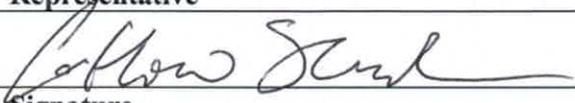


**Arizona Water Protection Fund  
Application Cover Page  
FY 2019**

<b>Title of Project:</b> Protecting and restoring habitat and surface flow to lower Sabino Creek, a critical shallow groundwater area											
<b>Type of Project:</b> <input checked="" type="checkbox"/> Capital or Other <input type="checkbox"/> Water Conservation <input type="checkbox"/> Research	<b>Stream Type:</b> <input checked="" type="checkbox"/> Perennial <input type="checkbox"/> Intermittent <input type="checkbox"/> Ephemeral										
<b>Your level of commitment to maintenance of project benefits and capital improvements:</b> <input type="checkbox"/> < 5 years <input type="checkbox"/> 5-10 years <input type="checkbox"/> 11-15 years <input checked="" type="checkbox"/> 16-20 years											
<b>Applicant Information:</b> Name/Organization: Watershed Management Group Address 1: 1137 N Dodge Blvd Address 2: City: Tucson State: AZ ZIP Code: 85716 Phone: 520 396-3266 Fax: Tax ID No.: <span style="background-color: black; color: black;">XXXXXXXXXX</span>	<b>Inside an AMA:</b> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>  <b>If yes, which AMA:</b> <input type="checkbox"/> Phoenix <input checked="" type="checkbox"/> Tucson <input type="checkbox"/> Prescott <input type="checkbox"/> Pinal <input type="checkbox"/> Santa Cruz										
<b>Contact Person:</b> Name: Catlow Shipek Title: River Restoration Biologist Phone: 520 396-3266 x4 Fax: e-mail: catlow@watershedmg.org	<b>Type of Application:</b> <input type="checkbox"/> New <input type="checkbox"/> Continuation  <b>Any Previous AWPf Grants:</b> <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No  <b>If yes, please provide Grant #(s):</b>										
<b>Arizona Water Protection Fund Grant Amount Requested:</b>  \$312,922.00  If the application is funded, will the Grantee intend to request an advance: <input type="checkbox"/> Yes <input type="checkbox"/> No	<b>Matching Funds Obtained and Secured:</b> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left; border-bottom: 1px solid black;"><u>Applicant/Agency/Organization:</u></th> <th style="text-align: right; border-bottom: 1px solid black;"><u>Amount (\$):</u></th> </tr> </thead> <tbody> <tr> <td>1. Applicant</td> <td style="text-align: right;">138,967.00</td> </tr> <tr> <td>2.</td> <td></td> </tr> <tr> <td>3.</td> <td></td> </tr> <tr> <td colspan="2" style="text-align: right;"><b>Total: 138,967</b></td> </tr> </tbody> </table>	<u>Applicant/Agency/Organization:</u>	<u>Amount (\$):</u>	1. Applicant	138,967.00	2.		3.		<b>Total: 138,967</b>	
<u>Applicant/Agency/Organization:</u>	<u>Amount (\$):</u>										
1. Applicant	138,967.00										
2.											
3.											
<b>Total: 138,967</b>											
Has your legal counsel or contracting authority reviewed and accepted the Grant Award Contract General Provisions? <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A											
<p><b>Signature of the undersigned certifies understanding and compliance with all terms, conditions and specifications in the attached application. Additionally, signature certifies that all information provided by the applicant is true and accurate. The undersigned acknowledges that intentional presentation of any false or fraudulent information, or knowingly concealing a material fact regarding this application is subject to criminal penalties as provided in A.R.S. Title 13. The Arizona Water Protection Fund Commission may approve Grant Awards with modifications to scope items, methodology, schedule, final products and/or budget.</b></p>											
Catlow Shipek	Policy and Technical Director 520 396-3266 x4										
<b>Typed Name of Applicant or Applicant's Authorized Representative</b>	<b>Title and Telephone Number</b>										
	9/6/2018										
<b>Signature</b>	<b>Date Signed</b>										

## **Title: Protecting and restoring habitat and surface flow to lower Sabino Creek, a critical shallow groundwater area**

### **Executive Summary**

Watershed Management Group (WVG) and partners will collaborate to preserve and restore lower Sabino Creek, a critical riparian area supported by shallow groundwater (PAG, 2012), through a holistic community-based restoration effort. WVG's multi-pronged and landowner centric approach as part of our River Run Network program recognizes that no singular strategy will protect streamflow in Sabino Creek for the long-term. Exacerbating factors including drought, invasive species, and continued pressure from wells requires a holistic water resource and landscape management approach. This approach will look to 1) enhance surface runoff recharge through upstream and floodplain restoration activities, 2) promote water demand reduction and use of rainwater to reduce withdrawals from local wells, and 3) remove exotic invasive species impacting riparian habitat.

While most groundwater levels in the Tucson Basin are 200 feet or more below the land surface, local studies have identified areas of shallow groundwater. These areas, where groundwater is less than 50 feet below the surface, support the few remaining pockets of riparian habitat in the basin. These are the remnants of our once extensive corridors connecting mountain creeks to the Santa Cruz River.

Vital to this effort are continued efforts to engage residents which will build on WVG's five years of building trust and relationships with local landowners in the Sabino Creek area and the implementation of on-the-ground restoration projects at four different sites. Targeted engagement in this grant will consist of direct mailings, neighborhood and special-interest group presentations, and on-the-ground restoration and monitoring activities. The goal will be to strengthen landowners' and managers' connections to and ultimately stewardship of the creek and riparian environments which is critical for long-term health of lower Sabino Creek and viability of the restoration features.

The proposed project will:

1. Identify upland, tributary and creek restoration opportunities for immediate and future projects to enhance habitat and local recharge of the shallow groundwater aquifer.
2. Treat uplands and tributary drainages flowing into lower Sabino Creek to restore natural hydrological processes through slowing and infiltrating urban enhanced runoff and reduce erosion.
3. Assess, design, and cost work to protect a failing grade control structure critical to preserving upstream Sabino Creek riparian areas in collaboration with Pima County. Design techniques will utilize natural channel design tools to protect the upstream channel from further downcutting and enhance downstream floodplain connection for recharge, flood control, and habitat benefits.
4. Expand citizen science monitoring of stream flow and shallow groundwater through lower Sabino Creek to better understand the connection among recharge, well use, and surface flow.

The project will be landowner-centric and utilize a holistic approach to restoration. Outreach, education, and relationship building will be central to all restoration project identification, selection, planning, and implementation activities. The project scope will include not just the riparian corridor of lower Sabino Creek but also the uplands and tributary drainages feeding the creek to facilitate restoration of natural hydrologic processes. Restoration sites will be monitored before and after installation to assess

effectiveness, infer impacts, and inform future restoration strategies. The selected restoration sites will be chosen to:

1. Enhance recharge of storm flows from tributaries to the Sabino Creek shallow groundwater area to impact perennial baseflow of lower Sabino Creek
2. Improve riparian habitat along degraded reaches of tributary channels and lower Sabino Creek
3. Provide community-supported restoration activities to engage landowners and promote long-term stewardship of the creek.

WMG will work directly with Pima County (Regional Flood Control District; Natural Resources, Parks and Recreation Department; and Office of Sustainability and Conservation), Pima Association of Governments, University of Arizona, Tucson Water, American Rivers, local residents, homeowners associations, local businesses, and the developing Santa Cruz Watershed Collaborative to develop and further community supported restoration efforts.

Letters of Support have been provided by:

- Deborah Suppes (resident and landowner)
- Carol Parker (resident and landowner)
- Michael Woodin (resident and landowner)
- Hidden Hills HOA (landowner)
- Janice Hughes (resident and landowner)
- Tasha Pontifax (Bear Creek Ranch and Estates resident and landowner)
- Dr. John and Sherri Madden (resident and landowner)
- Pima County Regional Flood Control District (landowner)
- US Forest Service
- Dr. James Washbourne (neighbor and leader of invasive species monitoring and removal efforts)
- Sabino Canyon Naturalists

## **Project Overview**

The Santa Cruz and its major tributaries in Tucson flowed just 60 years ago but today are mostly dry washes, flowing only after large storms. Watershed Management Group's (WMG) River Run Network program is working to reverse the trend of groundwater depletion and loss of riparian areas through watershed and restoration planning, community outreach and education activities, tributary and creek restoration projects, and watershed-scale collaborations and policy initiatives. Residents and visitors to Tucson have come to see dry creeks and rivers as the norm. Through this program, we reconnect people with our heritage of flowing desert rivers.

While most groundwater levels in the Tucson Basin are 200 feet or more below the land surface, local studies have identified areas of shallow groundwater. These areas, where groundwater is less than 50 feet below the surface, support the few remaining pockets of riparian habitat in the basin. These are the remnants of our once extensive corridors connecting mountain creeks to the Santa Cruz River. Because these pockets of shallow groundwater are often perched aquifers, semi-independent of the larger groundwater supply, they are more vulnerable to being depleted through over-pumping and more responsive to recharge efforts—showing recovery within years, rather than decades, following a reduction in pumping activities. Sabino Creek is one such area where loss of shallow groundwater has resulted in significant depletion of flows, reducing this once-perennial stream that supports important habitat for plants and animals to an intermittent and ephemeral waterway that flows only after large storm events.

Watershed Management Group and partners have launched a community campaign to restore habitat and surface flow to the lower Sabino Creek watershed. This section of the creek, located downstream of Sabino Canyon Recreation Area in northeast Tucson, passes through low-density residential development and joins Tanque Verde Creek. The riparian vegetation community supported along these lower reaches includes stands of velvet mesquite, Fremont cottonwood, Arizona sycamore, Arizona walnut and willow, and other mixed broadleaf species (PAG, 2000a). A commissioned ecosystem services valuation study conducted by Earth Economics (2016) estimates an annual value of \$1.4 million is provided by lower Sabino Creek's riparian areas. Each acre that is restored has the potential to add \$1,032 per acre per year in value through clean water, clean air, reduced heat island effect, recreational opportunities and aesthetics.

Through local outreach and restoration activities proposed in this project, we will begin to reverse the historic decline of groundwater levels through a multi-pronged community-based approach. This approach includes restoring natural hydrology to support perennial surface flow and associated riparian vegetation. Our project will engage 60 people in on-the-ground restoration activities and 400 people in direct outreach actions. In addition, we will continue to engage thousands of people through our ongoing River Run Network creek walks, presentations, monthly e-bulletin, Flow 365 Citizen Science Monitoring volunteers, Santa Cruz Watershed Collaborative, and more.

This project complements recommendations in Pima Association of Governments' Shallow Groundwater Areas in Eastern Pima County, Arizona: Water Well Inventory & Pumping Trend Analysis Report (2012). It aligns with Pima County's Sonoran Desert Conservation Plan (SDCP) for balancing the conservation and protection of our cultural and natural resource heritage with our efforts to maintain an economically vigorous and fiscally responsible community. The project area overlaps with an area identified for priority purchase through Pima County's open space bond and Floodprone Land

Acquisition Fund. In addition, the project will build off of gains in groundwater recovery realized through the discontinuation of pumping in 2006 from a nearby Tucson Water municipal well field and in 2015 from private irrigation wells along lower Sabino Creek.

*Goal:* To preserve and restore lower Sabino Creek, a critical shallow groundwater area, through a holistic community-based restoration effort.

*Objectives:*

1. Identify and select upland tributary and creek restoration opportunities for immediate and future projects to enhance habitat and local recharge of the shallow groundwater aquifer.
2. Treat uplands and tributary drainages flowing into lower Sabino Creek to restore natural hydrological processes through slowing and infiltrating urban enhanced runoff and reduce erosion.
3. Assess, design, and install features to protect a failing grade control structure critical to preserving upstream Sabino Creek riparian areas in collaboration with Pima County. Design techniques will utilize natural channel design tools to protect the upstream channel from further downcutting and enhance downstream floodplain connection for recharge, flood control, and habitat benefits.
4. Expand citizen science monitoring of stream flow and shallow groundwater through lower Sabino Creek to better understand the connection among recharge, well use, and surface flow.

