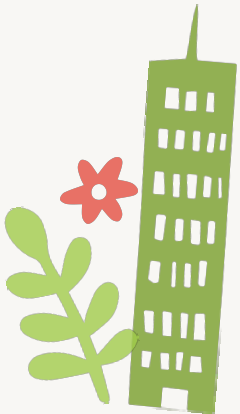
Green Stormwater Infrastructure in Urban Parks: Maintenance and Workforce

Greater & Greener | CITY PARKS ALLIANCE



CONFERENCE TRACK

Parks as Resilient Infrastructure

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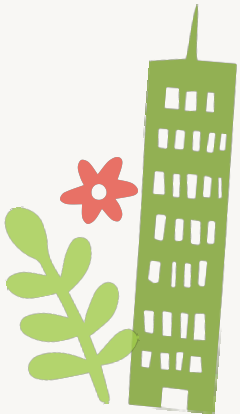

GSI Maintenance in Parks:

Successes, Challenges, and the Path to Stewardship

Austin Parks & Recreation and Austin Watershed Protection

June 15, 2026

Meet the Team!

- GSI Accelerator Wranglers:
  - Sari Albornoz (Austin Watershed Protection)
  - Meredith Gauthier (Austin Parks & Recreation)
  - Kerstin Johansson (Austin Watershed Protection)
  - Lindsey Machamer (Austin Parks & Recreation)
- Austin Youth River Watch
- Austin Equity & Inclusion, Equity Division team
  - Sheridan Ray
  - Arleni Carreño
- EcoRise
  - Elijah Scott (not pictured)
- American YouthWorks – Texas Conservation Corps and Austin Civilian Conservation Corps
  - Marina Chazco

What is Green Stormwater Infrastructure (GSI)?

Features designed to use vegetation and soils to mimic natural processes and manage rain where it falls, soaking water into the ground and filtering pollutants.

Examples include:

- Rain gardens
- Detention ponds/biofiltration ponds
- Porous pavement
- Rainwater harvesting

GSI for Austin's Cycles of Flood and Drought

- Central Texas sees both extreme flood and drought
- Parks are natural spaces amidst areas of high impervious cover
- GSI is a solution with many co-benefits
  - Flood Risk Reduction*
    - (*up to ~10yr Storm)
  - Increased habitat and biodiversity
  - Heat reduction

Duncan Park Constructed Wetland

Pharr.Tennis.Center.Rain.Garden

Norman.Sims.Park.Cistern

Colony Park Rain Garden

Drivers of Growth of GSI in Austin

- 2022 GSI Code Updates
  - GSI now required as the primary method to protect water quality for most development
- 2021 Green Building Policy Update
  - LEED Silver required for all City projects
  - SITES Certification required for Park Projects

Pease District Park

GSI Accelerator Overview

Austin

GSI Problem Statement:

The City's ability to design and install GSI far outpaces its ability to maintain it, due to systemic issues. This dynamic is resulting in a widening stewardship deficit that threatens the long-term function of these public assets.

CENTER FOR REGENERATIVE SOLUTIONS

TRUST FOR PUBLIC LAND™

GREEN INFRASTRUCTURE LEADERSHIP EXCHANGE

Major Findings: The Landscape Analysis

- Interviews with 55 City staff and community members who work on GSI
- Austin's GSI Journey has been a history of starts and stops.
- Maintenance responsibilities and asset management is fragmented across City Departments

Highland Neighborhood Park Biofiltration Pond

Root Causes & Challenges

Root Causes for GSI Challenges

- Inconsistent executive championing & the “Start – Stop” innovation cycle
- Conflicting departmental missions & “Siloed” thinking & funding
- Philosophical divide amongst experts
- Racism, classism, and capitalism dictating organizational value:
  - Which can result in systematic exclusion of Operations and Maintenance (O&M) staff from the planning and design process
  - And institutional decision-making often devaluing field expertise in favor of office-based hierarchy

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Manager - Austin Watershed Protection, Environmental Monitoring & Compliance Division

Austin

GSI Challenges

1. Maintenance Operations:
   Overstretched staff and the growing care backlog
2. Workforce Development:
   Gaps in specialized training and career paths
3. Design & Policy:
   Lack of maintenance-first standards
4. Organizational Structure:
   Unclear roles and split responsibilities
5. Conceptual Framework:
   Unclear definitions and categories
6. Asset Management:
   Fragmented Data and the GSI Information gap
7. Public Perception:
   Lack of understanding and education
8. Community Engagement:
   Missed opportunity for community stewardship.

"If we can't promise that something will be maintained, then we can't build it. We are limited by the maintenance burden. For construction, there is so much more enthusiasm and funding. But, how do we make sure that there's more of a balance and like resources available for the maintenance."

LEE SHERMAN

ENGINEER- WATER QUALITY & DRAINAGE WPD

Austin

"Things are "done to us" not "for us" or "with us" with high expectations of changing operations and equipment and procedures entirely without any coordination."

MERRIDETH JILES

PARKS GROUNDS MANAGER PARD

FELIX PADRON- PARKS GROUNDS MANAGER PARD

Austin

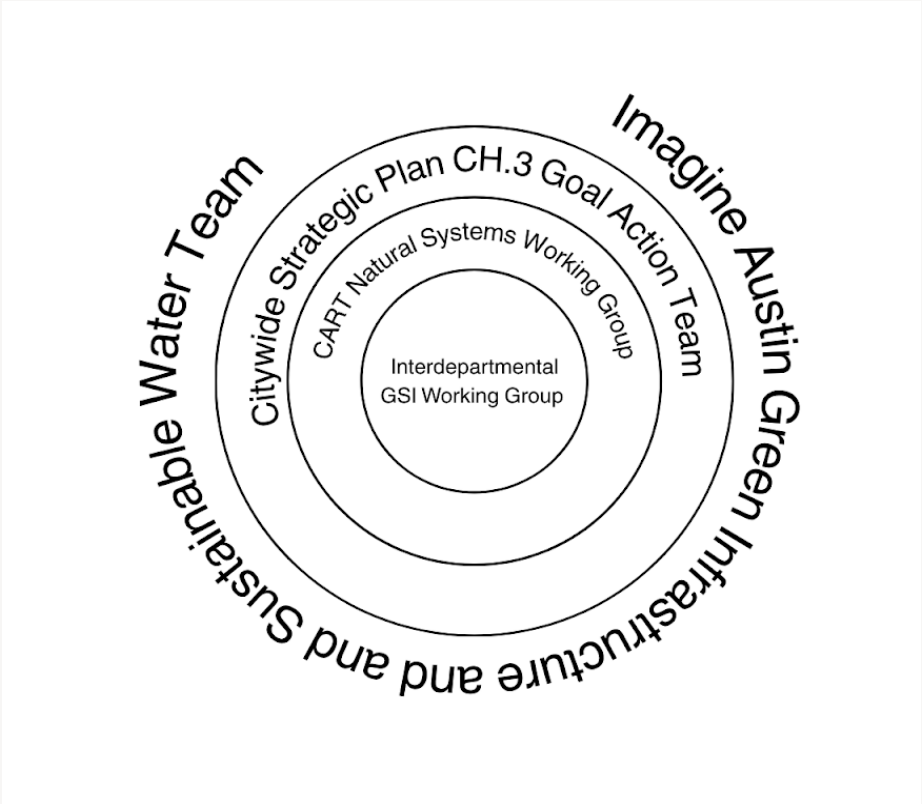
The Path Forward

Recommendations, Opportunities & Promising Starts

Recommendations- Playbook

Addressing Root Causes

- Identify an executive-level champion with a clear mandate to institutionalize GSI across departments.
- Establish a formal Interdepartmental Natural Systems & Green Infrastructure Working Group, including maintenance staff
- Adopt a Maintenance First Policy for design, implementation and maintenance
- Develop a Citywide Green Infrastructure Plan that unifies existing efforts, sets priorities, and incorporates GSI throughout.
- Adopt a unified stewardship model



Recommendations- Playbook

Adopt a unified stewardship model delivered through a coordinated green workforce development ecosystem, including a stewardship lattice

- Tiers
- Stewards
- GSI Practitioners
- Barrier Removal
- Maintenance feedback loop

Promising Starts

➡️ Listening & designing with maintenance

- Discussions between staff
- Tailored training

- Build Back Better
  - Intentionally connecting our "stewards"
  - Expanding collaborations
  - Right of Way Rain Gardens Adoption Program

- Coming together with GSI Week!

