Pre-mon. 2018	Post-mon. 2018	Pre-mon. 2019	Post-mon. 2019	Pre-mon. 2020
Poaceae	<i>Dasyochloa pulchella</i>	low woollygrass	native	perennial	grass	X	X	X		X
Poaceae	<i>Digitaria ciliaris</i>	southern crabgrass	non-native	annual	grass		X	X	X	
Poaceae	<i>Echinochloa crus-galli</i>	barnyard grass	non-native	annual	grass		X		X	
Poaceae	<i>Eragrostis echinochloidea</i>	African lovegrass	non-native	perennial	grass	X	X	X	X	X
Poaceae	<i>Eriochloa acuminata</i>	tapertip cupgrass	native	annual	grass		X			
Poaceae	<i>Panicum antidotale</i>	blue panicum	non-native	perennial	grass	X	X	X	X	X
Poaceae	<i>Pennisetum ciliare</i>	buffelgrass	non-native	perennial	grass	X	X	X	X	X
Poaceae	<i>Pennisetum setaceum</i>	fountain grass	non-native	perennial	grass			X	X	X
Poaceae	<i>Schismus barbatus</i>	Mediterranean grass	non-native	annual	grass		X	X	X	X
Poaceae	<i>Sorghum halepense</i>	Johnson grass	non-native	perennial	grass	X	X	X	X	X
Polygonaceae	<i>Eriogonum deflexum</i>	flatcrown buckwheat	native	annual	forb/herb		X	X	X	X
Polygonaceae	<i>Eriogonum spp.</i>	buckwheat	native	annual	herb	X				
Rhamnaceae	<i>Ziziphus obtusifolia</i>	graythorn	native	perennial	shrub			X		X
Salicaceae	<i>Populus fremontii</i>	Fremont cottonwood	native	perennial	tree			X		
Sapindaceae	<i>Sapindus saponaria</i>	western soapberry	native	perennial	shrub/tree	X	X	X		
Saururaceae	<i>Anemopsis californica</i>	yerba mansa	native	perennial	forb/herb					X
Scrophulariaceae	<i>Veronica anagallis-aquatica</i>	water speedwell	native	perennial	herb				X	
Solanaceae	<i>Datura wrightii</i>	sacred datura	native	perennial	herb	X	X	X	X	X
Solanaceae	<i>Nicotiana glauca</i>	tree tobacco	non-native	perennial	shrub/tree	X	X	X	X	X
Solanaceae	<i>Nicotiana obtusifolia</i>	desert tobacco	native	perennial	subshrub	X	X	X	X	X
Solanaceae	<i>Solanum elaeagnifolium</i>	silverleaf nightshade	native	perennial	herb	X	X	X	X	X
Tamaricaceae	<i>Tamarix aphylla</i>	athel tamarisk	non-native	perennial	tree	X	X	X	X	X
Tamaricaceae	<i>Tamarix ramosissima</i>	saltcedar	non-native	perennial	tree	X	X	X	X	X
Typhaceae	<i>Typha domingensis</i>	southern cattail	native	perennial	herb				X	X
Viscaceae	<i>Phoradendron californicum</i>	desert mistletoe	native	perennial	shrub			X	X	X
Zygophyllaceae	<i>Larrea tridentata</i>	creosotebush	native	perennial	shrub	X	X	X	X	X



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**Appendix B: Counts of woody species and patches of bunch grasses below the soil cement
in the Santa Cruz River Heritage Project Area
Pre-Monsoon survey 2020**

* Note that these are counts of occurrences of individuals or patches of each species, not total cover.
Native species are highlighted in gray.

