Greater Edwards Aquifer Alliance

Lorence Creek HOA Retrofit Project

Funded as Lorence Creek Stormwater Retrofit and Research Project Under the Proposition 1 Edwards Aquifer Protection Projects

Conservation Advisory Board (CAB)

January 25, 2023

CITY OF SAN ANTONIO TEXAS

CITY OF SAN ANTONIO EDWARDS AQUIFER PROTECTION PROGRAM

SAN ANTONIO RIVER AUTHORITY

GEAA Greater Edwards Aquifer Alliance

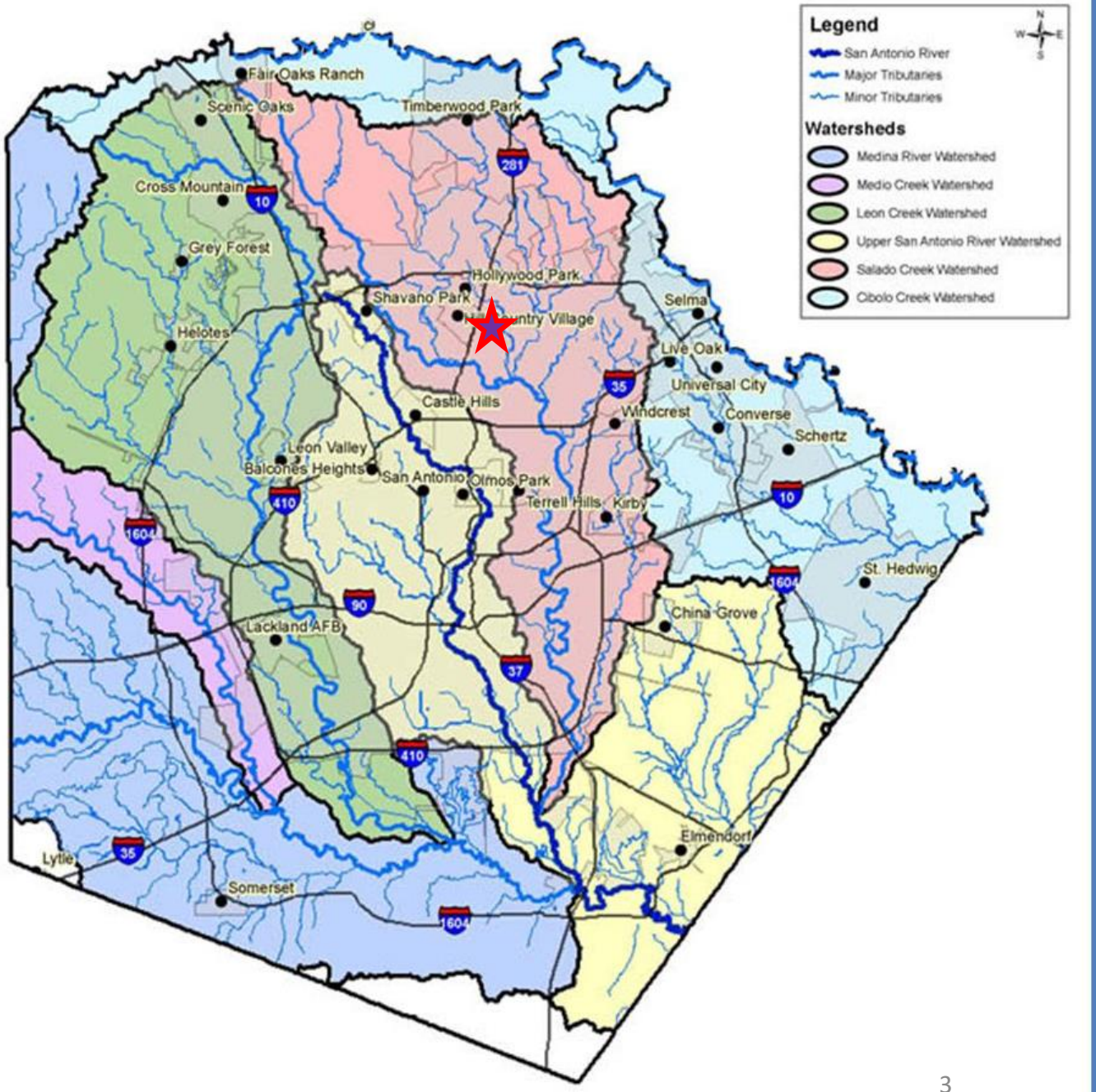
Presentation Content

Lorence Creek HOA Retrofit Project

- Location and initiation of the project.
- Project timeline and unique aspects.
- Preconstruction activities.
- Deliverables:
  - Design.
  - Construction.
  - Preconstruction and Post construction water quality data.
  - Maintenance and public outreach.

Location of the project is within:

- Edwards Aquifer Recharge Zone.
- Upper Salado Creek Watershed.
- Lorence Creek Watershed where previous monitoring identified potential impairment due to urbanization.



Project Timeline

2017 - 2018

- Project initiated
- Preconstruction sampling completed
- Design completed
- Bid invitation sent

2019 - 2020

- Pre-bid construction meeting