*Statement of Problems/Causes.* As outlined by PAG (2012), the Sabino Canyon Shallow Groundwater Area has a high density of wells: 286 wells total and 17.9 wells per square mile. Historically, groundwater levels have declined until 2005 when several municipal non-exempt wells discontinued production and led to a slight recovery of local aquifer levels. However, this area has seen high numbers of new non-exempt wells installed: 15 new wells from 2000 – 2012. It is estimated that the percentage withdrawn in this area from non-exempt wells is 92.5%. PAG identified Sabino Canyon Shallow Groundwater Area as a high priority for additional study due to water withdrawal characteristics. (PAG 2012)

Sabino Creek, its tributaries and some upland areas are experiencing accelerated rates of erosion due to increased and concentrated stormwater flows from the hardened urban landscape. In addition a headcut in the main channel of Sabino Creek that started in the early 1980s at its confluence with Tanque Verde Creek was halted by a constructed dam installed by Pima County in the early 1990s (pers comm, B. Woodin, 2014). This dam was destroyed in 2006 by large floods associated with the Aspen and Bullock fires in the Catalina Mountains, it was rebuilt but is at risk of failing again due to under cutting.

*Statement of Solutions.* Watershed Management Group's multi-pronged approach to preserve and enhance streamflow in Sabino Creek recognizes that no single strategy will protect the creek for the long-term. To mitigate exacerbating factors including drought, invasive species, and continued pressure from wells will require a holistic approach. The proposed project will focus efforts to 1) enhance surface runoff recharge through upstream and floodplain restoration activities, 2) protect a failing grade control structure, 3) promote water demand reduction and use of active and passive rainwater systems to reduce withdrawals from local wells, and 4) remove exotic invasive species impacting riparian habitat.

To support these efforts, WMG and partners have formed the Santa Cruz Watershed Collaborative to strategically coordinate water resource management, land use planning, and policy initiatives to achieve river restoration goals throughout the greater Tucson Basin, and this effort was recently awarded a Bureau of Reclamation WaterSMART Grant to support the development of a Santa Cruz Watershed Restoration Plan. Co-conveners of the Santa Cruz Watershed Collaborative include Bureau of Reclamation, PAG, Pima County, Sky Island Alliance, Sonoran Institute, Southwest Decision Resources, Tucson Water, and the University of Arizona Water Resources Research Center and WMG. Representatives from dozens of other organizations, jurisdictions, and industry have participated in the semi-annual forums held to build the collaborative effort. We will work closely with co-conveners and other representatives to plan and coordinate efforts as well as share through the forums the results of this project.

*Statement of Project Years of Benefit to the resource and general public.* This 4-year project will enhance and restore stream and riparian resources in Sabino Creek that will provide direct improvements to surface flows and address degraded watershed health conditions through implementation of scientifically-based restoration projects. The restoration plan will address additional benefits including flood mitigation, water quality, and increased value to adjacent properties. Beyond the grant funded years our community-based approach to develop stewardship and leverage community partners will ensure long-term maintenance of the creek and associated riparian habitat that are enhanced by the project. This project includes broad based local involvement and support and directly benefits Sabino Creek and downstream riparian habitat. Matching monies or assets including in kind contributions have been provided by WMG and other sources.

### **Project Activities Outline**

**Task 1:** Identify and select tributary drainage restoration sites for work to enhance shallow groundwater aquifer recharge, restore geomorphic processes, increase flow and hydro-period, and benefit riparian habitat and wildlife.

Description: Activities under this task include:

- Outreach to landowners, partners, and neighborhoods to generate interest and support of the restoration work and assist with restoration opportunity identification.
- Assess tributary drainages to lower Sabino Creek to identify potential restoration project sites.
- Collect representative longitudinal profiles and cross-sections to assess geomorphic problems, constraints, and opportunities.
- Develop GIS coverages of assessed tributaries that include riparian vegetation conditions, erosional areas, areas of aggradation, geomorphology and geologic control, and invasive species.
- Assess recharge potential of tributary drainages to the shallow groundwater area to identify areas of potential hydrologic connectivity using geologic and soil map layers, on-the-ground assessment, and groundwater response modeling.
- In coordination with landowners and partners, develop a process to prioritize sites most in need of restoration.
- Select 2-5 restoration project sites for completion with grant funds.

The proposed study reach of Sabino Creek starts at the Coronado National Forest boundary just below the Sabino Canyon Recreation Area at an elevation of 2670 feet and continues downstream just over 4 miles to the confluence with the Tanque Verde Creek at 2500 feet. Along this 4-mile reach we have identified 53 private landowners; in addition Pima County owns approximately 27.5 acres in six parcels and an additional 200 acres along Bear Creek, an important tributary to Sabino Creek.

Recent restoration work along lower Sabino Creek included treatment of two parcels as part of WMG's river restoration activities: a private 12-acre parcel (Hidden Valley HOA) and a private 40-acre parcel (Woodin); and two residential sites to slow and infiltrate stormwater. Sky Island Alliance has worked to remove invasive *Arundo donax* and buffelgrass from a Pima County parcel along Bear Creek (a tributary to Sabino Creek), and Dr. James Washburne, a UofA Hydrology professor, has worked with AZ Water Protection Fund assistance (#14-182) to remove *Arundo donax* from the majority of lower Sabino Creek.

Funding from this grant will enable us to assess riparian vegetation and geomorphic conditions across the entire lower Sabino Creek Watershed from historic and current aerial imagery, site surveys and discussions with landowners and help us move forward with landowners and neighborhood associations already committed including six landowners and neighborhood associations (see partners letters for full list) and directly engage additional landowners and offer restoration assistance.

Purpose: to select restoration sites to begin planning for restoration activities, neighbor outreach and engagement workshops, and pre and post project monitoring.

Responsible Personnel: Catlow Shipek and Trevor Hare, Watershed Management Group

Deliverable Description: Technical memo with supporting maps and signed landowner restoration project agreements.

Deliverable Due Date: Quarter 4

Task Cost: \$30,610 from grant funds

**Task 2:** Instrument selected restoration sites with monitoring equipment and establish photo and survey points to collect baseline information. In addition, expand WMG's Flow 365 citizen science program by engaging landowners and community members to include surface flow, well levels, and invasive species monitoring.

Description: Activities under this task include:

- Establish representative photo points for repeat photography of restoration project areas and/or set up automatic cameras to provide time-lapse photos and capture flow events.
- Establish and record representative cross-sections and longitudinal profiles of channels, and other geomorphic and hydrological characteristics worth noting.
- Outreach, identify, and engage potential wells and willing landowners to instrument with pressure transducer loggers to record groundwater levels. These sites will be added to WMG's existing Flow 365 citizen science groundwater monitoring sites.
- Engage and train additional volunteer participants to record surface flow observations along lower Sabino Creek and make note of invasive species. These participants will be part of WMG's existing Flow 365 citizen science flow monitoring efforts.

Purpose: WMG currently has two groundwater monitoring sites and six volunteers monitoring surface flow within the Sabino Creek shallow groundwater area as part of our Flow365 Citizen Science Monitoring program that spans across the Tucson Basin. However, to better understand the dynamics of surface flow to groundwater levels and impacts of pumping a greater spatial and temporal distribution of data is required. We will also install automatic cameras to record flow events along tributary channels within our restoration area to assess performance and conduct other pre- and post-project monitoring to assess restoration effort effectiveness for the near and far terms. The data collected will also form part of our baseline conditions and help in the understanding of system dynamics and relationships for updating our restoration plans.

Responsible Personnel: Trevor Hare, Watershed Management Group

Deliverable Description: Technical memo, supporting maps, and data observations and summary

Deliverable Due Date: Quarter 4

Task Cost: \$27,710 from grant funds

**Task 3:** Design and plan for restoration projects.

Description: Activities under this task include:

- Develop project scopes and site-specific restoration plans in collaboration with consultants, Pima County personnel and parcel owners.
- Develop budgets to implement restoration plans and identify potential funding sources to leverage and/or for future work.

Each priority site specific restoration plan will include information on past conditions and events that have caused degradation, desired future conditions and a goal statement along with objectives, descriptions of restoration techniques and expected result, and a long-term monitoring and management plan. We will design all the work to improve human safety and enjoyment, wildlife habitat, and flood control. The budget for each plan will include assessment, planning and design work, cultural clearance and permitting, baseline monitoring and implementation activities, the development of a long-term monitoring and management plan, and communications and reporting. A robust assessment, design and planning effort will be conducted for the 2-5 prioritized sites. This includes an assessment of the problem(s), cause(s), and potential remedies. The restoration design process will be carried out with experts and land managers/owners. Assessments, designs, and planning are based on over twenty years' experience using protocols such as Proper Functioning Condition (USDI, 2015), the Calidad del Bosc de Ribera (Munné et al., 2003), Rapid Assessment-Riparian Assessment method (Stacey et al., 2006), and those outlined in the book *Let the Water do the Work: Induced Meandering, an Evolving Method for Restoring Incised Channels* (Zeedyk and Clothier, 2012).

Each site will be visited by a restoration specialist and the land manager and/or owner and the areas of interest will be delineated on an aerial image, critical elevations will be recorded with a laser level (LIDAR elevation data will be used where available), then through an iterative design exercise all available options will be carefully analyzed to develop a robust design. Restoration design will be carried out by an experienced restoration practitioner and we have budgeted for additional restoration expert input on difficult problems, specifically geomorphological considerations. Participating agencies like Pima County and Pima County Flood District have offered staff assistance in detailing specific work.

Purpose: To address urgent restoration needs and to prove efficacy of our approach and arid land restoration techniques.

Responsible Personnel: Trevor Hare and Catlow Shipek, Watershed Management Group, consulting engineers and geomorphologists

Deliverable Description: Technical memo and supporting maps

Deliverable Due Date: Quarter 5

Task Cost: \$32,855 from grant funds

**Task 4:** Obtain permits for restoration projects

Description: Obtain and submit all necessary permits, authorizations, clearances and agreements, and perform any consultations necessary to complete the tasks listed in this Scope of Work. These may include but are not limited to:

- State Historic Preservation Office (SHPO) clearance
- National Environmental Policy Act (NEPA) compliance
- Endangered Species Act Section 7 consultation with US Fish & Wildlife Service through the Pima County Section Ten Permit
- Pima County Floodplain Use Permit
- Clean Water Act Section 401 Certification from Arizona Department of Environmental Quality
- Clean Water Act Section 404 permit from the Army Corps of Engineers
- Access agreement(s) between Grantee and Landowner(s) (if different)

The State Historic Preservation Office will be furnished with detailed plans on sites for analysis on any prehistoric or historic sites present in the area,

Purpose: To comply with all local, state, and federal permit requirements, environmental laws such as NEPA and obtain legal access to project area.

Responsible Personnel: Trevor Hare, Watershed Management Group

Deliverable Description: Copies of all approved permits, authorizations, clearances and agreements.

Deliverable Due Date: Quarter 5

Task Cost: \$5,000 from grant funds

**Task 5:** Conduct conservation outreach to local residents

Description: WMG will refine and distribute additional informational materials regarding shallow groundwater, water conservation strategies, invasive species information, and creek restoration.

The primary materials in this campaign will include:

- Brochures and presentations for public meetings and community groups (already developed; may need to be updated to include project information)
- Direct mailing letter(s) to residents with informational inserts about the project, opportunities to learn more, and how to identify project opportunities and invasive species

- Get Wet Guide: Sabino and Tanque Verde Creek, a pocket guide to the Sabino and Tanque Verde Creek areas highlighting riparian function and connecting to recreational activities, including birding, hiking, biking, and more outside of private land areas (already developed)
- Creek Walks, expert staff led tours of restoration sites and scenic areas of Sabino Creek

Purpose: We will use these materials and our established contacts through our River Run Network members (currently 113 members living in the Sabino Creek area) in addition to the partnering neighborhood associations(s) to promote awareness about the value of Sabino Creek and restoration efforts and inspire implementation of water saving strategies such as water harvesting to reduce groundwater pumping for outdoor irrigation use and/or arroyo restoration features to enhance recharge and benefit wildlife habitat.