Common Name	Status	Number of Individuals/ Patches Present in 2019	Number of Individuals/ Patches Present in 2020	Number of Individuals/ Patches Gone	Percent Individuals/ Patches Remaining in 2020
African sumac	non-native	2	0	2	0%
fourwing saltbush	native	2	0	2	0%
Fremont cottonwood	native	2	0	2	0%
honey mesquite	native	1	0	1	0%
seep willow	native	2	0	2	0%
willow acacia	non-native	1	0	1	0%
singlewhorl burrobrush	native	86	21	65	24%
blue panicum	non-native	4	1	3	25%
creosotebush	native	3	1	2	33%
exotic mesquite	non-native	3	1	2	33%
Johnson grass	non-native	5	2	3	40%
desert broom	native	35	15	20	43%
Mexican paloverde	native	65	29	36	45%
athel tamarisk	non-native	34	16	18	47%
whitethorn acacia	native	2	1	1	50%
velvet mesquite	native	49	34	15	69%
buffelgrass	non-native	24	17	7	71%
saltcedar	non-native	4	3	1	75%
blue paloverde	native	12	10	2	83%
catclaw acacia	native	7	6	1	86%
desert willow	native	2	2	0	100%
prickly pear cactus	native	1	1	0	100%
Total Individuals/ Patches		347	160	187	54%



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Appendix C: *Maps of Vegetation within Heritage Project Reach Pre-monsoon Plant Inventory 2020

***Includes maps of vegetation removed since the 2019 pre-monsoon survey**

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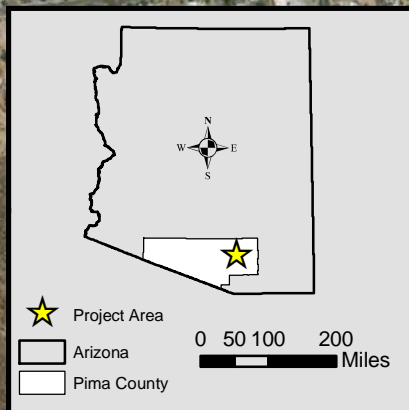
Legend **2020 Pre-Monsoon** **Vegetation Surveys**

Common Name

- velvet mesquite
- blue paloverde
- Mexican paloverde
- athel tamarisk
- saltcedar
- desert willow
- exotic mesquite
- Chinese pistache
- chinaberry tree
- catclaw acacia
- singlewhorl burrobrush
- desert broom
- creosotebush
- fourwing saltbush
- whitethorn acacia
- buffelgrass
- blue panicum
- Johnson grass
- southern cattail
- saguaro cactus
- barrel cactus
- cholla
- prickly pear cactus

— SCR Main Channel

— SCR Streambanks



CUSHING ST.

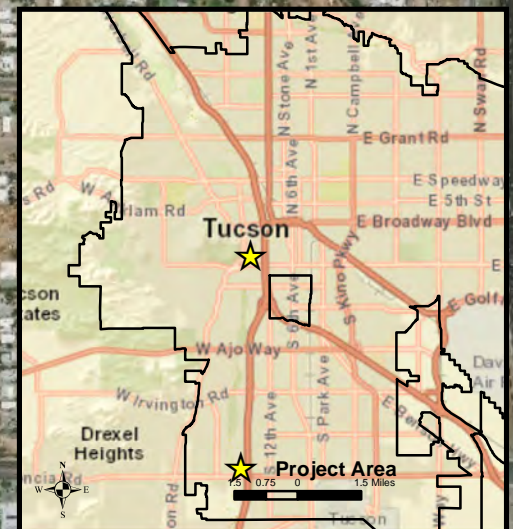
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Sheet 4

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Vegetation Mapping, Pre-monsoon 2020 **Santa Cruz River Heritage Project** **Extent**



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Legend
2020 Pre-Monsoon
Vegetation Surveys

Common Name

- velvet mesquite
- blue paloverde
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- desert willow
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- cholla
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- SCR Main Channel
- SCR Streambanks

Vegetation Mapping, Pre-monsoon 2020
Santa Cruz River Heritage Project
Sheet 1

Legend **2020 Pre-Monsoon** **Vegetation Surveys**

Common Name

- velvet mesquite
- blue paloverde
- Mexican paloverde
- athel tamarisk
- saltcedar
- desert willow
- exotic mesquite
- Chinese pistache
- chinaberry tree
- ★ catclaw acacia
- ★ singlewhorl burrobrush
- ◆ desert broom
- ◆ creosotebush
- ◇ fourwing saltbush
- ◆ whitethorn acacia
- ✱ buffelgrass
- ✱ blue panicum
- ✱ Johnson grass
- ✱ southern cattail
- ★ saguaro cactus
- ★ barrel cactus
- ★ cholla
- ★ prickly pear cactus