Promising Starts

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Thank You!

Green Stormwater Infrastructure in Urban Parks: Maintenance and Workforce

Greater and Greener Conference 2026

June 15, 2026

Raleigh

Raleigh, North Carolina

- Capital City
- 500,000+ residents
- #3 fastest growing city
- Wake County population growing by 66 people/day
- Neuse River - Nutrient Sensitive (not under Consent Decree)

1969 Raleigh Capital Improvement Plan

the park with a city in it

Park with a City in It, Cover

Raleigh

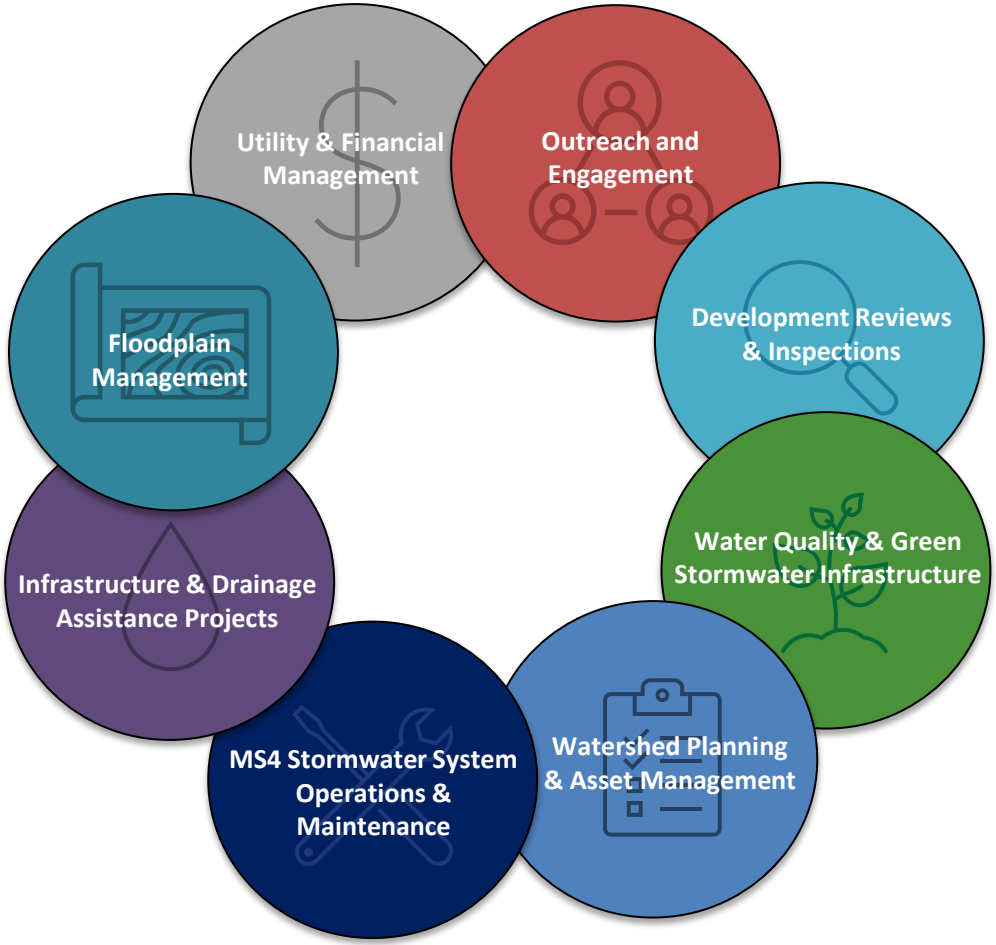
Raleigh Stormwater Mission Statement

Manage stormwater to preserve and protect life, **support healthy natural resources**, and complement sustainable growth for the community.

Vision Statement

Be the “smartest” stormwater program possible to economically and equitably achieve our mission.

Be Stormwater Smart!



Green Stormwater Infrastructure Benefits

Absorption of stormwater runoff – "Sponge City"

Filtering of stormwater pollution

Cooling of surrounding air

Filtering of air pollution

Providing wildlife/pollinator habitat

Mimics natural processes

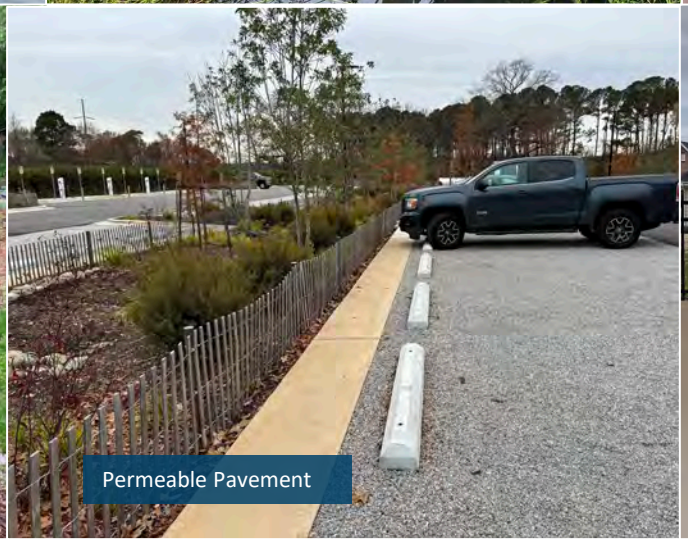
We design, fund, and maintain GSI for all City Departments!