Responsible Personnel: Trevor Hare and Catlow Shipek, Watershed Management Group

Deliverable Description: 1 – 2 mailings to residents, 4 – 8 community presentations and creek walk tours, distribution of information to broad audiences through email bulletins and social media

Deliverable Due Date: Ongoing through Quarter 14

Task Cost: \$11,255 from grant funds

**Task 6:** Implementation of 2 – 5 restoration projects.

Description: The restoration sites will be designed to restore the natural hydrologic function to portions of Sabino Creek and its tributaries while protecting public and private property against flood-caused erosion. We will use arid land channel restoration techniques utilizing natural channel design approaches including tree post and rock structures which are cost effective and easy to maintain, and water harvesting and native revegetation techniques to increase plant diversity and abundance (see Appendix). Work to protect the failing grade control dam and what types of structure can and should be used is yet to be determined and depends on the assessment proposed above. The work will include restoration of wildlife habitat including pollinator and bird-friendly plantings, and removal of invasive species. The number of demonstration sites will be dependent on priority (need, urgency, and feasibility), scope, and complexity to remain within our proposed project budget.

Purpose: To address urgent restoration needs and to provide educational and engagement opportunities with local residents for furthering adoption and implementation of restoration techniques.

Responsible Personnel: Trevor Hare, Watershed Management Group

Deliverable Description: Technical memo and supporting maps, photos, and other documentation

Deliverable Due Date: Quarter 14

Task Cost: \$137,938 from grant funds

**Task 7:** Monitor restoration projects.

Description: We will monitor the response of creek and arroyo geomorphology, surface water flows, and the vegetative response. Methods will include cross-section and longitudinal profile surveys which will show trends toward a stable channel configuration, photo-points to show vegetation and channel response, flow monitoring to show trends in hydro-period, and greenline vegetation monitoring (Winward, 2000) to show trends in increased bank storage and channel stability through vegetation response.

Purpose: To prove efficacy of our approach and arid land restoration techniques, and to inform future restoration work along the creek. The monitoring methods will further engage local residents as participants to develop long-term stewardship and understanding of Sabino Creek.

Responsible Personnel: Trevor Hare, Watershed Management Group

Deliverable Description: Technical memo and supporting maps

Deliverable Due Date: Quarter 15

Task Cost: \$10,103 from grant funds

**Task 8:** Develop and submit a final report and oral presentation.

Description: The final task of the project is to be submitted along with an oral presentation

Purpose: To summarize project accomplishments, identify next steps, and convey lessons learned.

Responsible Personnel: Catlow Shipek, Watershed Management Group

Deliverable Description: Final report and oral presentation

Deliverable Due Date: Quarter 16

Task Cost: \$7,950 from grant funds

<b>WMG AZWPF 2018 Budget</b>						
<b>Personnel</b>	<b>Description</b>	<b>Items</b>	<b>Rate</b>	<b>Requested Funds</b>	<b>Matching Funds</b>	<b>Total</b>
<b>Grant Administration and General Support</b>						
<b>Program Advisor, Catlow Shipek</b>	Advise and administer project. 2 hrs per week for 4yrs	400	\$50	\$20,000	\$16,000	<b>\$36,000</b>
<b>GIS Technician Intern</b>	Intern to assist with recording and analyzing spatial data, and creating maps, 4hrs per week for 6months per year for 4yrs	400	\$23		\$9,200	<b>\$9,200</b>
<b>Task Subtotal</b>				<b>\$20,000</b>	<b>\$25,200</b>	<b>\$45,200</b>
<b>Task 1: Identify and select restoration sites</b>						
<b>Program Advisor</b>	Technical oversight of feasibility study, 2hrs for 3/4yr	75	\$50	\$3,750	\$3,000	<b>\$6,750</b>
<b>WMG Project Manager, Trevor Hare</b>	Lead site identification and selection. 10hrs for 3/4year	375	\$50	\$18,750	\$9,375	<b>\$28,125</b>
<b>WMG Communications Coordinator, Jamie Manser</b>	Assist with development and administer outreach mailings, 50hrs	50	\$40	\$2,000	\$1250	<b>\$3,250</b>
<b>Materials and Equipment</b>	1 new laptop & software, survey equipment, purchasing historic aerial and ground-based photos			\$4,000		<b>\$4,000</b>
<b>Printing and Mailing</b>	Outreach with information materials to landowners			\$1,000		<b>\$1,000</b>
<b>Graphic Design Consultant</b>	graphical design and layout of outreach materials			\$600		<b>\$600</b>
<b>Travel, WMG Staff</b>	40 trips, 25 miles each @\$0.51/mi	1000	\$0.51	\$510		<b>\$510</b>
<b>Santa Cruz River Watershed Group -- Key Advisors</b>	10 advisors @ 40 hours each for 4years, estimated hourly rate: \$30/hr.				\$12,000	<b>\$12,000</b>
<b>Task Subtotal</b>				<b>\$30,610</b>	<b>\$25,625</b>	<b>\$56,235</b>
<b>Task2: Initiate monitoring of wells and selected restoration sites</b>						
<b>Program Advisor</b>	Provide technical assistance, 40hrs	40	\$50	\$2,000	\$1,600	<b>\$3,600</b>

<b>WMG Project Manager</b>	Develop monitoring sites, analyze and submit reports, conduct wet-dry mapping, 100hrs	100	\$50	\$5,000	\$2,500	<b>\$7,500</b>
<b>Laurel Lacher, Lacher Hydrological Consulting</b>	Analyze results of data collected of baseline conditions and refine water balance model			\$15,000		<b>\$15,000</b>
<b>Materials and Equipment</b>	Groundwater well data loggers	12	\$400	\$4,800		<b>\$4,800</b>
<b>Printing</b>	survey logs, outreach materials			\$400		<b>\$400</b>
<b>Travel, WMG Staff</b>	40 trips, 25 miles each @\$0.51/mi	1000	\$0.51	\$510		<b>\$510</b>
<b>Task Subtotal</b>				<b>\$27,710</b>	<b>\$4,100</b>	<b>\$31,810</b>
<b>Task 3: Design and plan for restoration work</b>						
<b>Program Advisor</b>	Provide technical assistance, 40hrs	40	\$50	\$2,000	\$1,600	<b>\$3,600</b>
<b>WMG Project Manager</b>	Develop site specific plans, 110hrs	110	\$50	\$5,500	\$2,750	<b>\$8,250</b>
<b>Consultant: Civil Engineer</b>	Design help			\$17,000		<b>\$17,000</b>
<b>Consultant: Geomorphologist</b>	Design help			\$8,000		<b>\$8,000</b>
<b>Printing</b>	print plans			\$100		<b>\$100</b>
<b>Travel, WMG Staff</b>	20 trips, 25 miles each @\$0.51/mi	500	\$0.51	\$255		<b>\$255</b>
<b>Task Subtotal</b>				<b>\$32,855</b>	<b>\$4,350</b>	<b>\$37,205</b>
<b>Task 4: Obtain permits for restoration work</b>						
<b>WMG Project Manager</b>	Develop and submit permit applications, 100hrs	100	\$50	\$5,000	\$2,500	<b>\$7,500</b>
<b>Cultural Clearances</b>				\$10,000		<b>\$10,000</b>
<b>Task Subtotal</b>				<b>\$5,000</b>	<b>\$2,500</b>	<b>\$17,500</b>
<b>Task 5: Conduct conservation outreach to local residents and well users</b>						
<b>Program Advisor, Catlow Shipek</b>	Provide technical assistance and coordinate outreach activities, and provide presentations, 40hrs	40	\$50	\$2,000	\$1,600	<b>\$3,600</b>

<b>WMG Project Manager</b>	Provide presentations 100hrs	100	\$50	\$5,000	\$2,500	<b>\$7,500</b>
<b>WMG Communications Coordinator</b>	Assist with development and administer outreach mailings, 60hrs	60	\$40	\$2,400	\$1,500	<b>\$3,900</b>
<b>Printing and Mailing</b>	1-2 mailings and outreach guides to landowners about conservation and restoration site demonstration(s)			\$1,000		<b>\$1,000</b>
<b>Graphic Design Consultant</b>	graphical design and layout of outreach materials (mailings)			\$600		<b>\$600</b>
<b>Travel, WMG Staff</b>	20 trips, 25 miles each @\$0.51/mi	500	\$0.51	\$255		<b>\$255</b>
<b>Task Subtotal</b>				<b>\$11,255</b>	<b>\$5,600</b>	<b>\$16,855</b>
<b>Task 6: Implementation of 2-5 restoration sites</b>						
<b>Program Advisor</b>	Technical oversight of restoration site development, 50hrs	50	\$50	\$2,500	\$2,000	<b>\$4,500</b>
<b>WMG Project Manager</b>	Demonstration site development, 100hrs	300	\$50	\$15,000	\$7,500	<b>\$22,500</b>
<b>Volunteer Labor</b>	3 workshops x 5hrs x 15 people x \$20.25/hr				\$4,556	<b>\$4,556</b>
<b>Contracted, Excavator</b>	Excavation and hauling services			\$15,000		<b>\$15,000</b>
<b>Contracted Youth Crew through Arizona Conservation Corp</b>	Assist with staging and finish work in coordination with volunteer workshop days (4 weeks with a crew of 8)			\$25,000		<b>\$25,000</b>
<b>Tools</b>	Hand tools and power tools needed for hands-on, volunteer based workshops; Match: value of the tools WMG owns for workshops including hand tools, wheelbarrows, jackhammers, and power tools for workshops with up to 15 people.			\$800	\$2,500	<b>\$3,300</b>

<b>Materials and Equipment</b>	Rock and other restoration materials, plants and seed mixes			\$80,000		<b>\$80,000</b>
<b>Contracted Services</b>	Water truck for dust control during excavation and establishment of vegetation; Hauling services for removal of invasives ( <i>Arundo donax</i> )			\$4,000		<b>\$4,000</b>
<b>Travel, WMG Staff</b>	50 trips, 25 miles each @\$0.51/mi	1250	\$0.51	\$638		<b>\$638</b>
<b>Task Subtotal</b>				<b>\$142,938</b>	<b>\$16,556</b>	<b>\$159,494</b>
<b>Task 7: Monitoring of Restoration Sites</b>						
<b>Program Advisor, Catlow Shipek</b>	Provide technical assistance, 20hrs	20	\$50	\$1,000	\$800	<b>\$1,800</b>
<b>WMG Project Manager</b>	Survey, photo, and vegetation monitoring for 1 year, 120hrs	120	\$50	\$6,000	\$3,000	<b>\$9,000</b>
<b>Volunteer Labor</b>	3 people x 2hrs per month for 12months x \$20.25/hr				\$1,458	<b>\$1,458</b>
<b>Monitoring Equipment</b>	Data well loggers and trail camera; Match: WMG camera, video, and GPS			\$2,550	\$1,200	<b>\$3,750</b>
<b>Travel, WMG Staff</b>	12 trips, 25 miles each @\$0.51/mi			\$153		<b>\$153</b>
<b>Task Subtotal</b>				<b>\$9,703</b>	<b>\$6,458</b>	<b>\$16,161</b>
<b>Task 8: Develop and submit final report and oral presentations</b>						
<b>Program Advisor</b>	Provide technical and editorial assistance, present results, 50hrs	50	\$50	\$2,500	\$2,000	<b>\$4,500</b>
<b>WMG Project Manager</b>	Develop final report, present results, 75hrs	75	\$50	\$3,750	\$1,875	<b>\$5,625</b>
<b>Graphic Design Consultant</b>	graphical design and layout of final report and outreach summary documents			\$1,200		<b>\$1,200</b>
<b>Printing</b>	Final report copies			\$500		<b>\$500</b>
<b>Task Subtotal</b>				<b>\$7,950</b>	<b>\$3,875</b>	<b>\$11,825</b>

<b>All Tasks Subtotal</b>				<b>\$298,021</b>	<b>\$94,264</b>	<b>\$392,285</b>
<b>Indirect Costs</b>	5%			\$14,901	\$44,703	<b>\$59,604</b>
<b>TOTAL</b>				<b>\$312,922</b>	<b>\$138,967</b>	<b>\$451,889</b>

**Budget Narrative**

**Grant Admin and General Support**

Requested Funds -\$20,000

Match -\$25,200 (does not include forgone indirect at 15% which is calculated from the all task subtotal\*)

Direct Labor Costs

Program Advisor, \$20,000 = 400 hours (two hours per week for four years) at \$50/hour includes salary and fringe

Administrative Costs

5% of above

Matching Funds

Program Advisor, \$16,000 = 400 hours of forgone wages of \$40/hour includes salary and fringe

GIS Intern, \$9,200 = 400 hours at \$23/hour

\*15% forgone indirect

**Task One**

Requested Funds -\$30,610

Match -\$25,625 (does not include forgone indirect at 15% which is calculated from the all task subtotal\*)

Direct Labor Costs

Program Advisor, \$3,750 = 75 hours at \$50/hour includes salary and fringe

Project Manager, \$18,750 = 375 hours at \$50/hour includes salary and fringe

Communications Coord, \$2,000 = 50 hours at \$40/hour includes salary and fringe

Outside Services

Graphic Designer, \$600 in services

Other Direct Costs

Print and mail outreach materials, \$1000

Materials and Equipment –Computer and survey equipment, aerial imagery at \$4,000

Travel, \$510 = 40 trip at 25 miles at \$0.51/mile

Administrative Costs

5% of above

Matching Funds

Program Advisor, \$3,000 = 75 hours of forgone wages of \$40/hour includes salary and fringe  
Project Manager, \$9,375 = 375 hours of forgone wages of \$25/hour includes salary and fringe  
Communications Coord, \$1,250 = 50 hours of forgone wages of \$25/hour includes salary and fringe

Santa Cruz Watershed Collaborative -- Key Advisors, \$12,000, 10 advisors at 40 hours each for four years, at estimated hourly rate of \$30/hr.