— SCR Main Channel

— SCR Streambanks



Vegetation Mapping, Pre-monsoon 2020 **Santa Cruz River Heritage Project** **Sheet 2**

0.065 0.0325 0 0.065 Miles

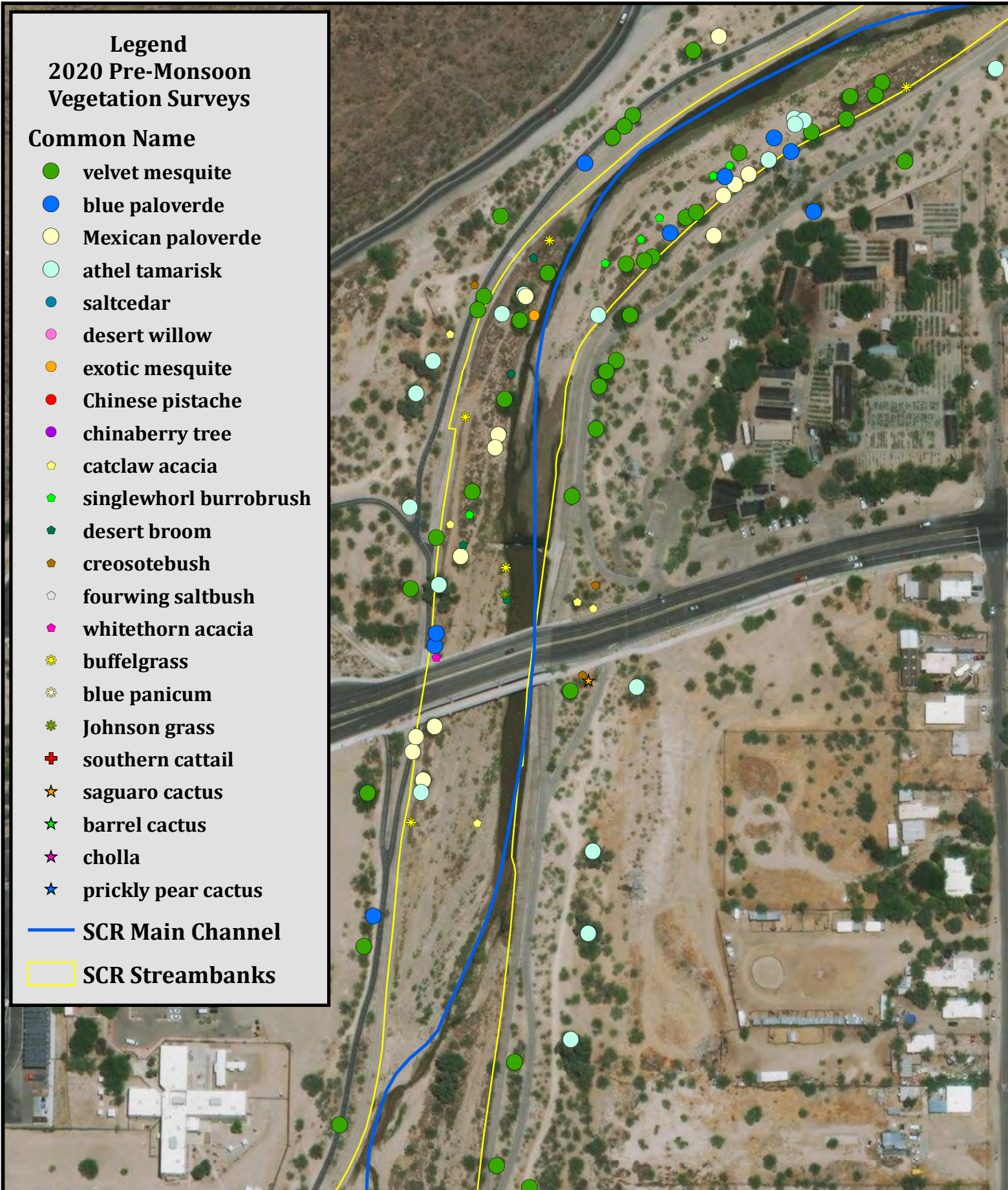


Map Produced by A. La Porte
Harris Environmental, 2020
UTM, WGS 84
Basemap: ESRI, 2020