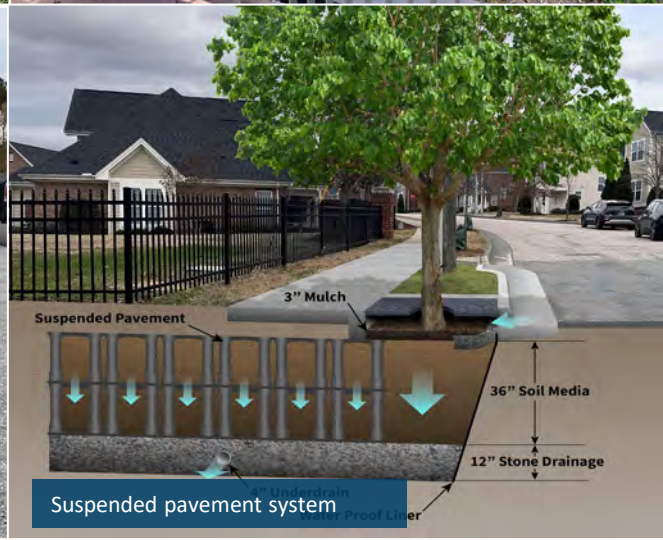

Rain barrel / Cistern


Constructed Wetland


Green Roof


Rain Garden / Bioretention Area


Permeable Pavement



Suspended pavement system

Green Stormwater Infrastructure Maintenance

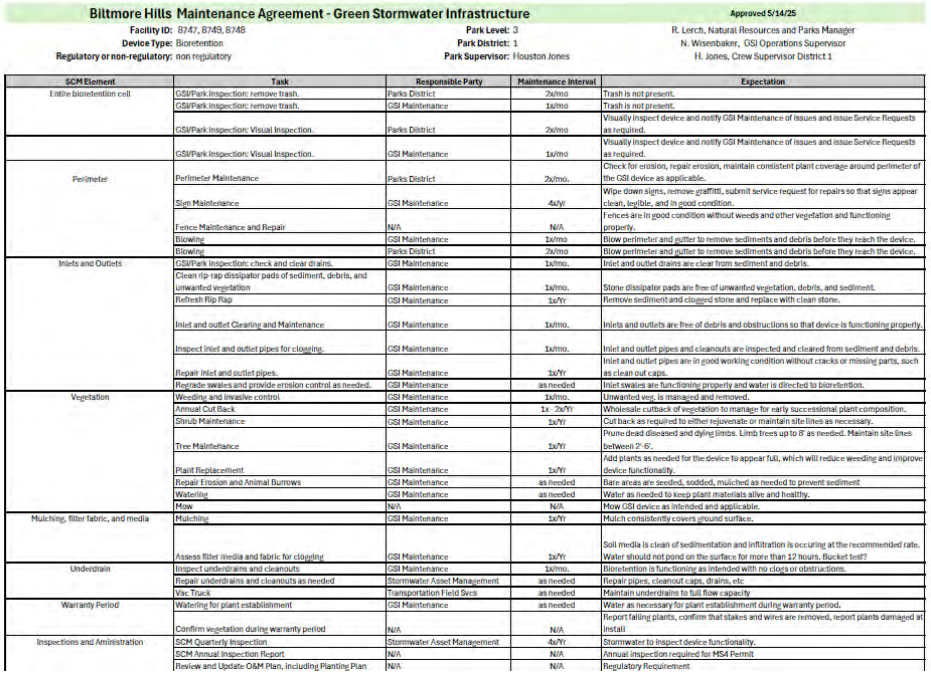
- Stormwater and Parks Staff
- Contractors
- GSI Maintenance Crew
- Volunteers

Small but Mighty Maintenance Team

- Formed in early 2025
- Hired four full time staff
- Completed over 500 Work Orders
- Maintain around 40 devices

Maintenance Agreements

- Aligned with North Carolina Department of Environmental Quality Operation and Maintenance Guidelines
- Assigns Responsible Party
- Establishes Frequencies
- Reviewed each year



Biltmore Hills Maintenance Agreement - Green Stormwater Infrastructure

Approved 5/14/25

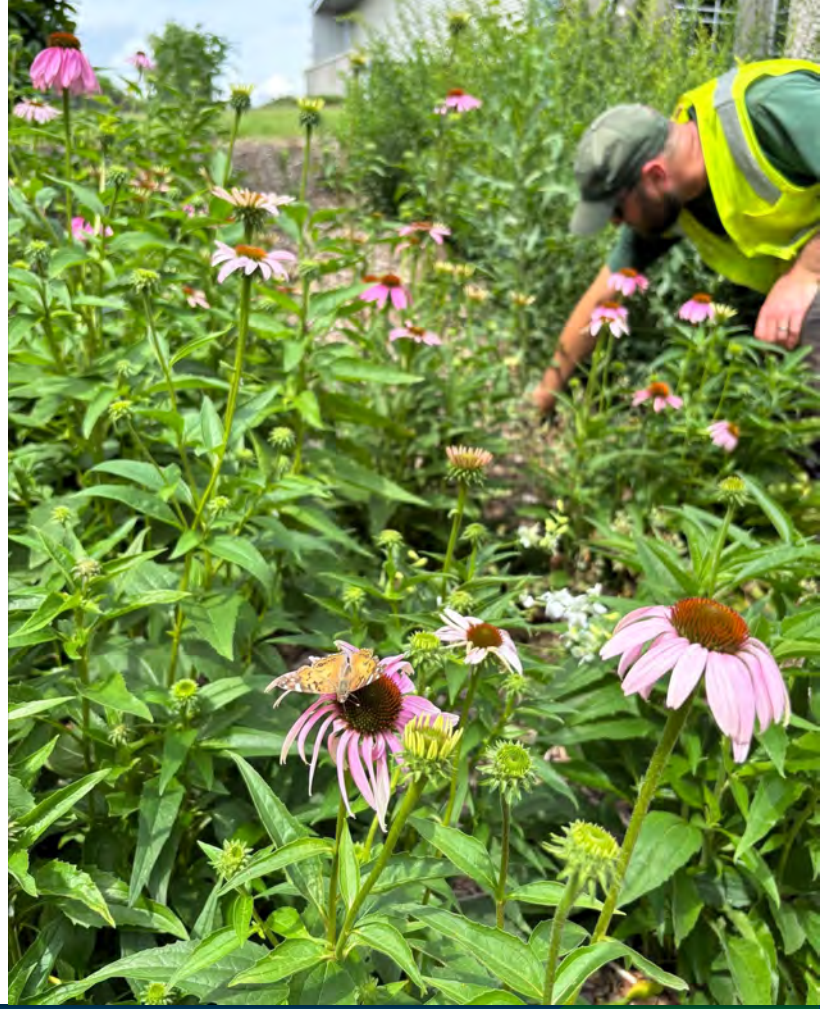
Facility ID: 8747, 8749, 8748
Device Type: Bioretention
Regulatory or non-regulatory: non regulatory
Park Level: 3
Park District: 1
Park Supervisor: Houston Jones

R. Lerch, Natural Resources and Parks Manager
N. Wisenbaker, GSI Operations Supervisor
H. Jones, Crew Supervisor District 1