\*15% of grant of task total request in forgone indirect

**Task Two**

Requested Funds -\$27,710

Match -\$4,100 (does not include forgone indirect at 15% which is calculated from the all task subtotal\*)

Direct Labor Costs

Program Advisor, \$2,000 = 40 hours at \$50/hour includes salary and fringe  
Project Manager, \$5,000 = 100 hours at \$50/hour includes salary and fringe

Outside Services

Lacher Hydro -\$15,000

Other Direct Costs

Printing of survey logs and monitoring outreach materials -\$400

Travel, \$510 = 40 trip at 25 miles at \$0.51/mile

Equipment Costs

Groundwater well level loggers, \$4,800 = 12 at \$400

Administrative Costs

5% of above

Matching Funds

Program Advisor, \$1,600 = 40 hours of forgone wages of \$40/hour includes salary and fringe  
Project Manager, \$2,500 = 100 hours of forgone wages of \$25/hour includes salary and fringe

\*15% of grant of task total request in forgone indirect

**Task Three**

Requested Funds -\$32,855

Match -\$4,350 (does not include forgone indirect at 15% which is calculated from the all task subtotal\*)

Direct Labor Costs

Program Advisor, \$2,000 = 40 hours at \$50/hour includes salary and fringe

Project Manager, \$5,000 = 100 hours at \$50/hour includes salary and fringe

Other Direct Costs

Travel, \$255 = 20 trip at 25 miles at \$0.51/mile

Administrative Costs

5% of above

Matching Funds

Program Advisor, \$1,600 = 40 hours of forgone wages of \$40/hour includes salary and fringe

Project Manager, \$2,750 = 100 hours of forgone wages of \$25/hour includes salary and fringe

\*15% of grant of task total request in forgone indirect

**Task Four**

Requested Funds -\$15,000

Match -\$2,500 (does not include forgone indirect at 15% which is calculated from the all task subtotal\*)

Direct Labor Costs

Project Manager, \$2,500 = 100 hours of forgone wages of \$25/hour includes salary and fringe

Outside Services

Cultural Clearances -\$10,000

Administrative Costs

5% of above

Matching Funds

Project Manager, \$2,500 = 100 hours of forgone wages of \$25/hour includes salary and fringe

\*15% of grant of task total request in forgone indirect

**Task Five**

Requested Funds -\$11,255

Match -\$5,600 (does not include forgone indirect at 15% which is calculated from the all task subtotal\*)

Direct Labor Costs

Program Advisor, \$2,000 = 40 hours at \$50/hour includes salary and fringe

Project Manager, \$5,000 = 100 hours at \$50/hour includes salary and fringe

Communications Coord, \$2,400 = 60 hours at \$40/hour includes salary and fringe

Outside Services

Graphic Designer, \$600 in services

Other Direct Costs

Print and mail outreach materials, \$1,000

Travel, \$255 = 20 trip at 25 miles at \$0.51/mile

Administrative Costs

5% of above

Matching Funds

Program Advisor, \$1,600 = 40 hours of forgone wages of \$40/hour includes salary and fringe

Project Manager, \$2,500 = 100 hours of forgone wages of \$25/hour includes salary and fringe

Communications Coord, \$1,500 = 60 hours of forgone wages of \$25/hour includes salary and fringe

\*15% of grant of task total request in forgone indirect

**Task Six**

Requested Funds -\$142,938

Match -\$16,556 (does not include forgone indirect at 15% which is calculated from the all task subtotal\*)

Direct Labor Costs

Program Advisor, \$2,500 = 50 hours at \$50/hour includes salary and fringe

Project Manager, \$15,000 = 300 hours at \$50/hour includes salary and fringe

Outside Services

Equipment Operator -\$15,000

Arizona Conservation Crew of Eight (four weeks with a crew of eight) -\$25,000

Truck hauling -\$4,000

Other Direct Costs

Rock and other restoration materials, plants and seed mixes -\$80,000

Travel, \$638 = 50 trip at 25 miles at \$0.51/mile

Equipment Costs

Tools -\$800

Administrative Costs

5% of above

Matching Funds

Program Advisor, \$2,000 = 50 hours of forgone wages of \$40/hour includes salary and fringe

Project Manager, \$7,500 = 300 hours of forgone wages of \$25/hour includes salary and fringe

Volunteer Monitors, \$4,556 - 3 workshops x 5hrs x 15 people x \$20.25/hr

\*15% of grant of task total request in forgone indirect

**Task Seven**

Requested Funds -\$9,703

Match -\$6,458 (does not include forgone indirect at 15% which is calculated from the all task subtotal\*)

Direct Labor Costs

Program Advisor, \$1,000 = 20 hours at \$50/hour includes salary and fringe  
Project Manager, \$6,000 = 120 hours at \$50/hour includes salary and fringe

Other Direct Costs

Travel, \$153 = 12 trips, 25 miles each @\$0.51/mi

Equipment Costs

Monitoring Equipment -\$2,550

Administrative Costs

5% of above

Matching Funds

Program Advisor, \$800 = 20 hours of forgone wages of \$40/hour includes salary and fringe  
Project Manager, \$3,000 = 120 hours of forgone wages of \$25/hour includes salary and fringe  
Volunteer Labor (3 people x 2hrs per month for 12months x \$20.25/hr) -\$1,458  
Monitoring Equipment (WMG's) -\$1,200  
\*15% of grant of task total request in forgone indirect

**Task Eight**

Requested Funds -\$7,950

Match -\$3,875 (does not include forgone indirect at 15% which is calculated from the all task subtotal)

Direct Labor Costs

Program Advisor, \$2,500 = 50 hours at \$50/hour includes salary and fringe  
Project Manager, \$3,750 = 75 hours at \$50/hour includes salary and fringe

Outside Services

Graphic Design Consultant, design and layout of final report and outreach summary documents - \$1,200