Legend **2020 Pre-Monsoon** **Vegetation Surveys**

Common Name

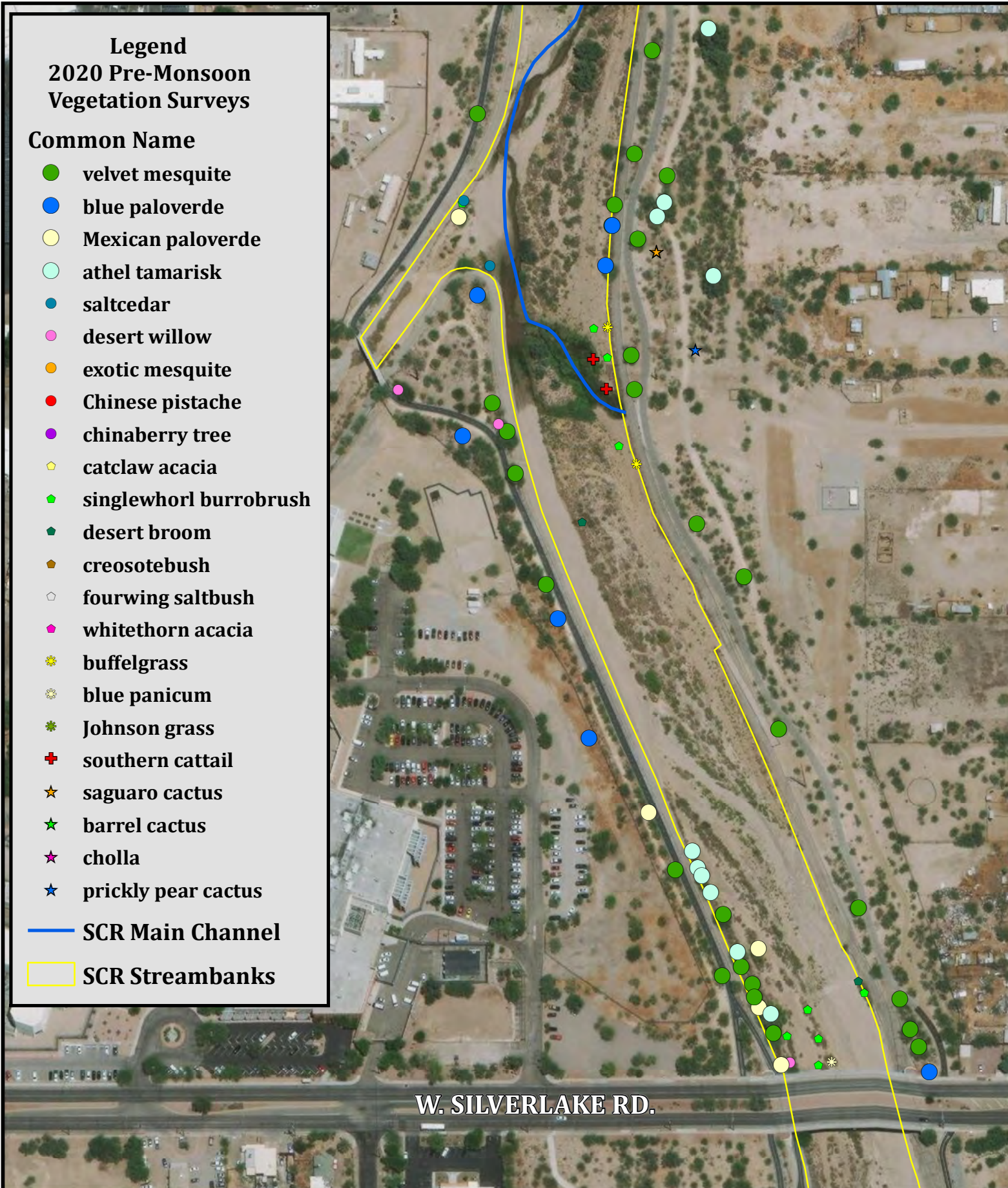
- velvet mesquite
- blue paloverde
- Mexican paloverde
- athel tamarisk
- saltcedar
- desert willow
- exotic mesquite
- Chinese pistache
- chinaberry tree
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- ◆ desert broom
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- ◆ fourwing saltbush
- ◆ whitethorn acacia
- ✱ buffelgrass
- ✱ blue panicum
- ✱ Johnson grass
- ✱ southern cattail
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- ★ barrel cactus
- ★ cholla
- ★ prickly pear cactus
- SCR Main Channel
- SCR Streambanks