SCM Element	Task	Responsible Party	Maintenance Interval	Expectation
Entire bioretention cell	GSI/Park Inspection: remove trash.	Parks District	2x/mo	Trash is not present.
	GSI/Park Inspection: remove trash.	GSI Maintenance	1x/mo	Trash is not present.
	GSI/Park Inspection: Visual Inspection.	Parks District	2x/mo	Visually inspect device and notify GSI Maintenance of issues and issue Service Requests as required.
	GSI/Park Inspection: Visual Inspection.	GSI Maintenance	1x/mo	Visually inspect device and notify GSI Maintenance of issues and issue Service Requests as required.
Perimeter	Perimeter Maintenance	Parks District	2x/mo.	Check for erosion, repair erosion, maintain consistent plant coverage around perimeter of the GSI device as applicable.
	Sign Maintenance	GSI Maintenance	4x/yr	Wipe down signs, remove graffiti, submit service request for repairs so that signs appear clean, legible, and in good condition.
	Fence Maintenance and Repair	N/A	N/A	Fences are in good condition without weeds and other vegetation and functioning properly.
	Blowing	GSI Maintenance	1x/mo	Blow perimeter and gutter to remove sediments and debris before they reach the device.
	Blowing	Parks District	2x/mo	Blow perimeter and gutter to remove sediments and debris before they reach the device.
Inlets and Outlets	GSI/Park Inspection: check and clear drains.	GSI Maintenance	1x/mo.	Inlet and outlet drains are clear from sediment and debris.
	Clean rip-rap dissipator pads of sediment, debris, and unwanted vegetation	GSI Maintenance	1x/mo.	Stone dissipator pads are free of unwanted vegetation, debris, and sediment.
	Refresh Rip Rap	GSI Maintenance	1x/Yr	Remove sediment and clogged stone and replace with clean stone.
	Inlet and outlet Clearing and Maintenance	GSI Maintenance	1x/mo.	Inlets and outlets are free of debris and obstructions so that device is functioning properly.
	Inspect inlet and outlet pipes for clogging.	GSI Maintenance	1x/mo.	Inlet and outlet pipes and cleanouts are inspected and cleared from sediment and debris.
	Repair inlet and outlet pipes.	GSI Maintenance	1x/Yr	Inlet and outlet pipes are in good working condition without cracks or missing parts, such as clean out caps.
	Regrade swales and provide erosion control as needed.	GSI Maintenance	as needed	Inlet swales are functioning properly and water is directed to bioretention.
Vegetation	Weeding and invasive control	GSI Maintenance	1x/mo.	Unwanted veg. is managed and removed.
	Annual Cut Back	GSI Maintenance	1x - 2x/Yr	Wholesale cutback of vegetation to manage for early successional plant composition.
	Shrub Maintenance	GSI Maintenance	1x/Yr	Cut back as required to either rejuvenate or maintain site lines as necessary.
	Tree Maintenance	GSI Maintenance	1x/Yr	Prune dead diseased and dying limbs. Limb trees up to 8' as needed. Maintain site lines between 2'-6'.
	Plant Replacement	GSI Maintenance	1x/Yr	Add plants as needed for the device to appear full, which will reduce weeding and improve device functionality.
	Repair Erosion and Animal Burrows	GSI Maintenance	as needed	Bare areas are seeded, sodded, mulched as needed to prevent sediment
	Watering	GSI Maintenance	as needed	Water as needed to keep plant materials alive and healthy.
	Mow	N/A	N/A	Mow GSI device as intended and applicable.
Mulching, filter fabric, and media	Mulching	GSI Maintenance	1x/Yr	Mulch consistently covers ground surface.
	Assess filter media and fabric for clogging	GSI Maintenance	1x/Yr	Soil media is clean of sedimentation and infiltration is occuring at the recommended rate. Water should not pond on the surface for more than 12 hours. Bucket test?
Underdrain	Inspect underdrains and cleanouts	GSI Maintenance	1x/mo.	Bioretention is functioning as intended with no clogs or obstructions.
	Repair underdrains and cleanouts as needed	Stormwater Asset Management	as needed	Repair pipes, cleanout caps, drains, etc
	Vac Truck	Transportation Field Svcs	as needed	Maintain underdrains to full flow capacity
Warranty Period	Watering for plant establishment	GSI Maintenance	as needed	Water as necessary for plant establishment during warranty period.
	Confirm vegetation during warranty period	N/A	N/A	Report failing plants, confirm that stakes and wires are removed, report plants damaged at install
Inspections and Administration	SCM Quarterly Inspection	Stormwater Asset Management	4x/Yr	Stormwater to inspect device functionality.
	SCM Annual Inspection Report	N/A	N/A	Annual inspection required for MS4 Permit
	Review and Update O&M Plan, including Planting Plan	N/A	N/A	Regulatory Requirement

Horticultural Expertise

- NCDA Pesticide Applicators
  - Ornamentals and Turf
  - Aquatics
- ISA Certified Arborist
- Certified Plant Professional
- Stormwater Control Measure Inspection and Maintenance



Bring Parks Values to Stormwater Management

- Water Quality
- Habitat
- Community

Green Stormwater Infrastructure Maintenance Improves Water Quality

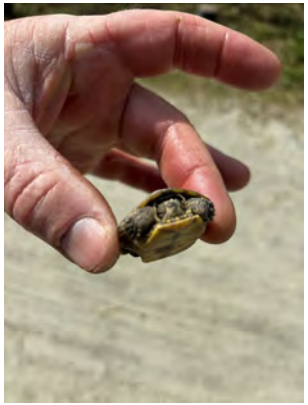
Mary Belle Pate Bioretention Maintenance

Halifax Park Bioretention Maintenance

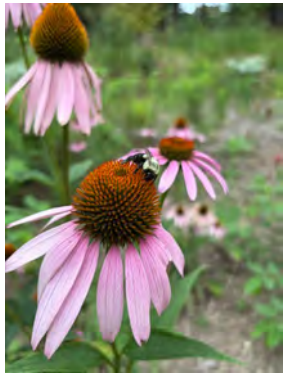
Habitat Management







Collective efforts inspire community stewardship

Workforce Development Opportunities

URBAN SUSTAINABILITY SOLUTIONS, INC

- Hosted 6 cohorts since 2025
- 6 Field Days
- 196 students and 17 teachers

Watershed Training Opportunities

PEJ
Partners For Environmental Justice

- Seven events in Walnut Creek Watershed
- GSI Warriors
- 100+ Participants

Building Community Stewards Through Volunteerism

Thank you! Questions?

Barbara Moranta, PE
Planning and Asset Manager
Barbara.Moranta@raleighnc.gov

Neal Wisenbaker, MNR
Superintendent GSI Operations
Neal.Wisenbaker@raleighnc.gov

CITY OF TUCSON
PARKS & RECREATION

Storm to Shade

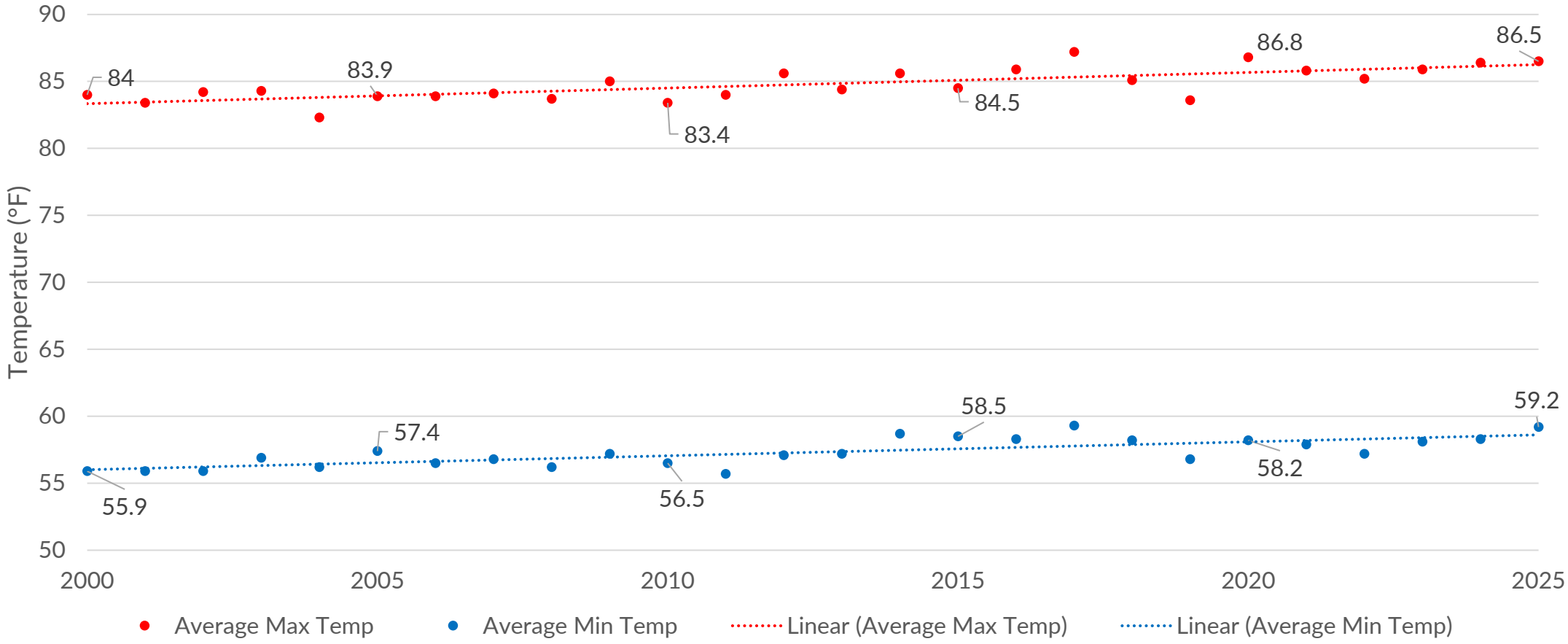
Green Stormwater Infrastructure in Urban Parks Maintenance and Workforce