Other Direct Costs

Printing of Final Report -\$500

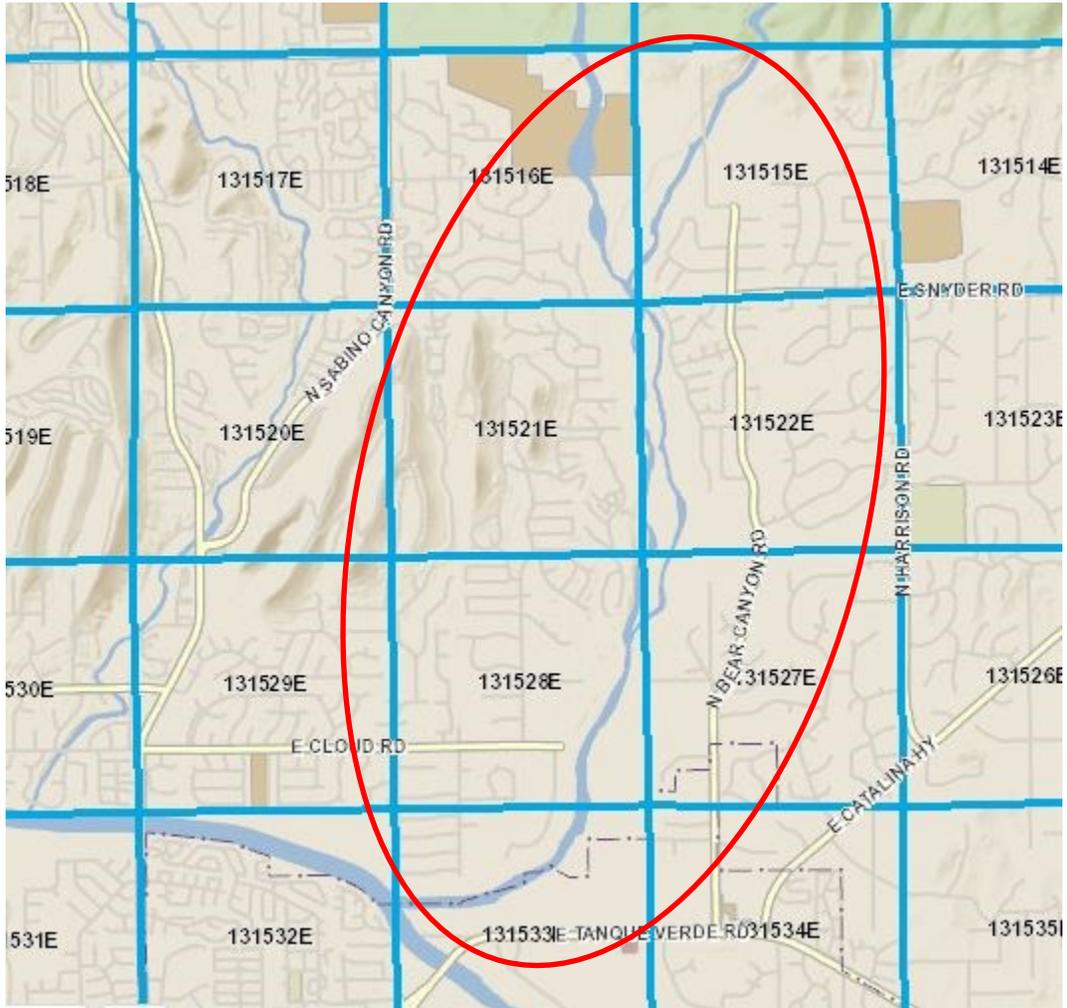
Administrative Costs

5% of above

Matching Funds

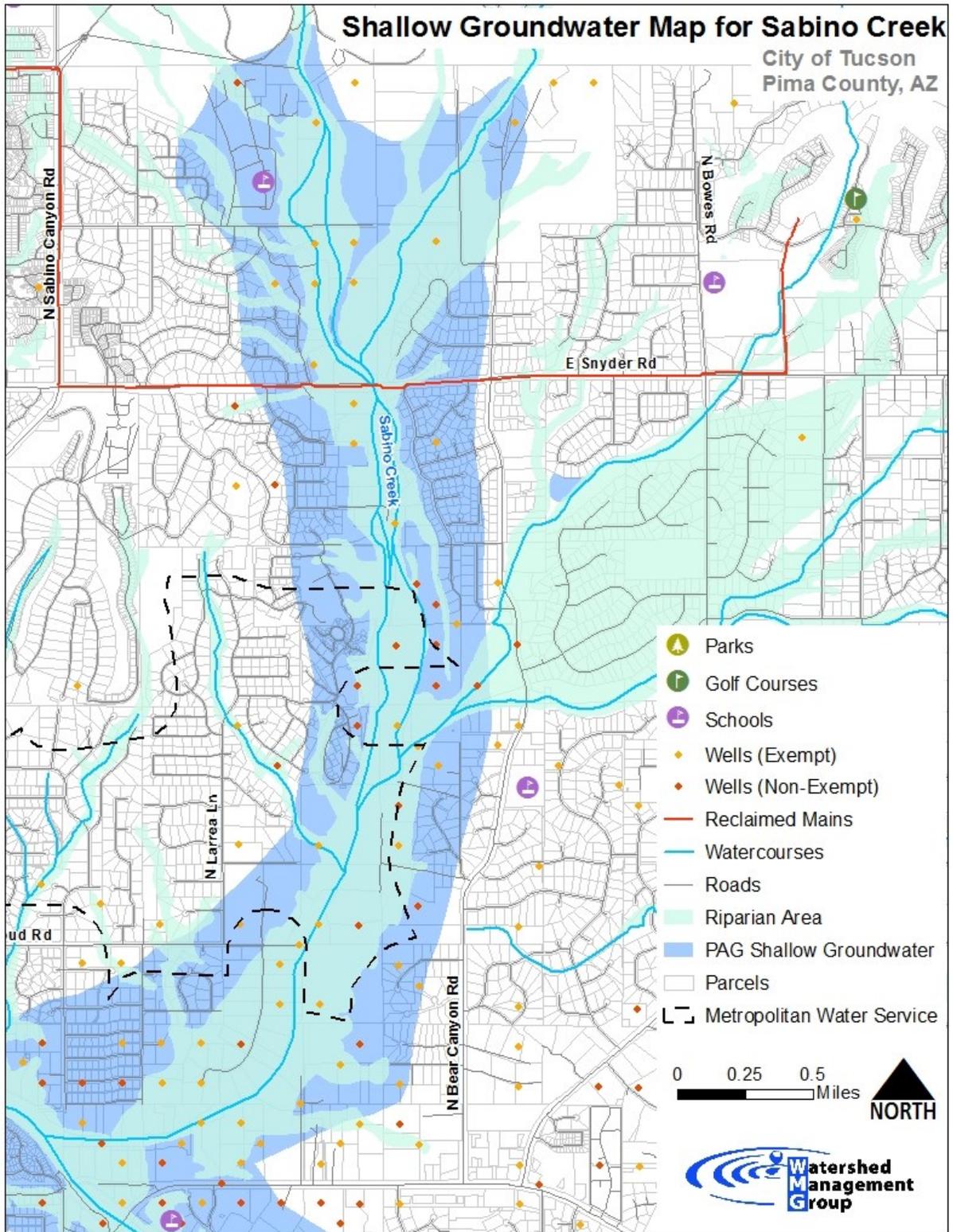
Program Advisor, \$2,000 = 50 hours of forgone wages of \$40/hour includes salary and fringe  
Project Manager, \$1,875 = 75 hours of forgone wages of \$25/hour includes salary and fringe  
15% of grant of task total request in forgone indirect

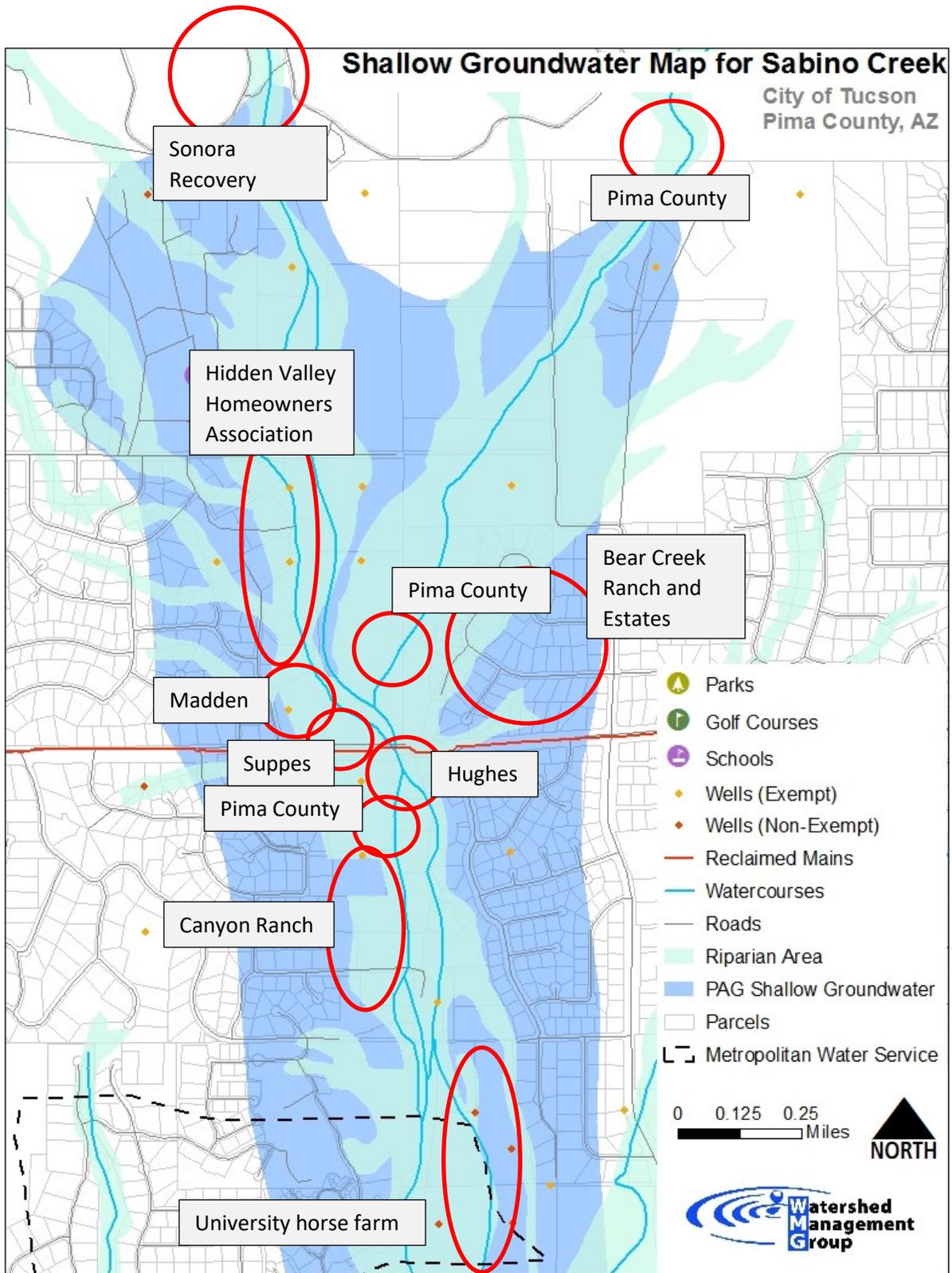
## Project Maps and Schematic

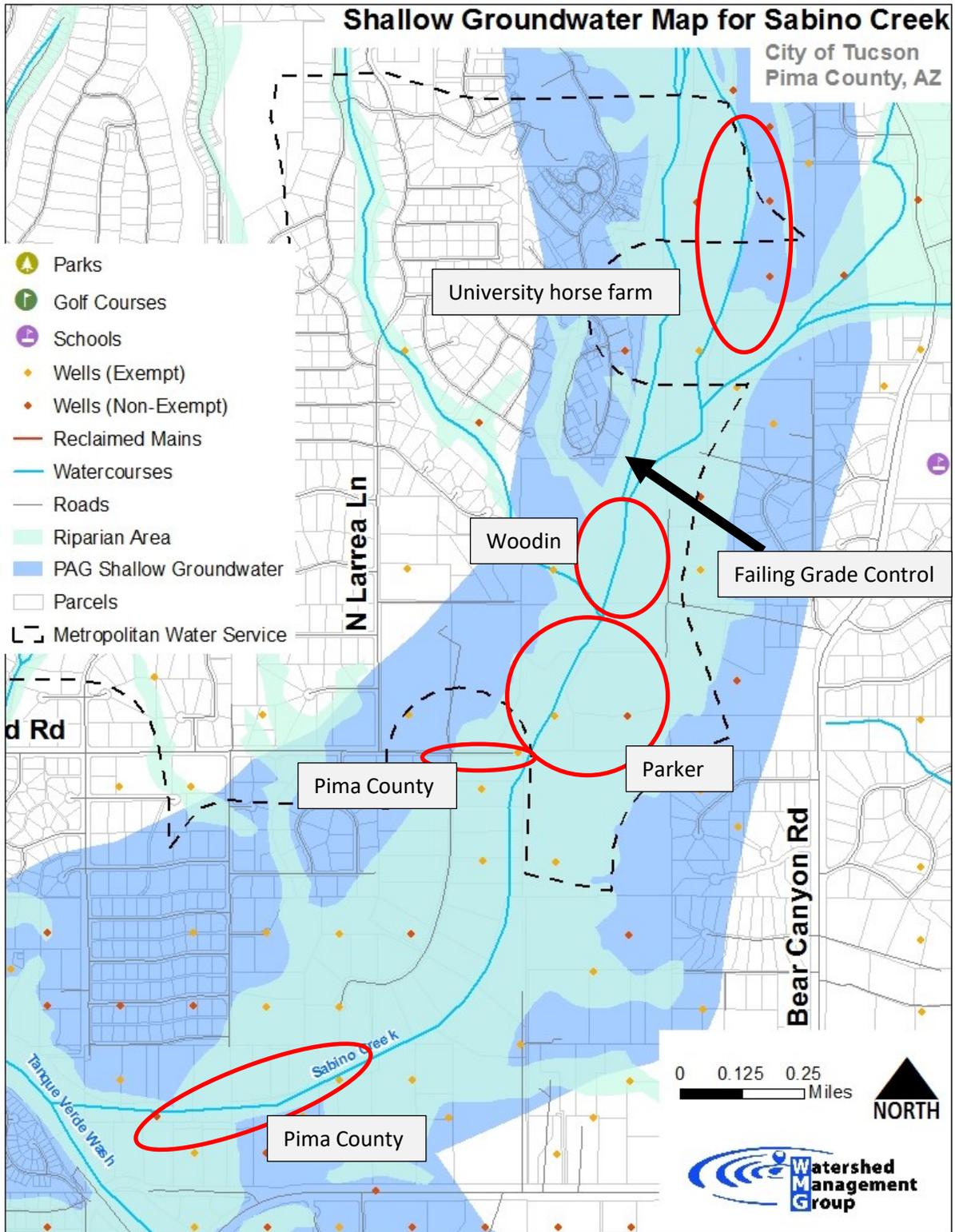


Township 13S, Range 15W, Sections 15, 16, 21, 22, 27, 28, 33

**Project Location/Ownership Map(s)**







**Organizational and staff expertise, qualifications and knowledge:**

Watershed Management Group has the programmatic capabilities and ability to successfully implement and manage the Sabino Creek Restoration project. The staff members and partners involved in this project are skilled educators and restoration practitioners who have fostered knowledge, skills, and passion in a diverse audience that includes both adults and youth.

All WMG staff members working on this project help teach WMG's Water Harvesting Certification course and Stream Restoration Technical Training, which focuses on techniques of water conservation that can help reduce shallow groundwater pumping and preserve riparian areas. The key staff members on this project also have combined experience in leading over 250 educational workshops with volunteers to implement a variety of green technologies at residential, neighborhood, and stream restoration sites.

Organizational experience and past history: WMG has the ability to successfully implement the Sabino Creek Restoration Project. We have a history of success in running a wide variety of watershed management, restoration planning, and educational programs in Arizona, New Mexico, California, and internationally, including 1) development of public rainwater harvesting demonstration sites, 2) residential rain gardens and rain tank projects, 3) river restoration planning, project design and implementation, monitoring, and community engagement, 4) Water Harvesting Design Certification courses, 5) K-12 schoolyard rainwater harvesting and restoration projects, and 6) green stormwater infrastructure (GSI) and low impact development (LID) planning, design, and project implementation. These programs and projects have been funded through a range of federal and state government grants, foundation grants, private donations, and fees for service.

WMG's River Run Network program, launched December 2016 with a programmatic purpose to restore seasonal and annual surface flow and riparian habitat to Tucson's rivers and creeks, has realized many program successes early on. In the first year of the program we had over 500 members pledge to take action to restore rivers by reducing water demand, implementing water harvesting features, and/or advocating to friends and neighbors. Currently we have over 960 members. Members are assigned to the subwatershed they live in and provided specific information to their subwatershed on what actions are most impactful. Additionally, through the River Run Network we have spearheaded the convening of two Tucson Basin watershed forums (a 3<sup>rd</sup> is planned for October 18th) that included over 70 participants representative of a range of water resource managers, planners, practitioners, agencies, organizations, and more. Through funding from US Fish and Wildlife Service, National Fish and Wildlife Foundation, American Rivers, and Pima County Regional Flood Control we have been able to develop restoration plans, implement restoration projects, and provide outreach and educational activities to residents throughout the basin including several projects in Sabino Creek as mentioned prior.