Legend **2020 Pre-Monsoon** **Vegetation Surveys**

Common Name

- velvet mesquite
- blue paloverde
- Mexican paloverde
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- ◊ fourwing saltbush
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- ✱ blue panicum
- ✱ Johnson grass
- + southern cattail
- ★ saguaro cactus
- ★ barrel cactus
- ★ cholla
- ★ prickly pear cactus
- SCR Main Channel
- SCR Streambanks



Vegetation Mapping, Pre-monsoon 2020 **Santa Cruz River Heritage Project** **Sheet 4**

Legend **2020 Pre-Monsoon** **Vegetation Surveys**

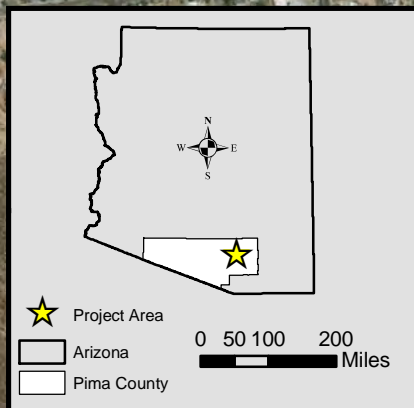
✕ removed vegetation

Common Name

- velvet mesquite
- blue paloverde
- Mexican paloverde
- athel tamarisk
- saltcedar
- desert willow
- exotic mesquite
- Chinese pistache
- chinaberry tree
- catclaw acacia
- singlewhorl burrobrush
- desert broom
- creosotebush
- fourwing saltbush
- whitethorn acacia
- buffelgrass
- blue panicum
- Johnson grass
- ✚ southern cattail
- ★ saguaro cactus
- ★ barrel cactus
- ★ cholla
- ★ prickly pear cactus

— SCR Main Channel

□ SCR Streambanks



CUSHING ST.