June 15, 2026 Greater & Greener

Jasmine Chan, Parks & Recreation Administrator
Blue Baldwin, Storm to Shade Program Manager


Tucson, Arizona
Sonoran Desert
Southwestern United States

Average Maximum and Minimum Temperature (2000 – 2025)



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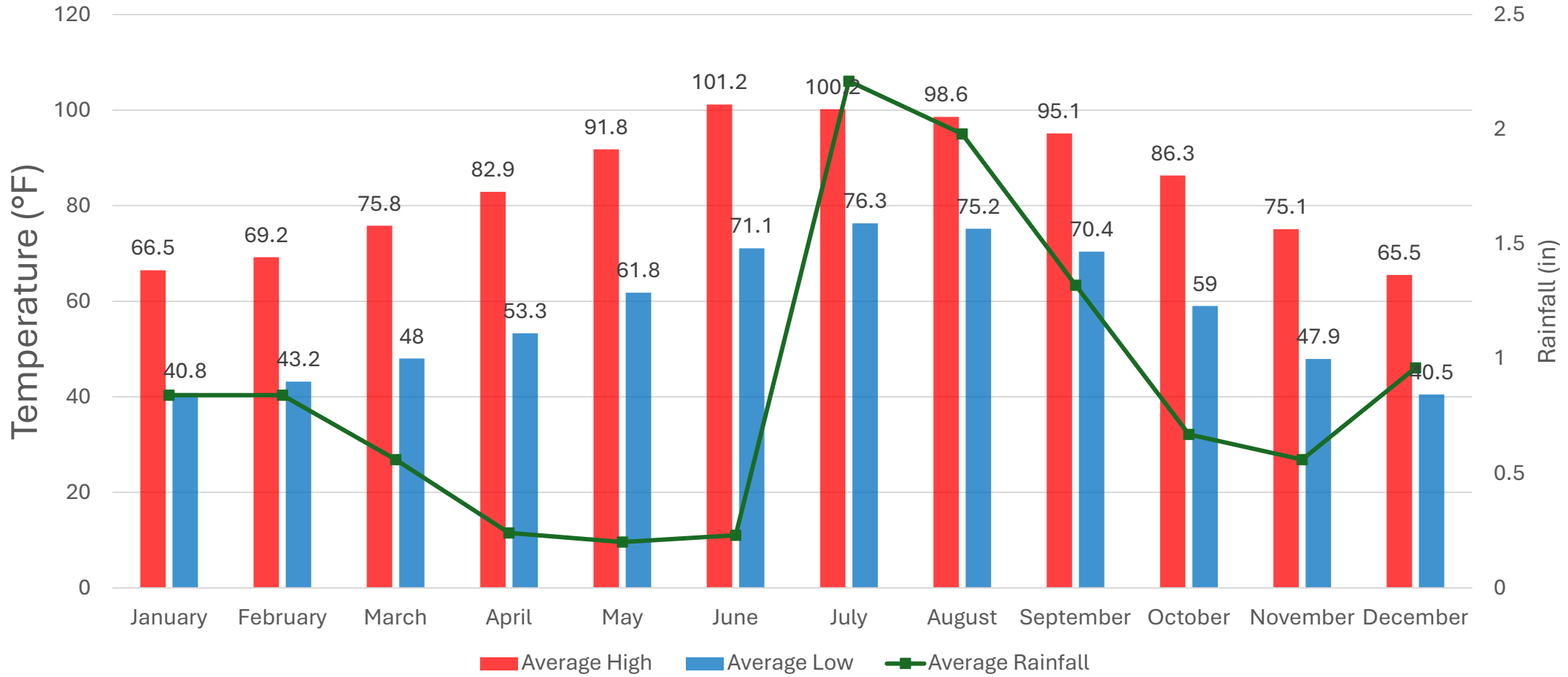
National Weather Service

Average Monthly Temperatures and Rainfall (1991-2020)



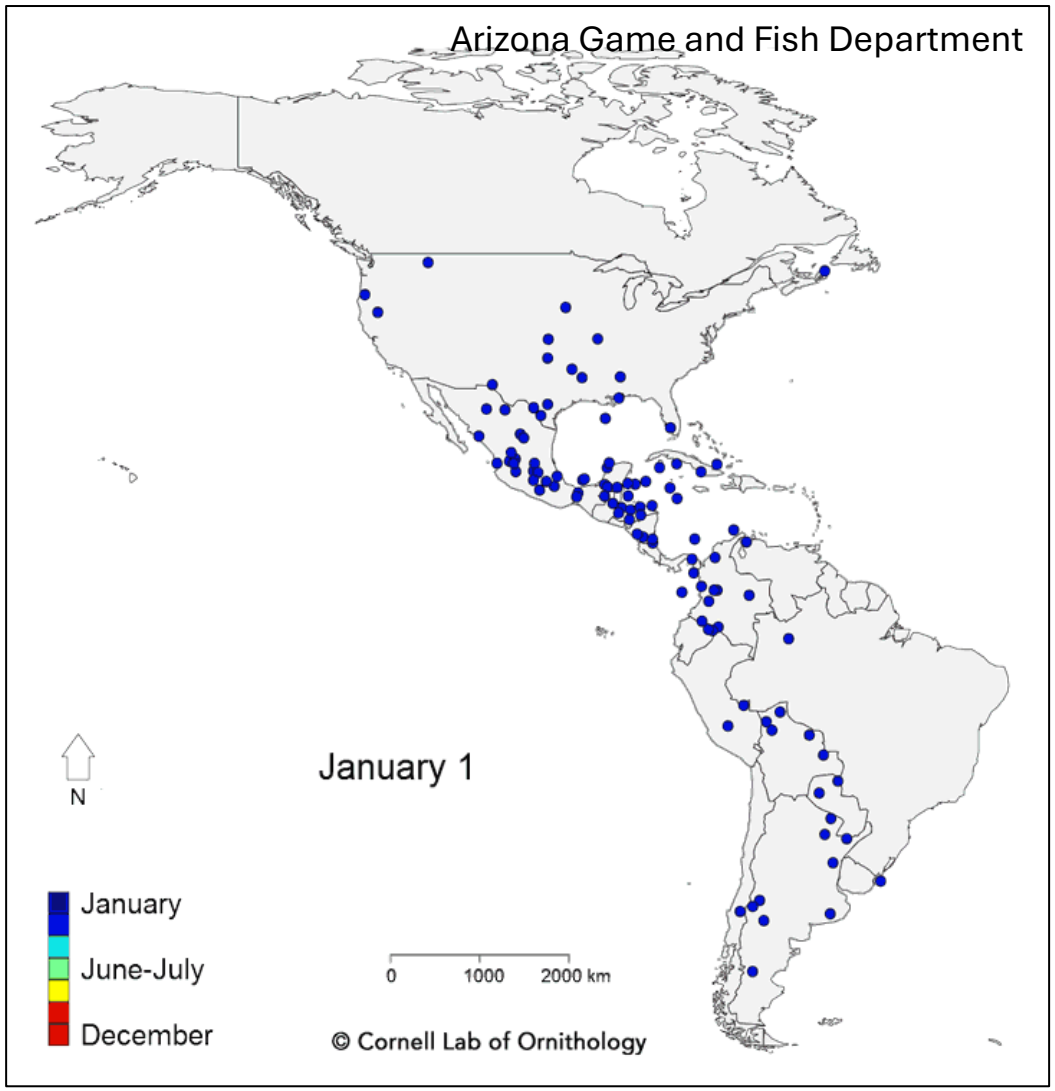
Average Annual Rainfall: 10.61”