- Contractor contract initiated and construction completed

2021 - 2023

- Post-construction sampling completed
- Report written and finalized
- Professional tour given
- CAB presentation
- Media release

Site before project initiation

Unique Project Aspects

1. Collaboration between public agencies and private landowners,
2. Utilization of existing site features and its materials as the core of the project,
3. Strong public education and outreach component, and
4. Permitted as a “volunteer” retrofit water quality project within the ERZD by TCEQ, SAWS, and CoSA.

Preconstruction Sampling

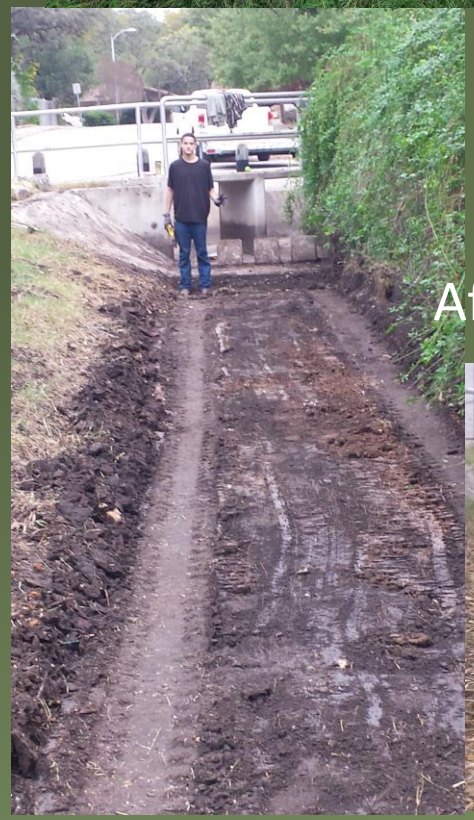
- Sampler was situated at the outfall that collects stormwater from the 26.1 ac drainage area.
- Sampling unit contained a single-phase sampling bottle.
- 5 stormwater samples were collected from “qualifying” rain events along with 5 soil samples.

Single-phase sample bottle

Preconstruction activities

- Installation of the SWAPP feature, a rock gabion across the channel
- Desilting and revegetation of the channel to the rock gabion.
- Percolation rate analysis within future bioretention area.
- Tree protection installed with mulch.