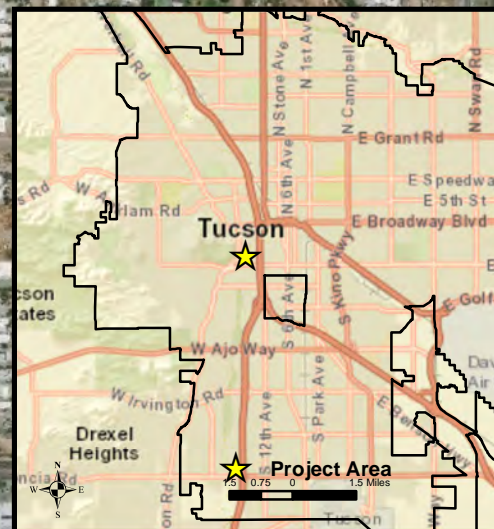
Sheet 1

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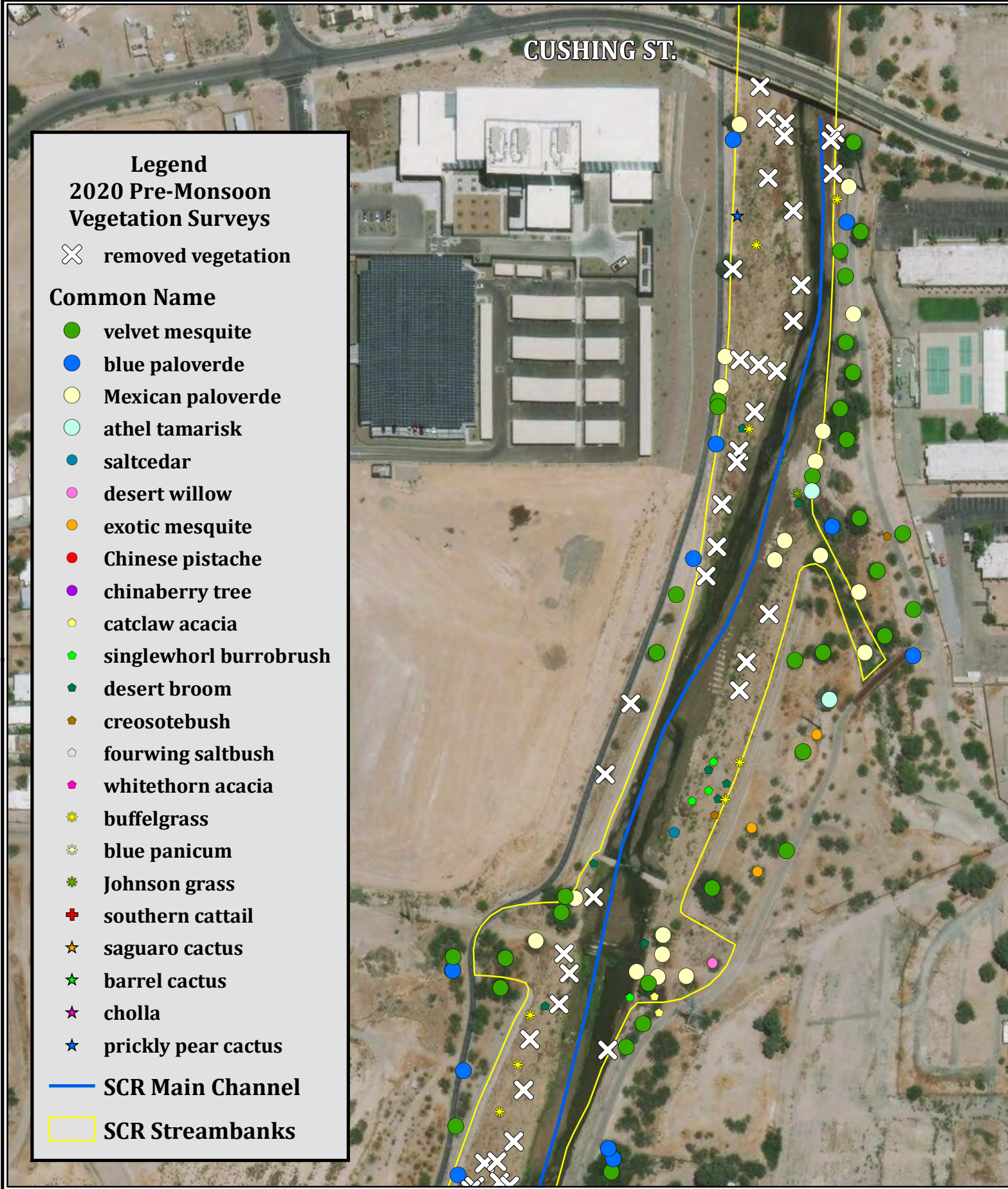
W. SILVERLAKE RD.



Vegetation Mapping, Pre-monsoon 2020 **Santa Cruz River Heritage Project** **Extent**



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Harris Environmental, 2020
UTM, WGS 84
Basemap : ESRI 2020



Vegetation Mapping, Pre-monsoon 2020
Santa Cruz River Heritage Project
Sheet 1

Legend **2020 Pre-Monsoon** **Vegetation Surveys**

✕ removed vegetation

Common Name

- velvet mesquite
- blue paloverde
- Mexican paloverde
- athel tamarisk
- saltcedar
- desert willow
- exotic mesquite
- Chinese pistache
- chinaberry tree
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- barrel cactus
- cholla
- prickly pear cactus

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— SCR Streambanks



Vegetation Mapping, Pre-monsoon 2020 **Santa Cruz River Heritage Project** **Sheet 2**