National Weather Service

Sonoran Desert

CITY OF TUCSON

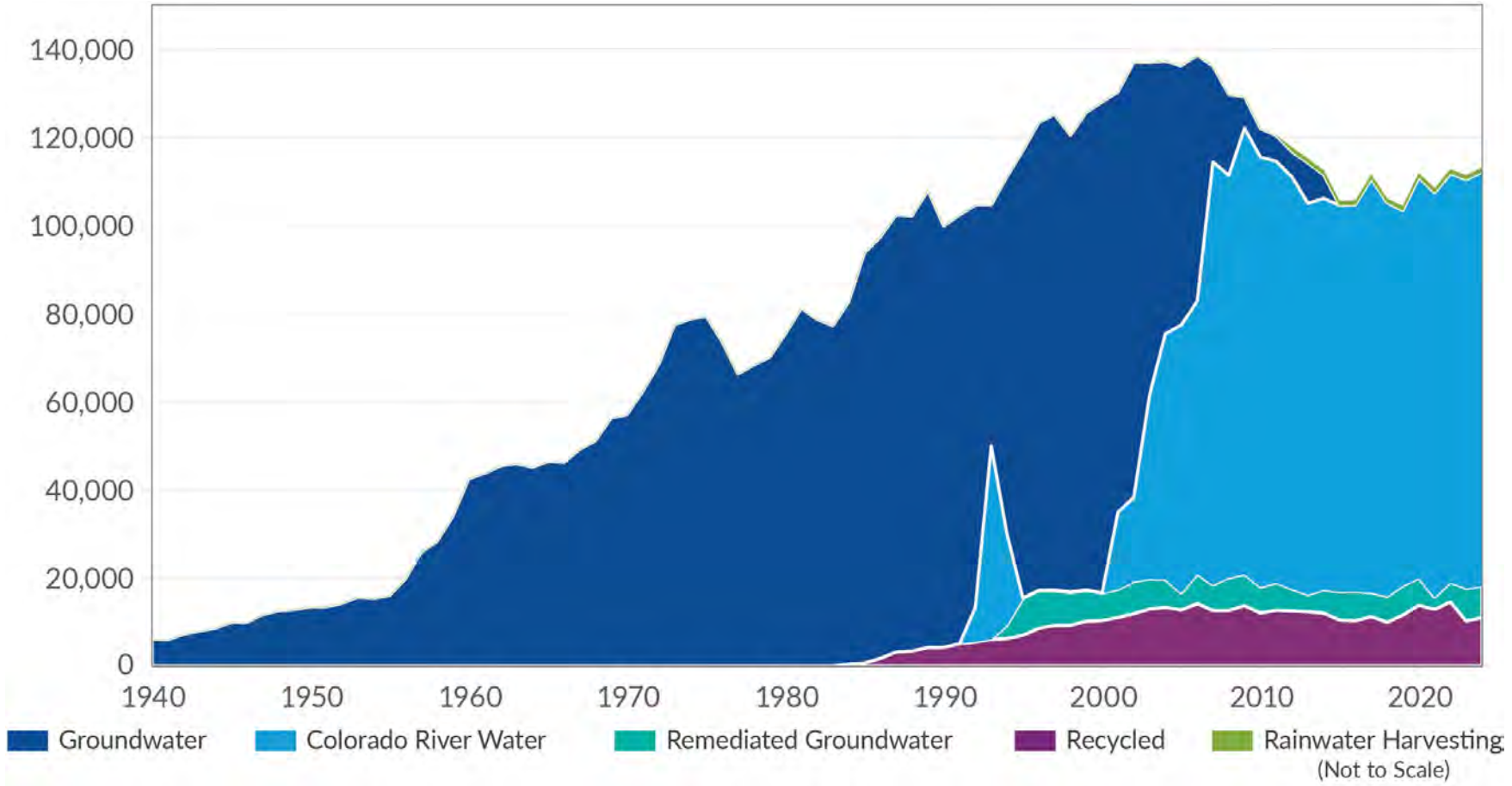
Wildlife of the Sonoran Desert



Sonoran Desert

A typical Tucson park

Tucson's Water Supply from 1940 to 2020



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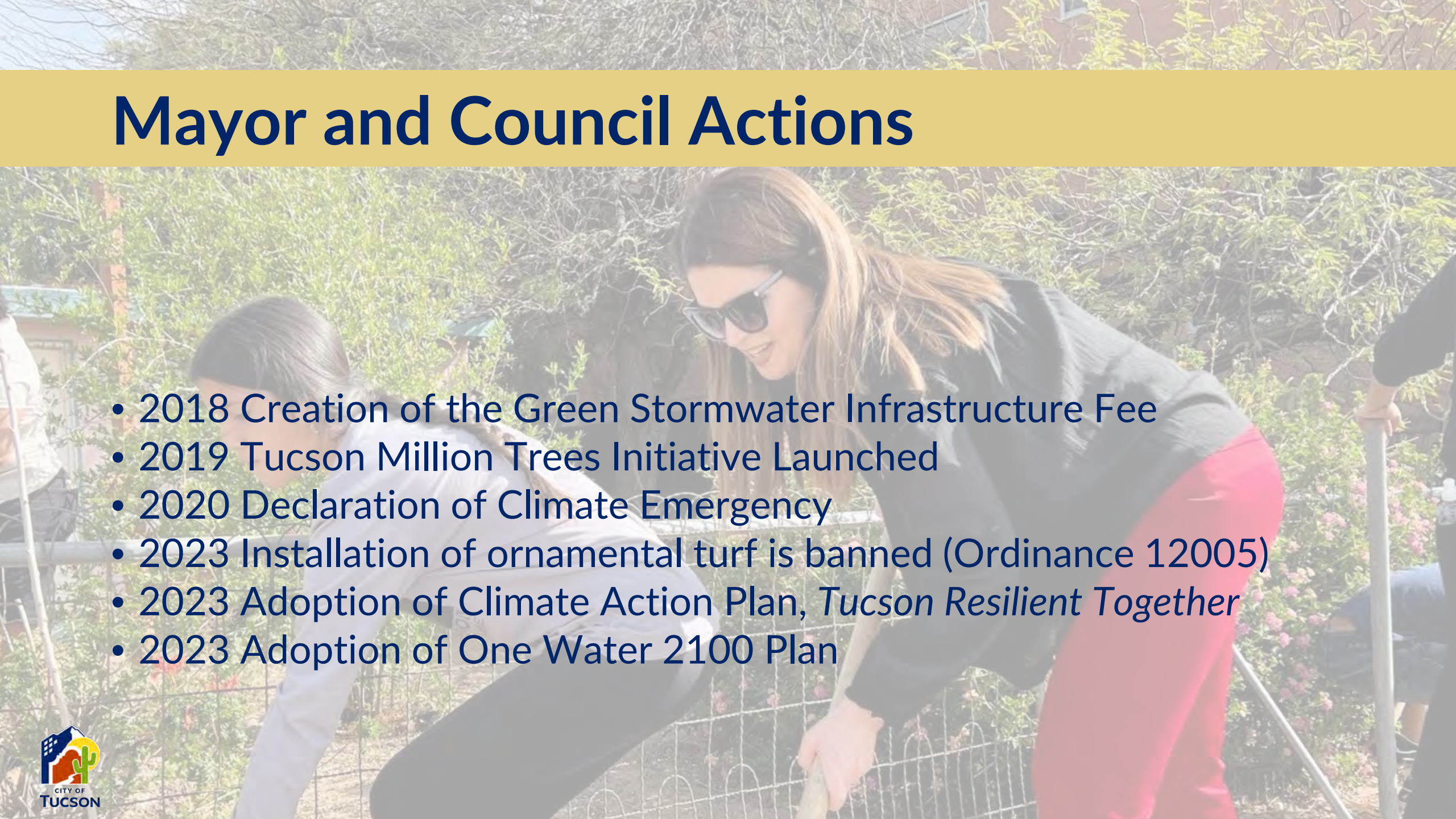
Tucson Water: OneWater 2100