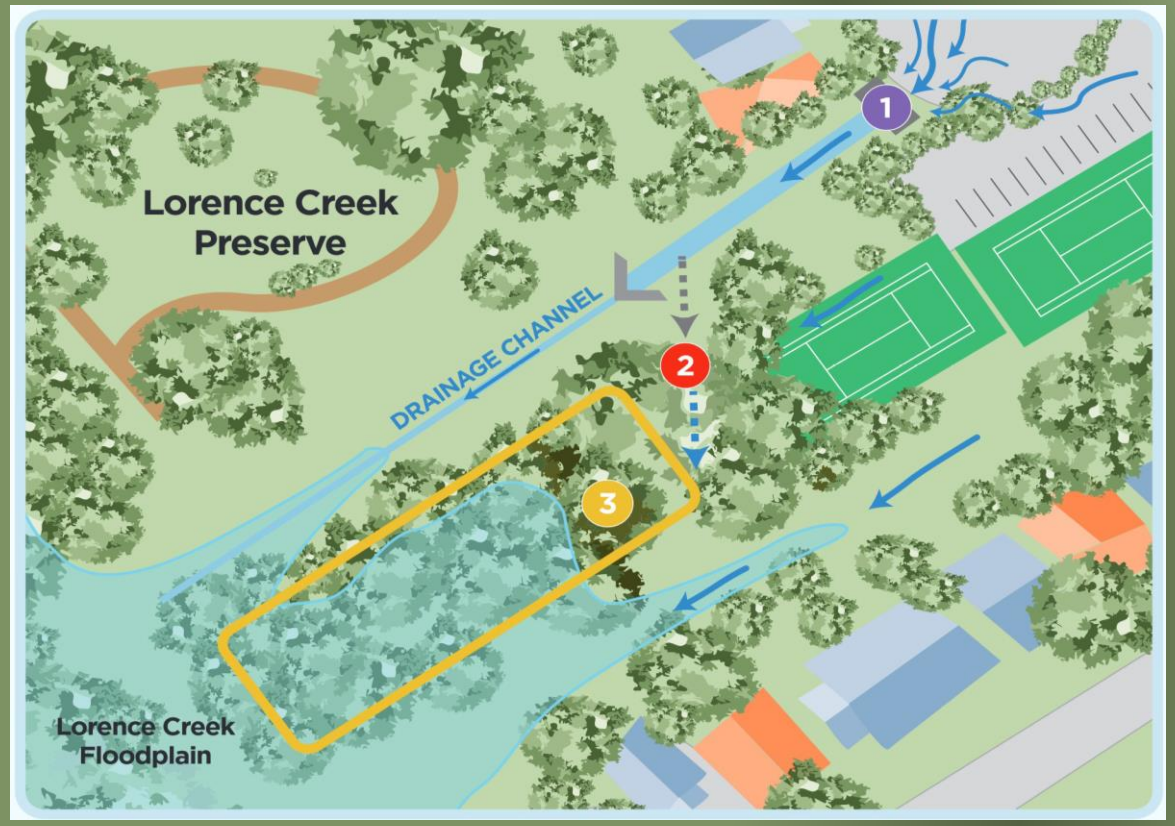
Before de-silting



After de-silting

Design of the Retrofit Project

- Project site was approximately 1.5 ac.
- To maximize potential, a LID treatment train with 3 main components was designed :
  1. Forebay to detain sediment and debris,
  2. Bioinfiltration basin to provide post-treatment sampling,
  3. Enhanced natural bioretention basin area which provides the greatest amount of stormwater treatment.