Legend **2020 Pre-Monsoon** **Vegetation Surveys**

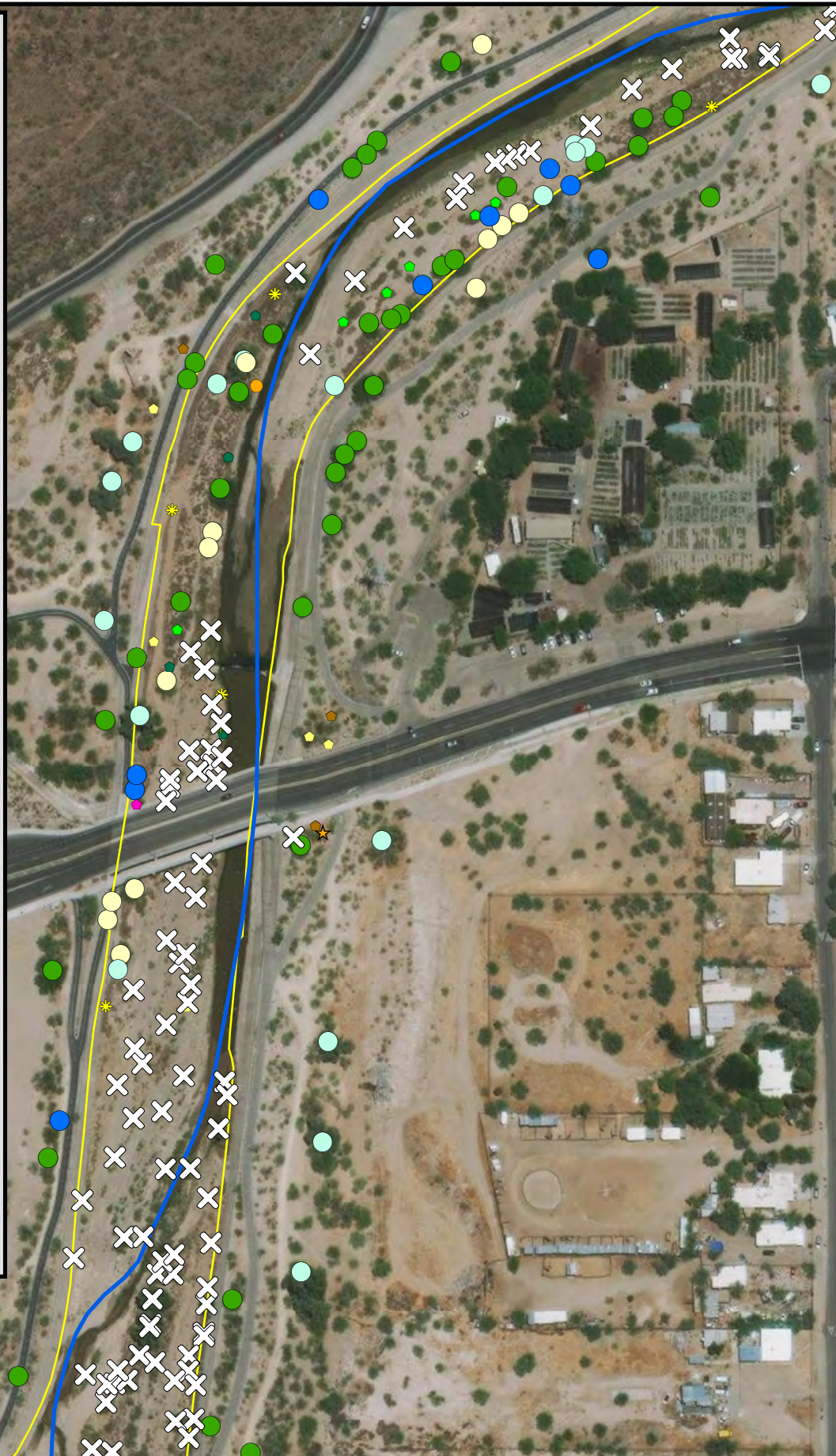
✕ removed vegetation

Common Name

- velvet mesquite
- blue paloverde
- Mexican paloverde
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— SCR Main Channel

— SCR Streambanks



Vegetation Mapping, Pre-monsoon 2020 **Santa Cruz River Heritage Project** **Sheet 3**

0.055 0.0275 0 0.055 Miles



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Harris Environmental, 2020
UTM, WGS 84
Basemap: ESRI, 2020