Beyond our River Run Network program additional highlights of program accomplishments over the past five years include:

- Created dozens of green infrastructure demonstration sites in public, residential, and commercial settings through public volunteer and professional training workshops in Arizona, New Mexico, and Sonora, Mexico.

- Developed K-12 rainwater harvesting curriculum and implemented hands-on rain garden installation projects with over a dozen K-12 public schools in Tucson and Phoenix. Currently we are working with 16 high school teachers, representative of 11 schools, through a 4-year NOAA climate literacy grant to co-develop curriculum and implement schoolyard rainwater harvesting and restoration projects.
- Led technical trainings on stream restoration techniques and over a half dozen stream restoration projects.
- Trained 200+ professionals from across the US, Canada, and Mexico through our 7-day Water Harvesting Certification program (the only one of its kind in the nation).
- Through our unique Co-op program we have implemented affordable backyard sustainability projects with families through a sweat equity model; we have run 195 half-day workshops in Tucson and Phoenix since 2008 to install cisterns, greywater systems, erosion control and one-rock dams, vegetable gardens, chicken coops, and native habitat gardens.
- Published a 2<sup>nd</sup> edition of the most comprehensive guide on green infrastructure in the Southwest, “Green Infrastructure for Southwestern Neighborhoods,” which downloaded more than 1,000 times and has been translated into Spanish.

#### Key Personnel

**Catlow Shipek, Policy and Technical Director and WMG Co-Founder**, will advise on the technical, design, restoration planning, and educational components of the program, as well as lead hands-on restoration activities. Catlow brings a diverse range of skills to this project, including substantial experience leading hands-on resource management workshops, designing green stormwater infrastructure, managing federal grants, developing outreach materials, and working with low-income and disadvantaged populations through community-based conservation projects in the U.S. and abroad. Catlow has technical experience in soil conservation and management through 5 years of work with the Southwest Watershed Research Center as a technician studying applied restoration applications to mitigate soil erosion and sedimentation. Catlow has worked with the City of Tucson to develop green infrastructure design details and with State of Arizona regulators to develop site-built residential composting toilet designs, and brings a wealth of knowledge about the basis and design of watershed restoration features to the project.

**Trevor Hare, Restoration Biologist and Restoration Project Manager**, will lead the restoration planning, prioritization, and project design, implementation and monitoring. Trevor graduated from the University of Arizona in 1991 with a degree in Ecology. For ten years he studied the impacts of suburban development on rattlesnakes and Gila monsters. Trevor has practiced riparian and upland restoration across the Sky Island Region for the past 25 years and developed a robust methodology for the assessment, planning and design of restoration projects, which has resulted in over \$2,000,000 of on the ground restoration work in SE Arizona, SE New Mexico and northern Sonora. Trevor serves as the Science Advisor for the Coalition for Sonoran Desert Protection, and sits on the Pima County Conservation Acquisition Commission. In addition he led the Ciénega Watershed Partnership restoration prioritization process and is now leading the implementation of eight restoration projects with federal and state grant funds.

**Jamie Manser, Communications and Public Relations Manager**, will coordinate and help develop outreach materials, and promote events. Jamie brings a strong background in written communications and direct outreach to promote sustainability and community building in a way that has direct impacts for human communities and the natural environment. Jamie received a B.A. in Journalism, with a minor in Ecology and Evolutionary Biology, from the UA in 1997. Jamie's professional background includes communications, public relations and community events. She has worked with the Downtown Tucson Partnership, KXCI Community Radio, and UA's Confluence Center for Creative Inquiry. She was the co-founder and editor of Zócalo Magazine and was the inaugural Program Director for 2nd Saturdays Downtown from May 2010-November 2015.

### **Contracted Consultants**

Laural Lacher, Lacher Hydrological Consulting, specializing in groundwater modeling to support baseflows in desert streams, water resources investigation, and water supply development for government entities. Areas of expertise include: groundwater modeling, drought analysis, surface water modeling, flood-plain mapping, water supply well design and development, aquifer testing, and natural resources and water utility policy development.

Natural Channel Design, Inc. is a civil engineering / environmental engineering consulting firm with an interdisciplinary team of civil engineers and natural resource specialists. We provide services in conservation engineering, restoration ecology, natural resource planning and river engineering and weed management.

Van Clothier, Stream Dynamics, Inc., specializes in turning runoff and erosion problems into water harvesting opportunities with water harvesting earth works, urban stormwater retrofits, and riparian and wetland restoration in both urban and wildland settings.

**List of government funded assistance agreements:** WMG has received six federal grants awards of similar size, scope and relevance to this proposal.

1. Bureau of Reclamation WaterSMART Grant, awarded in August 2018, Grant Title: Forming a Tucson Basin-Santa Cruz Watershed Collaborative and Restoration Plan, 2 year grant with a total budget of \$99,847.
2. Bureau of Reclamation WaterSMART Grant, awarded in September 2017 to the Ciénega Watershed Partnership and WMG, Grant Title: Implementing the Cooperative Watershed Restoration Plan for the Cienega Watershed in Southeastern Arizona, 2 year grant with a total budget of \$92,362
3. NOAA Climate Literacy Grant, awarded in 2016 and initiated January 2017, Grant Title: Recharge the Rain: Community Resilience through STEM education, Grant Award # NA16SEC0080003, 4-year grant with a total budget of \$498,575. This grant is currently just over 1.5 years of the 4 years and is on track for outputs and budget for a successful completion as outlined in the grant scope of work.

4. Border 2020 Grant, awarded in 2015, Grant Title: Strengthening Local Capacity in Nogales, Sonora to Integrate Green Infrastructure for Sediment Control, Grant Award # TAA15-044, 15 month project budget of \$53,927. This grant was successfully managed and completed in May 2017.

5. EPA EE Grant: awarded in 2010, Grant Title: Community-Based Green Streets – Green Neighborhoods Project, Grant Award #NE-83484001-0, Project Budget of \$75,734. This grant was successfully managed and completed in March 2012.

6. EPA EE Grant: awarded in 2011, Grant Title: Closing the Nutrient Loop: A Community Desert Soils Education and Action Program, Grant Award #00T5881, Project Budget of \$165,032. This grant was successfully managed and completed in May 2014.

The three grants listed which have been completed were successfully managed and met all reporting requirements, including adequate and timely progress reports on achievement of the expected outputs and outcomes of the agreements and acceptable final technical reports.

WMG staff successfully manages and completes these types of agreements by developing detailed work plans for accomplishing the vision, goals, outputs and outcomes of the agreements and implementing work plans in a timely, professional manner. Another key to WMG's success in meeting the objectives of these agreements is a high level of collaboration among staff members, as well as creative collaboration and clear communication with multiple project partners. WMG also has the detailed accounting system and other administrative infrastructure, including a full-time finance manager and administrative staff member, necessary to support the successful management of grant agreements of this proposal's structure and scope.



**Sabino Creek. Hughes Parcel. 2007 - Post 2006 Flood.**



**Sabino Creek. Hughes Parcel. Feb 14, 2009**



**Sabino Creek. Woodin Parcel. Mid 1950s**



**Sabino Creek. Woodin Parcel. April 2008**



**Sabino Creek. At Hidden Valley HOA Park. Feb 2015**



**Sabino Creek. At Cloud Road. Feb 2015**

**Existing Plans, Reports, Information Relevant to the Project (summary paragraph for each plan/report with relevant portion or full report attached as an appendix)**

Pima Association of Governments has produced a number of reports on shallow groundwater areas including:

Sonoran Desert Conservation Plan: GIS Coverages of Perennial Streams, Intermittent Streams and Areas of Shallow Groundwater. January 2000.

Sonoran Desert Conservation Plan: Water Usage along Selected Streams in Pima County, Arizona. July 2000.

Bingham Cienega Source Water Study. February 2001.

Water Usage near Shallow Groundwater in Pima County. March 2007.

Groundwater Withdrawals in Shallow Groundwater Areas: Eastern Pima County, Arizona 1984-2006. September 2008.

Shallow Groundwater Areas in Eastern Pima County, Arizona: Water Well Inventory and Pumping Trend Analysis. October 2012

As noted above Pima County, Pima Association of Governments, and Sonoran Institute have all been involved in recent work on shallow groundwater areas. In addition Pima County's Ecological Monitoring Program is monitoring groundwater, habitats, and species in priority areas (<http://www.pima.gov/cmo/sdcp/monitoring/>).

Arizona Land and Water Trust actively works throughout the region on the protection of open space and prioritizes areas with shallow groundwater and riparian habitats.

The Nature Conservancy is active in protecting and restoring shallow groundwater areas to benefit the San Pedro River.

The Central Arizona Phoenix Long-term Ecological Research Project is studying how urbanization and community norms impact desert systems including riparian areas.

In the Riparian Protection Technical Paper Water and Wastewater Infrastructure, Supply and Planning Study, Phase II. May 2009, the City of Tucson and Pima County explored opportunities for protecting environmentally sensitive natural riparian areas in Eastern Pima County connected to areas of shallow groundwater and perennial and intermittent streams supporting unique riparian vegetation. They noted that "multiple benefits accrue from protecting these sensitive areas, including slowing flood flows, reducing and preventing erosion, improving water quality, and conserving wildlife habitat, recreational opportunities, and scenic values."

Recommendations included:

- Continue exploring options for protection and enhancement of environmentally sensitive shallow groundwater areas.
- Evaluate the effectiveness of City and County programs and policies regarding the protection of environmentally sensitive areas from groundwater withdrawal, surface water diversions and riparian impairment.
- Where legally possible, prohibit new non-exempt wells and limit pumping of new exempt groundwater wells within and near shallow groundwater ecosystems.
- Initiate a public awareness and conservation campaign targeting exempt well owners in

- sensitive shallow groundwater areas to educate them on the important connection
- between water and riparian areas.
- The County, City, other jurisdictions and/or local water providers need to support water
- level data collection and aquifer monitoring programs in shallow groundwater areas.

The Water Resources Research Center at the University of Arizona has two projects, among many, that have direct connections to this proposed project - The Desert Water Harvesting Initiative and The Connecting Environmental Water Needs to Arizona Water Planning project.

The Desert Water Harvesting Initiative enhances outreach and communication between utilities, practitioners of water harvesting, academics, and interested citizens. The Initiative includes a two-year WaterSMART research grant to develop a decision guide to rainwater and stormwater harvesting; an online data clearinghouse for research and publications on water harvesting, low-impact development, and green infrastructure; and the Rainwater-Stormwater Professionals Networks that meets semi-annually at the WRRC to keep members abreast of current and planned activities, resources, and data. The tools developed through this project are aimed primarily at professionals and decision makers and will be very useful in our outreach to those groups, and as a model for the development of outreach strategies to community members. The project website -<https://wrrc.arizona.edu/DWHI>, has some preliminary resources, with the final products coming online late this year.

The Connecting Environmental Water Needs to Arizona Water Planning project uses information from the WRRC's 2010 Arizona Environmental Water Needs Assessment and other resources to collaborate with individuals and groups at the local, regional and state levels to explore what it means to consider the environment in water planning. The project has three aspects: 1) provide information on environmental water demands; 2) provide technical support to communities for their water management and planning; and 3) create a stakeholder driven "Roadmap" for considering the environment in Arizona water planning and management. With the goal to establish dialog among water users about voluntary, stakeholder-driven options for addressing the environment in the context of limited water supplies and existing water rights.

The Sonoran Institute has on going work on shallow groundwater areas through their Santa Cruz River Initiative with four components: Science-based Outreach; Water Harvesting and Restoration; Innovative Policy; and Water for the Environment  
<http://www.sonoraninstitute.org/where-we-work/southwest/santa-cruz-river.html>

Pima County Office of Sustainability and Conservation has ongoing monitoring, as described above, in priority shallow groundwater areas. Pima County Regional Flood Control has management responsibility for many parcels of land in shallow groundwater areas. Flood Control has two .5 FTEs assigned to the management of these areas where they have holdings and over the next two years will be developing management plans for each property or complex of properties. They participated in the Joint City of Tucson and Pima County Water and Wastewater Study Oversight Committee that produced the recommendation cited above. Flood Control staff is very excited about this project and has pledged significant involvement in this project.