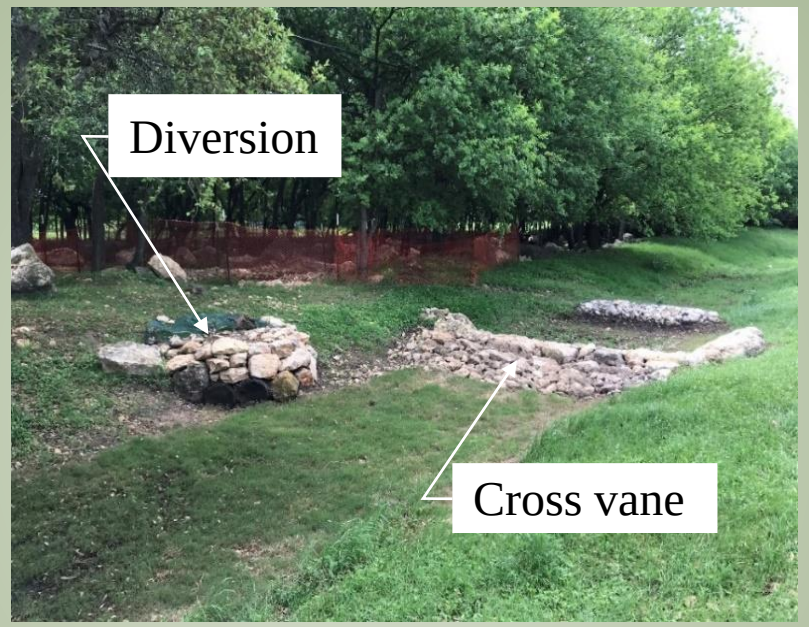


= diversion directs stormwater into the system.

= cross vane in the channel raises the water level slightly ensuring stormwater enters the diversion.

Sediment Forebay

Diversion and Cross Vane



This treatment train directs flow into the enhanced natural bioretention area – the area calculated to treat 0.5”.

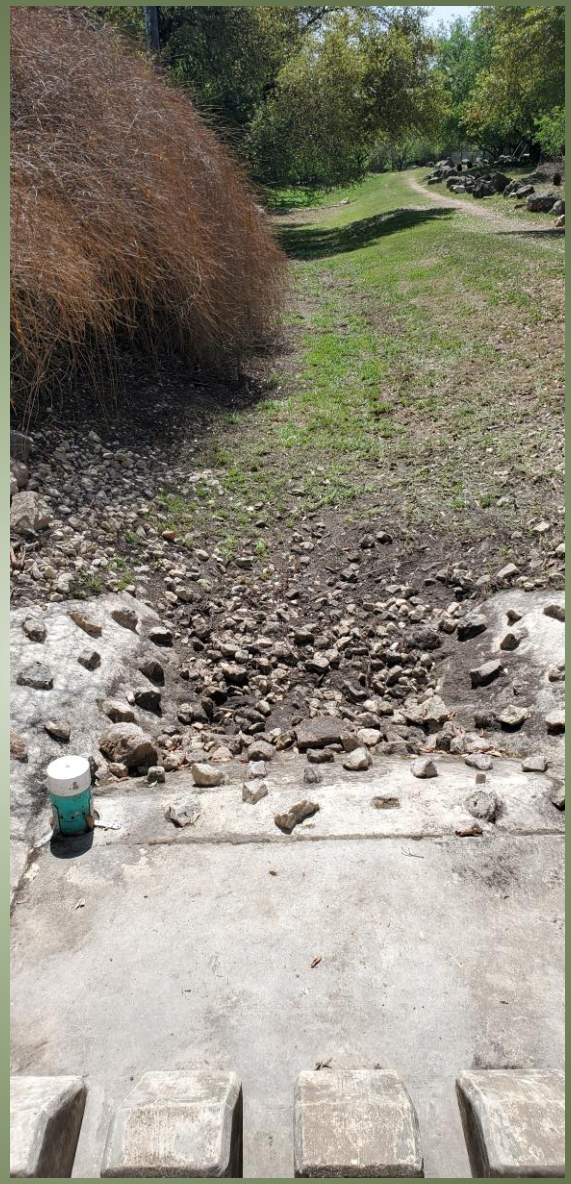
Bioinfiltration basin

Enhanced Natural Bioretention Area

- An existing rock berm on one side and a partial on the other side were used.
- This partial berm was extended with rock on site, and the entire berm was covered with an impermeable barrier.
- Creative strategies were required to protect re-vegetation efforts from local deer.

Post construction sampling

- To assess the performance of the stormwater water quality feature, 5 paired (pretreatment and post treatment) samples were collected.
- Location of the sampling equipment:
  - Street interceptor outfall for pre-treatment.
  - Bioinfiltration outfall for post treatment .