Legend **2020 Pre-Monsoon** **Vegetation Surveys**

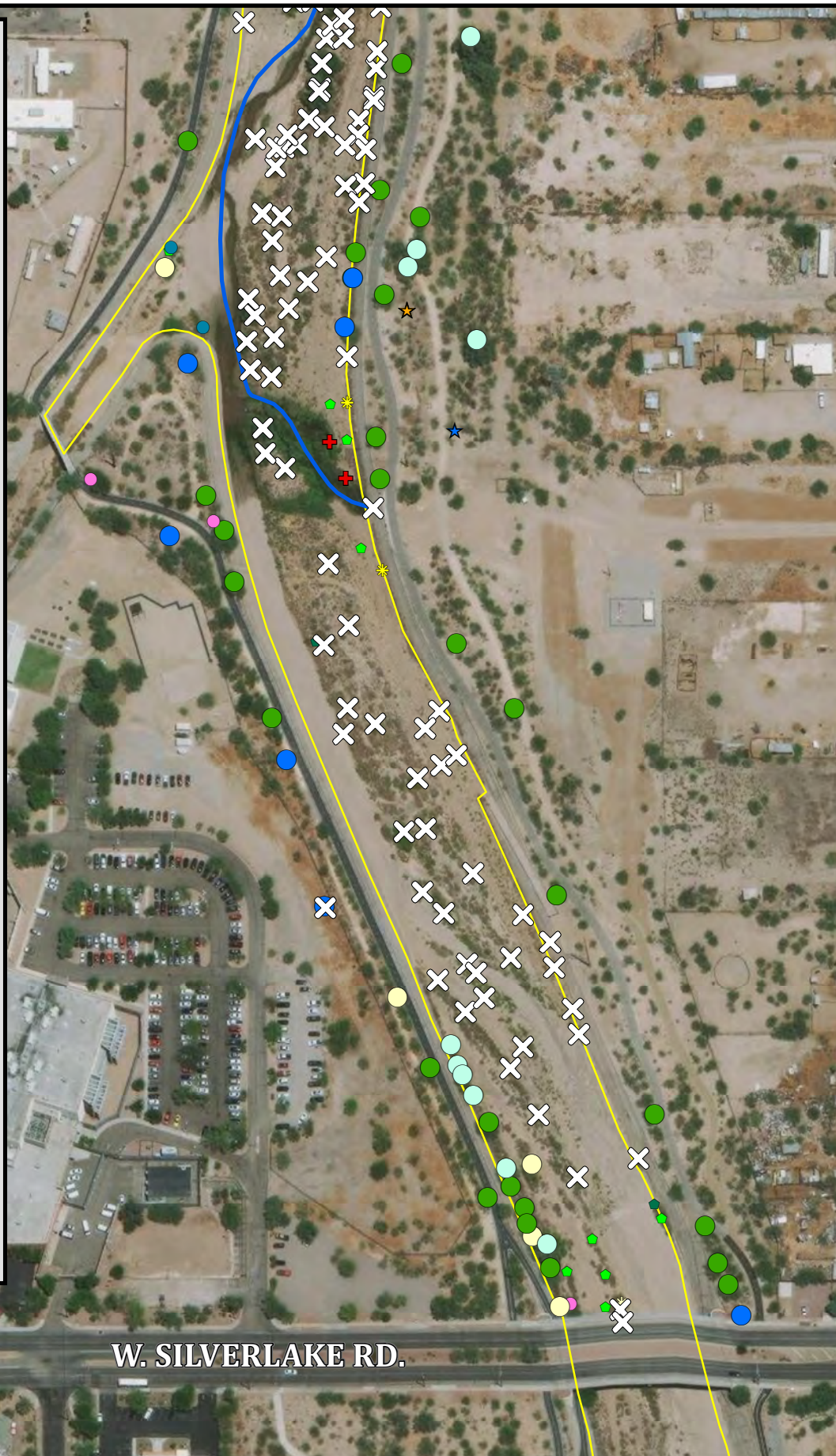
✕ removed vegetation

Common Name

- velvet mesquite
- blue paloverde
- Mexican paloverde
- athel tamarisk
- saltcedar
- desert willow
- exotic mesquite
- Chinese pistache
- chinaberry tree
- catclaw acacia
- singlewhorl burrobrush
- desert broom
- creosotebush
- fourwing saltbush
- whitethorn acacia
- buffelgrass
- blue panicum
- Johnson grass
- southern cattail
- saguaro cactus
- barrel cactus
- cholla
- prickly pear cactus

— SCR Main Channel

□ SCR Streambanks



W. SILVERLAKE RD.

Vegetation Mapping, Pre-monsoon 2020 **Santa Cruz River Heritage Project** **Sheet 4**