The proposed restoration efforts fits in well with efforts (see letters of support) to eradicate a previously widespread invasion of *Arundo donax* or Giant cane in Sabino Creek, an effort that also has garnered AWPf support (WPF 14-182). Their proposal to better understand the water budget of the watershed will help put this effort into perspective, particularly the likely redistribution of previously transpired *Arundo* water toward the health and regeneration of more native species. This effort (mostly prior to AWPf support) has logged about 10,000 volunteer hours, possibly removing 100,000 cane stems, which possibly were transpiring a million gallons (~3 af) of water a year.

**Letters of Community Support**

Please see attached letters of support

**Evidence of Control and Tenure of Land including legal access**

Please see attached Landowner Agreement template. We will secure individual agreements on access, and obtain evidence of control and tenure with landowners with restoration sites selected.

**Table of project task timeline.**

Task	Project Quarter and Year															
	2019				2020				2021				2022			
	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16
1	█															
2	█															
3	█															
4				█												
5	█															
6								█								
7									█							
8													█			

**Citations:**

Munné et al. 2003. A Simple Field Method for Assessing the Ecological Quality of Riparian Habitat in Rivers and Streams: A QBR Index. *Aquatic Conservation: Marine and Freshwater Ecosystems* 13: 147-163

Pima Association of Governments (PAG). 2000a. Sonoran Desert Conservation Plan: GIS Coverages of Perennial Streams, Intermittent Streams and Areas of Shallow Groundwater. January 2000.

Pima Association of Governments (PAG). 2012. Shallow Groundwater Areas in Eastern Pima County, Arizona. October 2012.

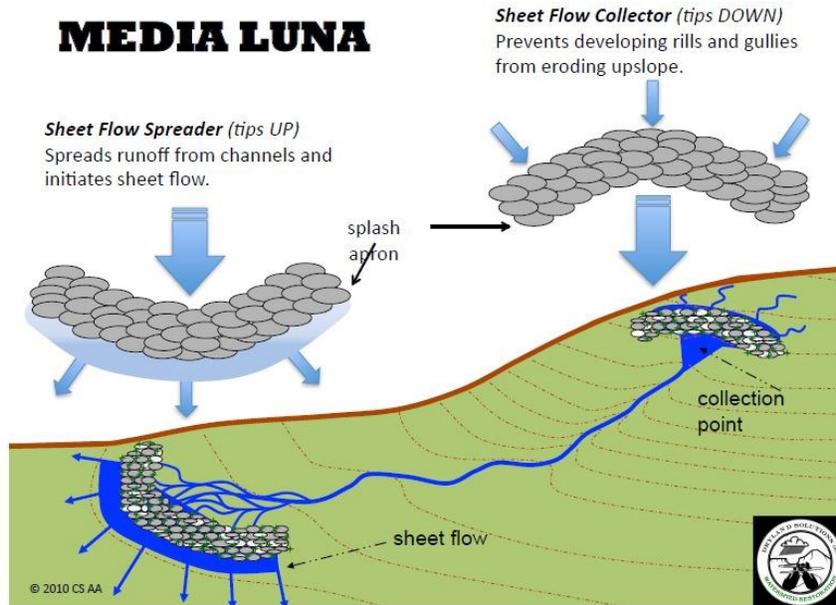
Stacey et al. 2006. User's Guide for the Rapid Assessment of the Functional Condition of Stream-Riparian Ecosystems in the American Southwest. Wild Utah Project.

USDI. 2015. Riparian area management: Proper functioning condition assessment for lotic areas. Technical Reference 1737-15. Bureau of Land Management, National Operations Center, Denver, CO.

Winward AH. 2000. Monitoring the vegetation resources in riparian areas. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Ogden, UT

Zeedyk and Clothier 2012. Let the Water do the Work: Induced Meandering, an Evolving Method for Restoring Incised Channels Quivera Coalition. Santa Fe, NM.

**Appendix: Descriptions of restoration structures and functions.**



**Media Lunas** are used to manage sheet flow and prevent erosion. These “sheet flow spreaders” are used on relatively flat ground to disperse erosive channelized flow and reestablish sheet flow where it once occurred. They are made appropriately sized rocks, generally 4-10”, and are one rock tall with the bottom row acting as a footer, dug in, and subsequent rows offsetting the previous row to get good a good locking structure that will capture sediment and provide germination sites for native plants.

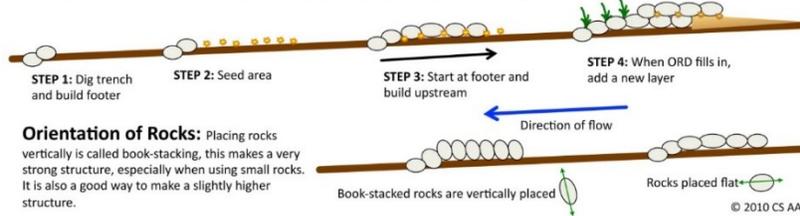
# ONE ROCK DAM "ORD"



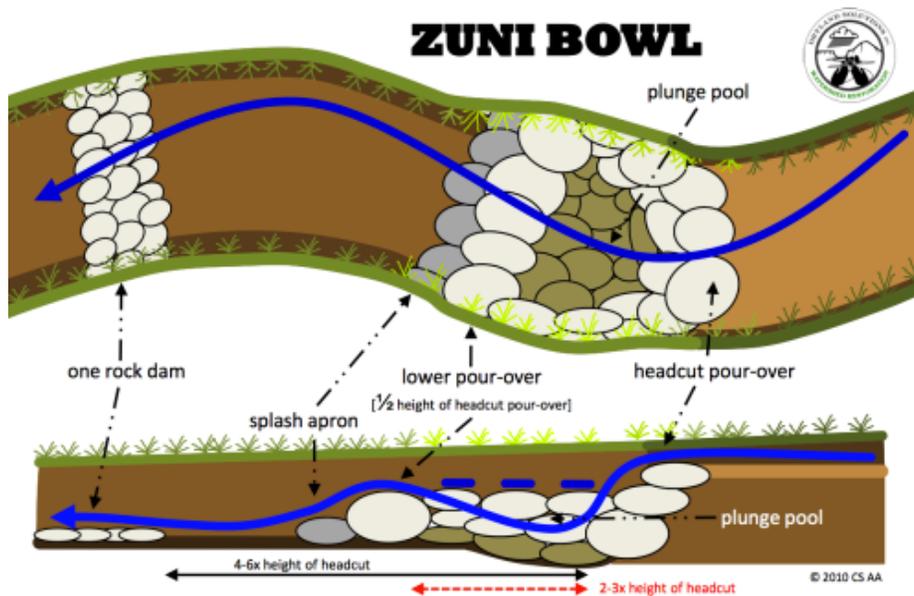
A low grade control structure built with a single layer of rock on the bed of the channel. ORDs stabilize the bed of the channel by slowing the flow of water, increasing roughness, recruiting vegetation, capturing sediment, and **gradually** raising the bed level over time. ORDs are also passive water harvesting structures. The single layer of rock is an effective rock mulch that increases soil moisture, infiltration, and plant growth. Original concept developed by Bill Zeedyk.

## Design & Construction

1. Select area to build the ORD; dig a shallow footer trench and fill with one or two rows of rock, so that no rock protrudes more than 2 in/5cm above the bed of the channel. This will serve as the **splash apron** for the ORD.
2. Scatter native grass and wildflower seeds in the area where the ORD is to be built.
3. Start building at the footer and continue upstream, laying down one layer of rock horizontally, as if you were building a rock wall.
4. Once the ORD is completely filled with sediment, another layer can be added to further raise the bed of the channel and capture more sediment. The original ORD becomes the splash apron for the new layer.



**One-Rock Dams** are small grade control and flow slowing structures that are only one rock high. The dams should be built with several rows of rock across from the up-stream to the downstream edge. Stones are selected, sized, and placed so that the completed structure ends up relatively level from bank to bank and flat from the upstream edge to the downstream edge. This is accomplished by placing larger rocks in the deepest part of the channel and as a footer row, and then smaller ones to either side. Placing greatly oversized rocks in the structure will generate turbulence that could undermine it. Flood flows will pack smaller-sized bedload particles between the rocks, gradually strengthening the structure over time as new vegetation begins to develop at the site.



**Zuni Bowls** are a headcut control structure composed of rock lined stepfalls and plunge pools that prevent headcuts from continuing to migrate upstream. Zuni Bowls stabilize actively eroding headcuts by dissipating the energy of falling water at the headcut pour over and the bed of the channel. The structure converts the single cascade of an eroding headcut into a series of smaller step falls. Zuni Bowls also serve to maintain soil moisture on the face of the headcut, encouraging the establishment of protective vegetation.

**From:** Trevor Hare  
**To:** [Reuben.Teran](mailto:Reuben.Teran)  
**Subject:** Fwd: Letter of Support for enhancing flow of Sabino Creek  
**Date:** Friday, September 7, 2018 2:41:56 PM

---

Reuben -one of our partners on our Sabino Canyon work is this HOA and I don't think anybody on their board can figure out how to PDF and email a document! Thank you -Trevor

----- Original Message -----

From: NOREEN NELSON <[nelson2772@comcast.net](mailto:nelson2772@comcast.net)>  
To: [thare@watershedmg.com](mailto:thare@watershedmg.com)  
Cc: Pete Cinquemani <[fivehands@theriver.com](mailto:fivehands@theriver.com)>  
Date: September 7, 2018 at 12:18 PM  
Subject: Letter of Support for enhancing flow of Sabino Creek

Dear Trevor: On behalf of the Hidden Valley Homeowner's Association we offer our support of efforts to restore Sabino Creek. We have a significant interest in WMG's efforts because we are stewards of a 12.5 nature preserve which is on Sabino Creek. The property was deeded to the Hidden Valley HOA in perpetuity but the original developer of Hidden Valley, Mr. Wesley Miller.

Since then our HOA has been engaged in numerous efforts with a number of community partners such as WMG, the Nature Conservancy and the Arizona State Forest Service to protect, preserve and restore Sabino Creek.

We estimate the value of time and effort involved in this effort on the part of our HOA to be approximately \$5,000.

Sincerely,

Norie Nelson

President, Hidden Valley Homeowner Association, Inc

--

Trevor Hare | River Restoration Biologist | Watershed Management Group  
Office: 520 396-3266 x12 Cell: 520 906-9854  
***Join the River Run Network! -- [RRN](#)***  
***[Donate to WMG](#)***

Carol and Michael Parker  
2525 N. Central Road  
Tucson, AZ 85750

August 29, 2018

Re: Support for Watershed Management Group's Proposal for Enhancing flow in the Sabino Creek Shallow Groundwater Area through a holistic community-based approach

To Whom It May Concern,

As property owners of 100+ beautiful acres along lower Sabino Creek, much of it preserved in its natural state, we strongly believe in the mission of Watershed Management Group's efforts to restore this riparian area by protecting and enhancing surface flows in the creek area. As our environment warms and dries due to climate change, this unique habitat comes under increasing stress.

To this end, we already are making monthly donations to Watershed Management. In addition we participate in the organization's River Run flow monitoring program, and we also participate in their monitoring of ground water levels using one of our wells.

We strongly support Watershed Management Group's grant proposal to the Arizona Water Protection Fund.

The proposal to restore Sabino Creek and its stated mission to pilot a holistic community-based restoration model in lower Sabino Creek to preserve and enhance surface flows in Shallow Groundwater Areas fits well with our vision as landowners.

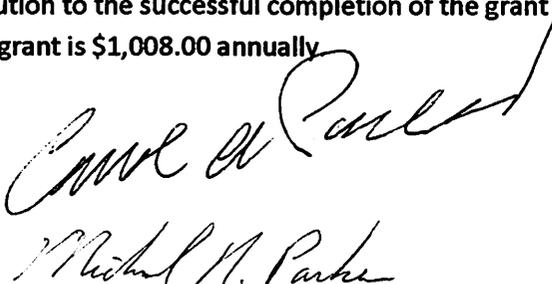
With support from many partnerships WMG is developing policy and advocacy initiatives to link individual water conservation efforts to local riparian restoration, with an emphasis on surface flow enhancement.