Mayor and Council Actions



- 2018 Creation of the Green Stormwater Infrastructure Fee
- 2019 Tucson Million Trees Initiative Launched
- 2020 Declaration of Climate Emergency
- 2023 Installation of ornamental turf is banned (Ordinance 12005)
- 2023 Adoption of Climate Action Plan, *Tucson Resilient Together*
- 2023 Adoption of One Water 2100 Plan

CITY OF TUCSON

How does Parks & Recreation serve amidst…

- Quickly heating climate
- Unpredictable annual cumulative precipitation
- Significant rainfall concentrated in the summer months
- Uncertainty with the future of Colorado River water
- Changing landscapes

…?

CITY OF TUCSON

Green Stormwater Infrastructure:
A Nature-Based Solution for Environmental Resilience

Storm to Shade

CITY OF TUCSON
PARKS & RECREATION

TUCSON DELIVERS
VOTER APPROVED
GREAT PARKS

Storm to Shade

City of Tucson

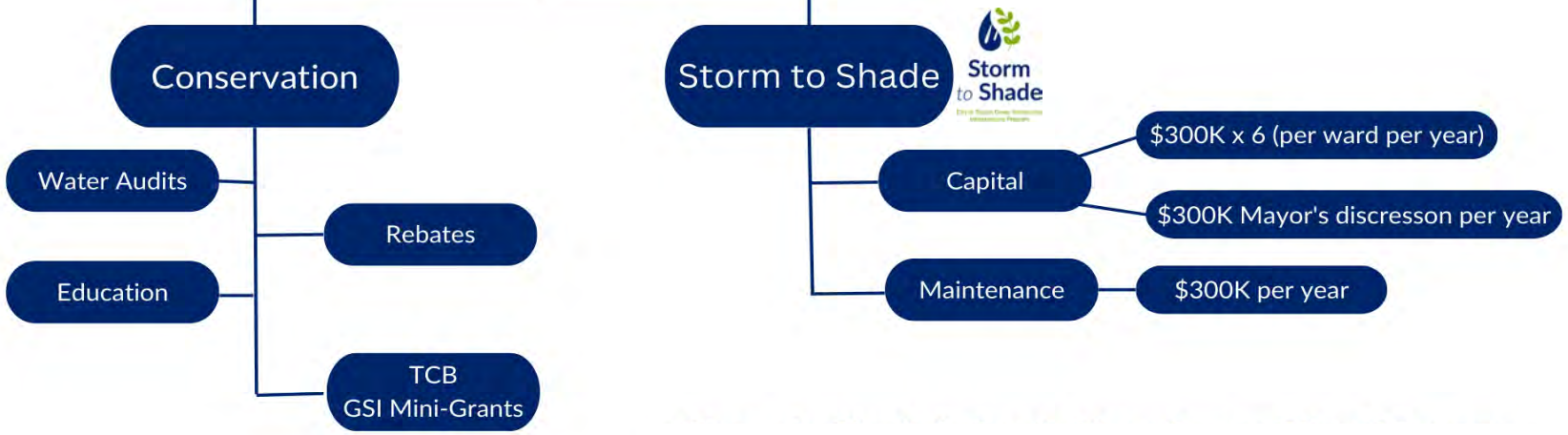
15¢/ccf on all Tucson Water customers' utility statements

~1$/month/avg. household

$4M annual revenue

Tucson Water

Conservation and Stormwater Resources



- ✓ **Build** new GSI
- ✓ **Maintain** new & existing GSI
- ✓ Equity

❖ Non-regulatory/voluntary

Storm to Shade

City of Tucson Green Stormwater Infrastructure Program

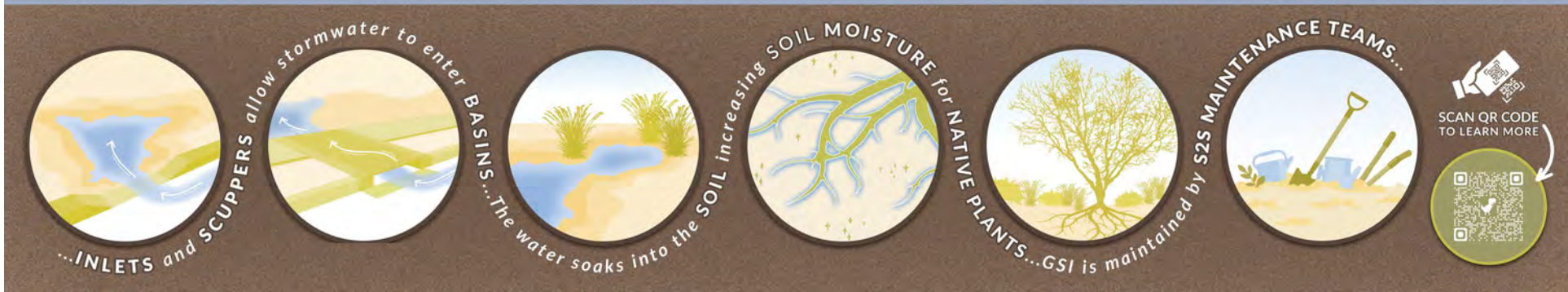
Using STORMWATER to GROW SHADE and SAVE WATER

What is Green Stormwater Infrastructure (GSI)? *GSI is defined as landscape features that capture and infiltrate stormwater runoff from impermeable surfaces to support native vegetation.*