Pretreatment Sampler Unit

Post-Treatment Sampler Unit

Summary of Results using the nonparametric Wilcoxon matched-pair signed ranks test

- Seven water quality parameters met the criteria to be statistically different at the 90% confidence interval (p-value < 0.1):
  - Total Organic Carbon (63% reduction),
  - Total Suspended Solids (77% reduction),
  - Escherichia coli (E. coli) (27% reduction),
  - Total Coliform (24% reduction), and
- Terphenyl-d14 (13% reduction) demonstrated improvement.
- Several constituents had increased levels after treatment which is assumed to be from the prescribed media.
  - Hardness (277% increase)
  - Nitrogen (35% increase)

Sediment Rates

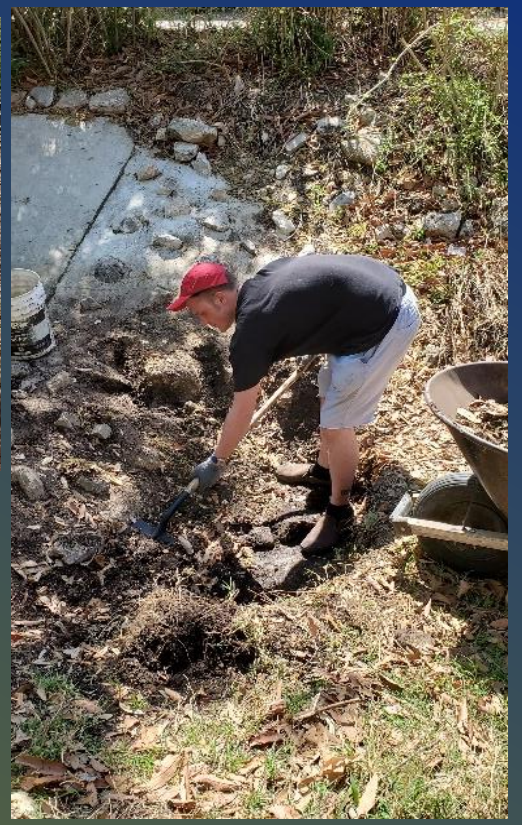
The amount of sediment washed from the neighborhood was surprising and prompted an additional study on its rate of accumulation within the Sediment Forebay.

Date of Collection	Amount of Sediment (Liters)*	Amount of Rain Between Collection Times
April 17, 2022	3.7	No recorded rain. Deposition due to water main break.
May 3, 2022	208.2	16 days between collection events. 1.52 in. of rain
May 12, 2022	13.7	8 days between collection events. 0.58 in. of rain
June 14, 2022	45.4	34 days between collection events. 0.50 in. of rain
July 4, 2022	63.4	20 days between collection events. 1.21 in. of rain
Average / event:	66.9	

Maintenance activities by staff, contractors and volunteers

Maintenance has primarily been:

- Removing sediment from the sediment forebay.
- Removing debris from in front of the diversion culverts,
- Keeping plants protected from deer and alive during drought conditions.