Funding received from the Arizona Water Protection Fund will enable WMG to expand the early stages of this initiative into a long-term project. WMG's success is critical to our mutual efforts to preserve and restore surface flows in an expanding dryland, urban environment. This goal reflects the greater regional need to reduce urban water consumption, and the environmental and economic impacts associated with water withdrawals and diversions. Additionally, on-the-ground conservation and restoration actions as proposed will kickstart local appreciation for the benefits of healthy urban watersheds and communities, which in turn fosters long-term behavior change and social adaptation to resilient dryland living.

The estimated value of our contribution to the successful completion of the grant objectives to be counted toward the match for this grant is \$1,008.00 annually

Sincerely,

Carol and Michael Parker

Handwritten signatures of Carol and Michael Parker. The signature of Carol is written in cursive and is positioned above the signature of Michael, which is also in cursive.

Michael Woodin  
[REDACTED]  
Tucson, AZ 85750

September 6, 2018

Re: Support for Watershed Management Group's Proposal for "Protecting and restoring habitat and surface flow to lower Sabino Creek, a critical shallow groundwater area"

To Whom It May Concern,

I am writing as a landowner on Sabino Creek to convey our support for Watershed Management Group's grant proposal to the Arizona Water Protection Fund.

The proposal to restore Sabino Creek and its stated mission to preserve and restore lower Sabino Creek, a critical remaining riparian wildlife linkage, through a holistic community-based restoration effort.

With support from many partnerships WMG is engaging landowners and groundwater users to link individual water conservation and arroyo enhancement efforts to local riparian restoration, with an emphasis on surface flow enhancement.

Funding received from the Arizona Water Protection Fund will enable WMG to expand this initiative throughout the Sabino Creek shallow groundwater area to make a significant long-term impact. WMG's success is critical to our mutual efforts to preserve and restore surface flows in an expanding dryland, urban environment. This goal reflects the greater regional need to reduce urban water consumption, and the environmental and economic impacts associated with water withdrawals and diversions. Additionally, on-the-ground conservation and restoration actions as proposed will kickstart local appreciation for the benefits of healthy urban watersheds and communities, which in turn fosters long-term behavior change and social adaptation to resilient dryland living.

Sincerely,

Michael Woodin

Hughes Family Trust



Tucson AZ 85749

August 31, 2018

Re: Support for Watershed Management Group's Proposal for "Protecting and restoring habitat and surface flow to lower Sabino Creek, a critical shallow groundwater area"

To Whom It May Concern,

I am writing as a landowner along Sabino Creek to convey our support for Watershed Management Group's grant proposal to the Arizona Water Protection Fund. We have owned a portion of this Tucson gem since the early 60's. Protection and restoration of the watershed is important to our family.

The proposal to restore Sabino Creek and its stated mission to preserve and restore lower Sabino Creek, a critical remaining riparian wildlife linkage, through a holistic community-based restoration effort.

With support from many partnerships WMG is engaging landowners and groundwater users to link individual water conservation and arroyo enhancement efforts to local riparian restoration, with an emphasis on surface flow enhancement.

Funding received from the Arizona Water Protection Fund will enable WMG to expand this initiative throughout the Sabino Creek shallow groundwater area to make a significant long-term impact. WMG's success is critical to our mutual efforts to preserve and restore surface flows in an expanding dryland, urban environment. This goal reflects the greater regional need to reduce urban water consumption, and the environmental and economic impacts associated with water withdrawals and diversions. Additionally, on-the-ground conservation and restoration actions as proposed will kickstart local appreciation for the benefits of healthy urban watersheds and communities, which in turn fosters long-term behavior change and social adaptation to resilient dryland living.

We are excited to partner and will assist with outreach to our neighbors along Sabino Creek.

Sincerely,

Brad and Janice Hughes

[REDACTED]  
Tucson, AZ 85749  
6 September 2018

Re: Support for Watershed Management Group's Proposal for "Protecting and restoring habitat and surface flow to lower Sabino Creek, a critical shallow groundwater area"

To Whom It May Concern,

I am writing as a landowner near Sabino Creek to convey our support for Watershed Management Group's grant proposal to the Arizona Water Protection Fund.

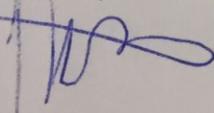
The proposal to restore Sabino Creek and its stated mission to preserve and restore lower Sabino Creek, a critical remaining riparian wildlife linkage, through a holistic community-based restoration effort.

With support from many partnerships WMG is engaging landowners and groundwater users to link individual water conservation and arroyo enhancement efforts to local riparian restoration, with an emphasis on surface flow enhancement.

Funding received from the Arizona Water Protection Fund will enable WMG to expand this initiative throughout the Sabino Creek shallow groundwater area to make a significant long-term impact. WMG's success is critical to our mutual efforts to preserve and restore surface flows in an expanding dryland, urban environment. This goal reflects the greater regional need to reduce urban water consumption, and the environmental and economic impacts associated with water withdrawals and diversions. Additionally, on-the-ground conservation and restoration actions as proposed will kickstart local appreciation for the benefits of healthy urban watersheds and communities, which in turn fosters long-term behavior change and social adaptation to resilient dryland living.

We are excited to partner and will assist with outreach to our neighbors in Bear Creek Ranch and Estates.

Sincerely,



Tasha Pontifex

**File Code:** 2900; 2520  
**Date:** September 5, 2018

Dear Arizona Water Protection Fund:

The Santa Catalina Ranger District is pleased to support Watershed Management Group's (WMG) Proposal for "Protecting and restoring habitat and surface flow to lower Sabino Creek, a critical shallow groundwater area."

Sabino Creek, once perennial, is an ephemeral stream, flowing an average of 294 days per year. Its headwaters begin on the top of Mt. Lemmon and the creek ends when it reaches Tanque Verde Creek. Sabino Creek, along with several others, help charge the Tucson Basin Aquifer.

With support from many partnerships, WMG is engaging landowners and groundwater users to link individual water conservation and arroyo enhancement efforts to local riparian restoration, with an emphasis on surface flow enhancement. Funding received from the Arizona Water Protection Fund will enable WMG to expand this initiative throughout the Sabino Creek shallow groundwater area, allowing a significant long-term impact. WMG's success is critical to our mutual efforts to preserve and restore surface flows in an expanding dryland, urban environment.

The proposal has three main goals:

- Goal 1: Enhance surface runoff recharge through upstream and floodplain restoration activities.
- Goal 2: Promote water demand reduction and use of rainwater to reduce withdrawals from local wells.
- Goal 3: Remove exotic invasive species impacting riparian habitat.

This funding will play a crucial role in supporting the collaborative efforts of the Santa Catalina Ranger District and WMG in the achieving these important goals. If you have further questions, please contact Christina Pearson, Santa Catalina Range Staff, at [cpearson@fs.fed.us](mailto:cpearson@fs.fed.us) or 520-749-7706.

Sincerely,



*Acting  
for* CHARLES E. WOODARD  
District Ranger





September 4, 2018

Arizona Water Protection Fund Commission  
1110 W. Washington Street, Suite 310  
Phoenix, Arizona 85007

**Subject: Watershed Management Group's Proposal for *Protecting and Restoring Habitat and Surface Flow to Lower Sabino Creek, A Critical Shallow Groundwater Area* – Letter of Support**

To Whom It May Concern:

The Pima County Regional Flood Control District (District), as both an agency interested in the natural beneficial functions of intact floodplain areas and as a Sabino Creek landowner, would like to convey our support for Watershed Management Group's (WMG) grant proposal to the Arizona Water Protection Fund. Funding received from the Arizona Water Protection Fund will enable WMG to expand this initiative throughout the Sabino Creek shallow groundwater area to make a significant long-term impact.

The proposal is to restore Sabino Creek and its stated mission to preserve and restore the lower Sabino Creek, a critical remaining riparian wildlife linkage, through a holistic community-based restoration effort. With support from many partnerships, WMG is engaging landowners and groundwater users to link individual water conservation and arroyo enhancement efforts to local riparian restoration with an emphasis on surface flow enhancement.

WMG's success is critical to our mutual efforts to preserve and restore surface flows in an expanding dryland, urban environment. This goal reflects the greater regional need to address groundwater depletion and the environmental and economic impacts associated with water withdrawals and diversions. Additionally, on-the-ground conservation and restoration actions as proposed will kick start local appreciation for the benefits of healthy urban watersheds and communities, which in turn fosters long-term behavior change and social adaptation to resilient dryland living.

The District would partner and assist with this project by providing technical guidance and advice, as well any information on Sabino Creek's hydrology and hydraulics in order to ensure the long-term viability of these enhancement projects.

Sincerely,

A handwritten signature in blue ink that reads "S Shields". The signature is fluid and cursive.

Suzanne Shields, P.E.  
Director and Chief Engineer

SS/tj

c: Eric Shepp, P.E., Deputy Director – Regional Flood Control District  
Andy Dinauer, P.E., Deputy Director – Regional Flood Control District

8/31/2018

Re: Support for Watershed Management Group's Proposal for "Protecting and restoring habitat and surface flow to lower Sabino Creek, a critical shallow groundwater area"

To Whom It May Concern,

I have been working for ten years to remove invasive Giant cane from Sabino and Bear Creeks, in part with the support of the Arizona Water Protection Fund grant #14-182. As such, I support Watershed Management Group's grant proposal to the Arizona Water Protection Fund to "Protect and restore habitat and surface flow to Sabino creek".

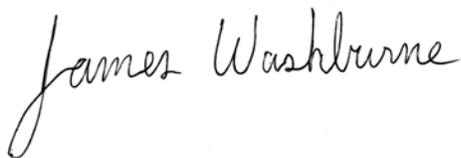
Their effort is a natural and critical progression from my effort to further protect the natural riparian conditions to further improve this watershed. The WMG already has an impressive record of engaging landowners and groundwater users in this basin to link individual water conservation and arroyo enhancement efforts to local riparian restoration with the goal of enhancing surface water flow. They expect that their project will reinforce local appreciation for the benefits of healthy urban watersheds, which in turn fosters long-term benefits to the whole community.

This plan will enable WMG to further develop this initiative throughout the Sabino Creek shallow groundwater area to make a significant long-term impact on the health of the riparian system. WMG's success is critical to our mutual efforts to preserve and restore surface flows and preserve the natural integrity of this precious ecosystem.

I am looking forward to working with WMG riparian experts to help maintain an arundo-free watershed and in the construction of off-channel rock dams to enhance infiltration and reduce erosion. In part, the labor for some of these efforts will come from associations I have with University of Arizona service clubs and a BIA Water Resources Technician Training program for Native Americans.

If you have any questions, please contact me at 520-260-2228 or [jwashburne@pima.edu](mailto:jwashburne@pima.edu)

Sincerely,



Dr. James Washburne  
Instructor and Research Scientist  
The University of Arizona and Pima Community College

SABINO CANYON VOLUNTEER NATURALISTS

September 1, 2018

Re: Support for Watershed Management Group's Proposal for "Protecting and restoring habitat and surface flow to lower Sabino Creek, a critical shallow groundwater area"

To Whom It May Concern,

On behalf of the Sabino Canyon Volunteer Naturalists, I wish to convey our support for Watershed Management Group's (WMG) grant proposal to the Arizona Water Protection Fund.

The proposal to restore Sabino Creek and its stated mission to preserve and restore lower Sabino Creek, a critical remaining riparian wildlife linkage, through a holistic community-based restoration effort, is commendable.

With support from many partnerships, WMG is engaging landowners and groundwater users to link individual water conservation and arroyo enhancement efforts to local riparian restoration, with an emphasis on surface flow enhancement.

Funding received from the Arizona Water Protection Fund will enable WMG to expand this initiative throughout the Sabino Creek shallow groundwater area to make a significant long-term impact. WMG's success is critical to our mutual efforts to preserve and restore surface flows in an expanding dryland, urban environment. This goal reflects the greater regional need to reduce urban water consumption, and the environmental and economic impacts associated with water withdrawals and diversions. Additionally, on-the-ground conservation and restoration actions, as proposed, will kickstart local appreciation for the benefits of healthy urban watersheds and communities, which in turn fosters long-term behavior change and social adaptation to resilient dryland living.

Our programs reach thousands of children and adults every year, and we appreciate the opportunity to partner with WMG in our educational efforts.

Sincerely,



Thomas H. Skinner  
Sabino Canyon Volunteer Naturalist

For:  
Ricki Mensching  
President  
Sabino Canyon Volunteer Naturalists  
5700 N. Sabino Canyon Road  
Tucson, AZ 85750