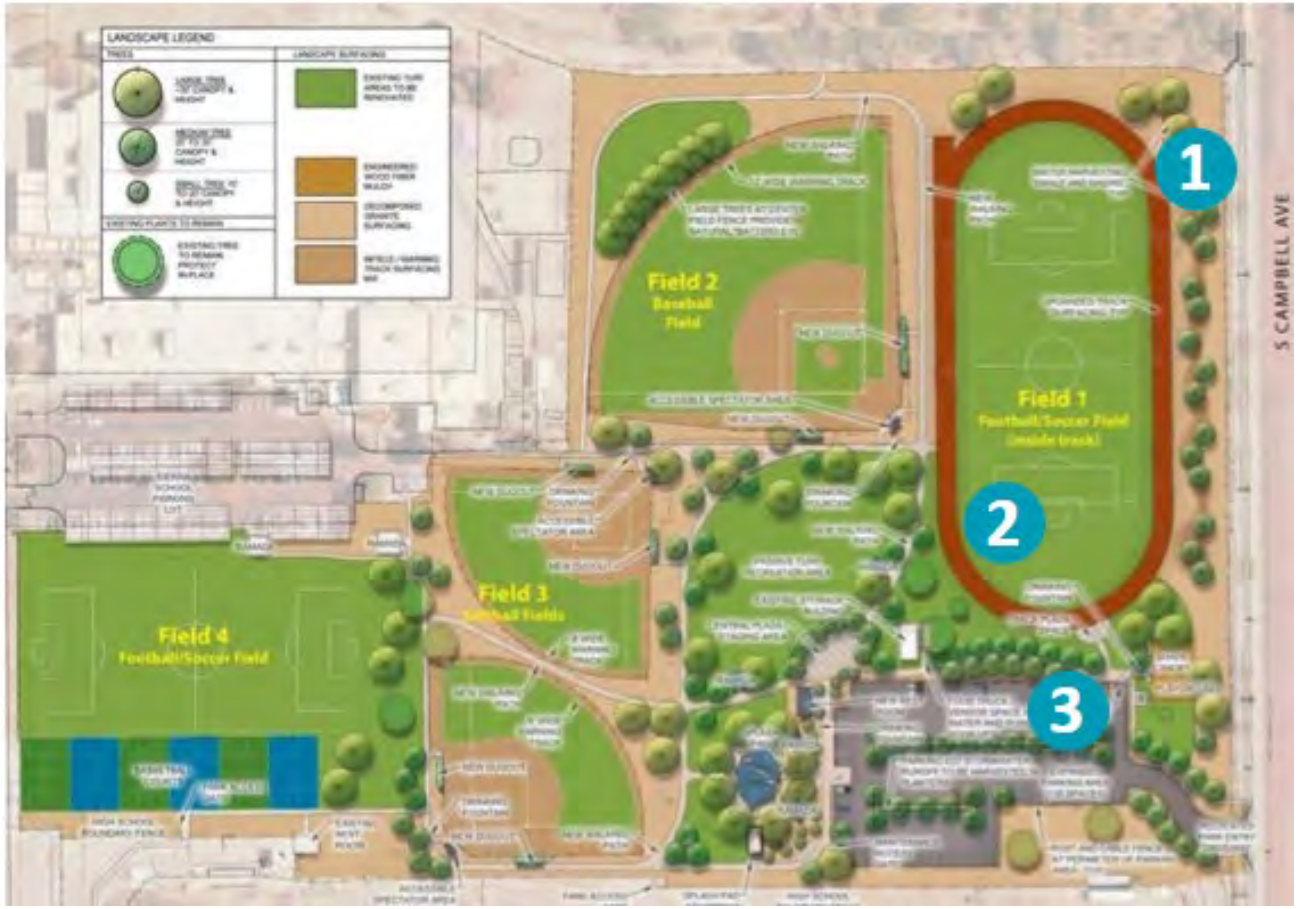
Storm to Shade (S2S) *is the City of Tucson's Green Stormwater Infrastructure Program. S2S installs and maintains GSI in public spaces throughout the City of Tucson like parks, streets, and City facilities. This work is funded by utility customers in the City of Tucson.*

Why GSI? *GSI reduces the amount of municipal water needed to grow healthier plants and cool the surrounding urban environment.*

CITY OF TUCSON | TUCSON WATER | Storm to Shade



GUNNY BARRERAS PARK



Storm to Shade

CITY OF TUCSON PARKS & RECREATION

TUCSON DELIVERS VOTER APPROVED GREAT PARKS

IRON HORSE PARK

Storm to Shade

CITY OF TUCSON PARKS & RECREATION

TUCSON DELIVERS VOTER APPROVED GREAT PARKS

LOWER LINCOLN PARK

Storm to Shade

CITY OF TUCSON PARKS & RECREATION

TUCSON DELIVERS VOTER APPROVED GREAT PARKS

ALVERNON PARK

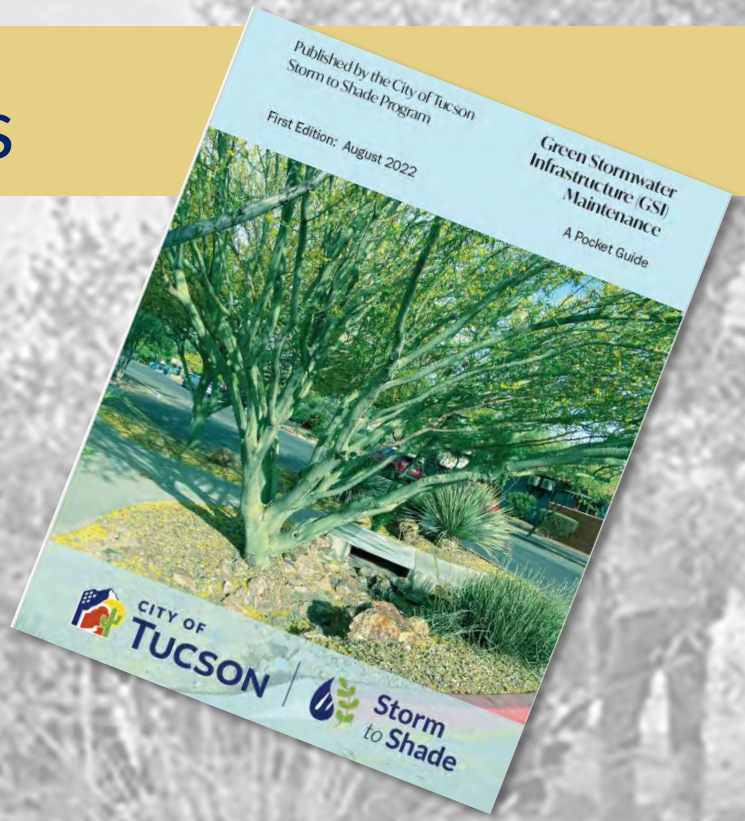
CITY OF TUCSON
PARKS & RECREATION

TUCSON DELIVERS
VOTER APPROVED
GREAT PARKS

PIMA COUNTY
FLOOD CONTROL

Storm to Shade

S2S Maintenance | Fundamentals



- Fully funded Maintenance Program
- Dedicated Maintenance Program Manager
- GSI Maintenance Protocol & Pocket Guide
- Enterprise Asset Management (EAM) System
- Interdepartmental partnership & agreements

S2S Maintenance | Opportunities

- **Public outreach**
  - mailers, events
  - S2S signage
  - S2S resources
- **Procurement**
  - contracts from scratch
  - targeted contractors
  - RFP info sessions (after hours, *with snacks)*
- **Practitioners**
  - traditional landscape Mx firms, small GSI specialists, CBOs…
  - hands-on contract management

- **Training**
  - based on Mx protocol
  - delivered via education program partner
  - delivered regularly
  - classroom & hands-on learning
  - expert instructors
  - *required*
- **Community member stipend program**
  - via CBO Mx contractor
- **NatureWorks,** Pima County + CBO partner
  - frontline communities
  - 12 weeks paid instruction
  - paid apprenticeship placements