Public Outreach and Education

Interpretive sign on site

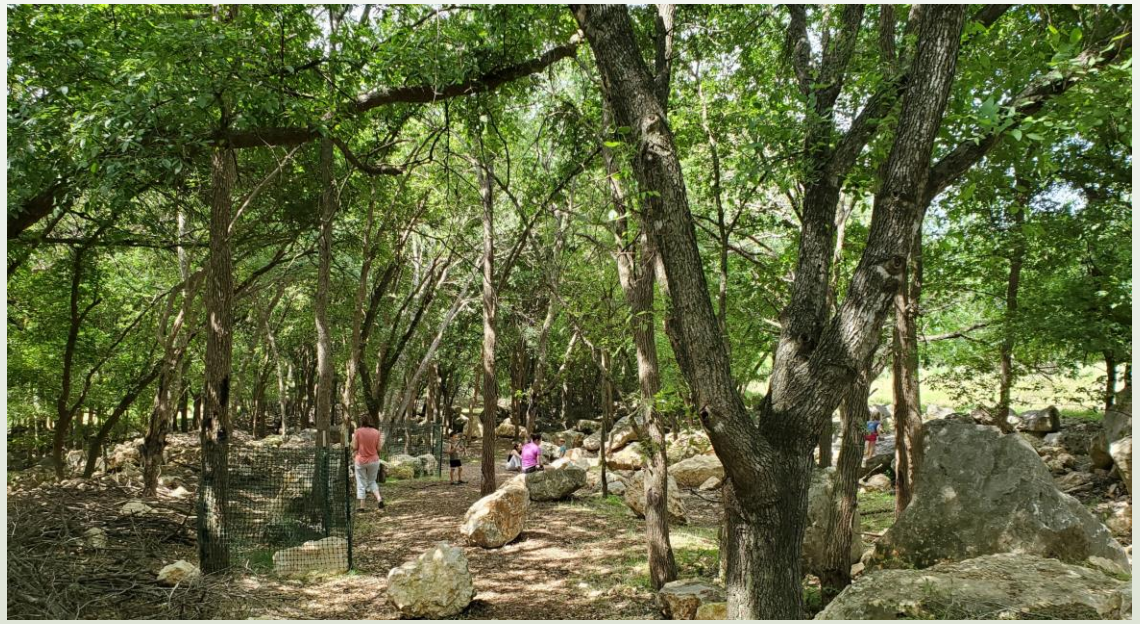
Audience	No. Presentations	No. People Reached
General	17	450
East Central HS: S.T.E.M.	1	22
EWRI	1	25
Total	**19**	**497**

Observations and Lessons Learned

- Systems smaller than required by the current LID code to capture 1.5”, can significantly improve stormwater runoff quality for TSS and Total *coliform*.
- Small urban parcels including parks can provide stormwater treatment (infiltration sites) which could also reduce local flooding and mitigate climate change.
- Sediment removal requirements is a big enough issue to reduce adoption by neighborhoods and volunteers. To address this issue:
  - Can sediment forebays be designed larger and for easier maintenance with the use of equipment? Could this be a SBEDA COSA contracted service to incentivize?
  - Can living soils with a robust microbiome and high aggregate stability better handle sediment loads to avoid/reduce removing plants and top layers of LID media periodically to maintain infiltration?
- Analyze your media before purchase for the tested constituents.
- A 5% nitrogen in the media can be too high and not needed for native plants.

Recommendations for Future Research

- Double the amount of time that is expected for a project, allow for additional water sampling and use field blanks.
- Install flow meters at the sampling locations.
- Keep the scope for testing in situ basic and use preconstruction sampling data to streamline post construction monitoring.
- Investigate the transfer of *E. coli* from sediment to stormwater runoff.



- Work with TCEQ to develop the scope of a project to qualify as a model within the EARZ.
- Explore the use of more natural LID features within floodplains to capture and treat stormwater runoff before entering streams.
- Explore the use of prairie biomes with enhanced fen features.
- Investigate the impact of sediment loading on more “natural” LID features.

Acknowledgments for funding and contract management:

- City of San Antonio Parks and Recreation Aquifer Protection Program
- San Antonio River Authority

Partners and Collaborators:

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- Vahid Zarezadeh, PhD, PE, CFM for sampling and data analysis contributions.
- Shadow Cliff Swim and Recreation Club and Lorence Creek Homeowner Association - private property owners.

Contractors:

- Tetra Tech, Inc. – San Antonio. - engineering services
- Alamo Analytical Laboratories, LTD.
- Fairway Landscape & Nursery, Inc. - construction
- Bain Medina Bain, Inc. - survey services
- Vibrant Scapes, LLC. - maintenance