



Rooftop Harvesting and Stormwater Dispersement Over the Edwards Aquifer Recharge Zone: A Retrofit for Treatment of Previously Un-treated Impervious Cover

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UTSA ROOFTOP RETROFIT PROJECT MOTIVATION AND GOALS

Targets



PROJECT MOTIVATION AND GOALS

Project Targets

- Retrofit 9.7 acres of impervious cover at the University of Texas at San Antonio main campus
- Capture and treat 4.1 acres of rooftops
- Capture and treat sidewalks, parking lots and roadway

Pollution Abatement Targets

- Reduce runoff
- Reduce pollutant loads

Aesthetic Targets

- Provide a highly visible element to the campus that provides native landscape, pollinators, respite and wellness

Learning Targets

- Can LIDs be efficiently implemented on university campuses? If so, benefits and costs?



PROJECT MOTIVATION AND GOALS

Project Budget

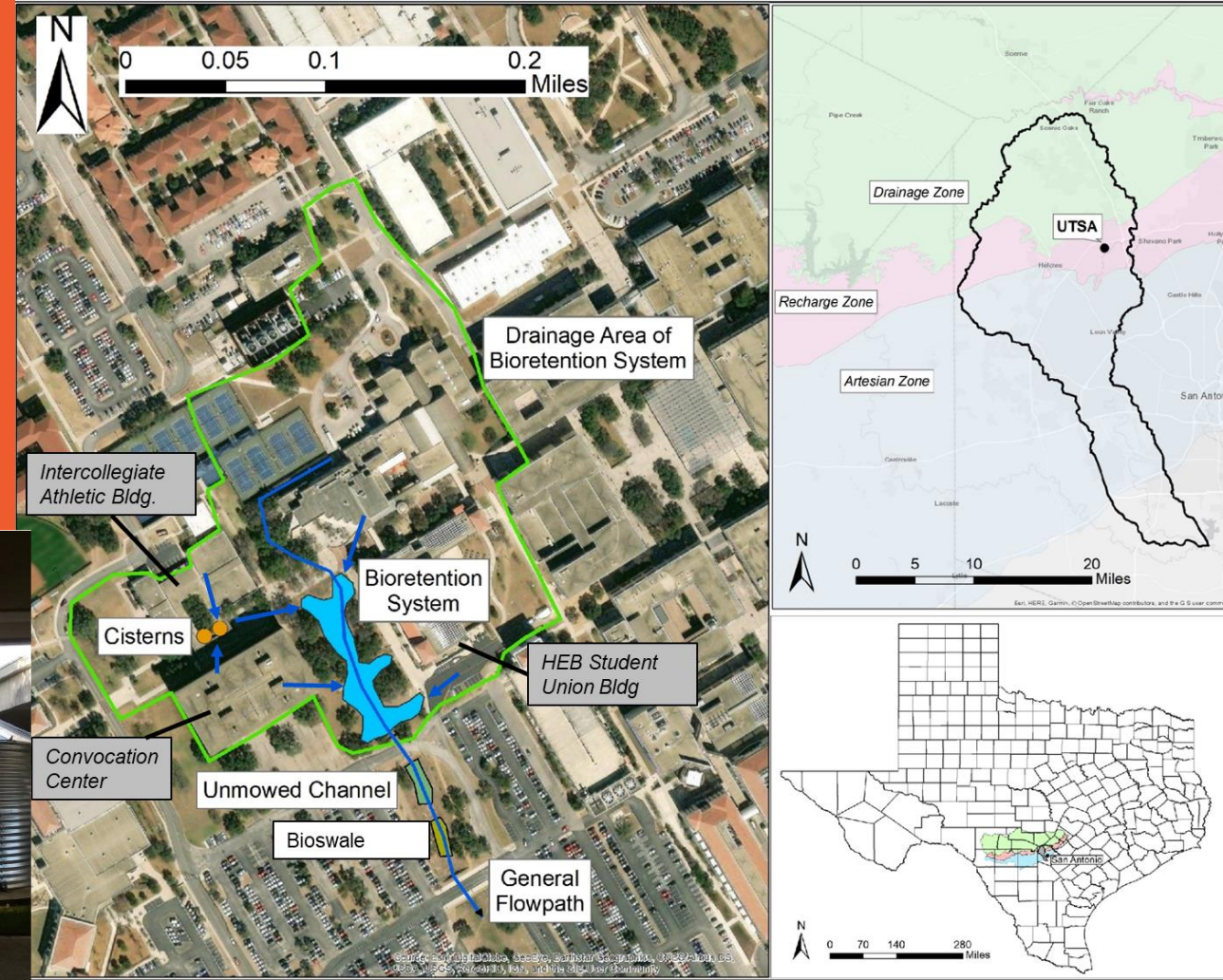
Prop 1 Funding:	\$1,057,501
Construction:	\$ 700,000
Research, equipment, indirect costs:	\$ 357,501
<u>UTSA's Construction Contribution:</u>	<u>\$1,642,599</u>
TOTAL PROJECT COST:	\$2,700,100



PROJECT MOTIVATION AND GOALS

Treatment Train Implementation

- Cisterns
- Bioretention basin
- Unmowed channel
- Bioswale



PROJECT MOTIVATION AND GOALS

Cisterns

Capacity: 9,500gal

Capture: 4.1 rooftop acres

Irrigation: non-potable re-use



PROJECT MOTIVATION AND GOALS

Bioretention Basin Construction

Impermeable Liner

Perforated pipes

1.25-foot layer of 1 inch gravel

Barrier layer of 2-inch washed sand

36" biomedica

(placed in 1' lifts, boot compacted)

85-88% sand

8-12% fines

2-5% organic matter

4-inch layer of hardwood mulch



PROJECT MOTIVATION AND GOALS

Material Testing Project Delays

- Material was tested multiple times on the project at the project expense. Construction stopped. Recommendation for onsite meeting with material provider, project hauling contractor, and others to ensure material is ordered, delivered, stored, and generally provided to specification. All Sheets match with Spec book.



Bioretention Basin Before/After



Pre-Construction



Post-Construction

Bioretention Basin Before/After



Un-mowed Grassy channel



Un-mowed Grassy channel



Bioswale Before



Bioswale construction



UTSA BIORETENTION BASIN EFFICIENCY

Monitoring



UTSA BIORETENTION BASIN EFFICIENCY

Monitoring

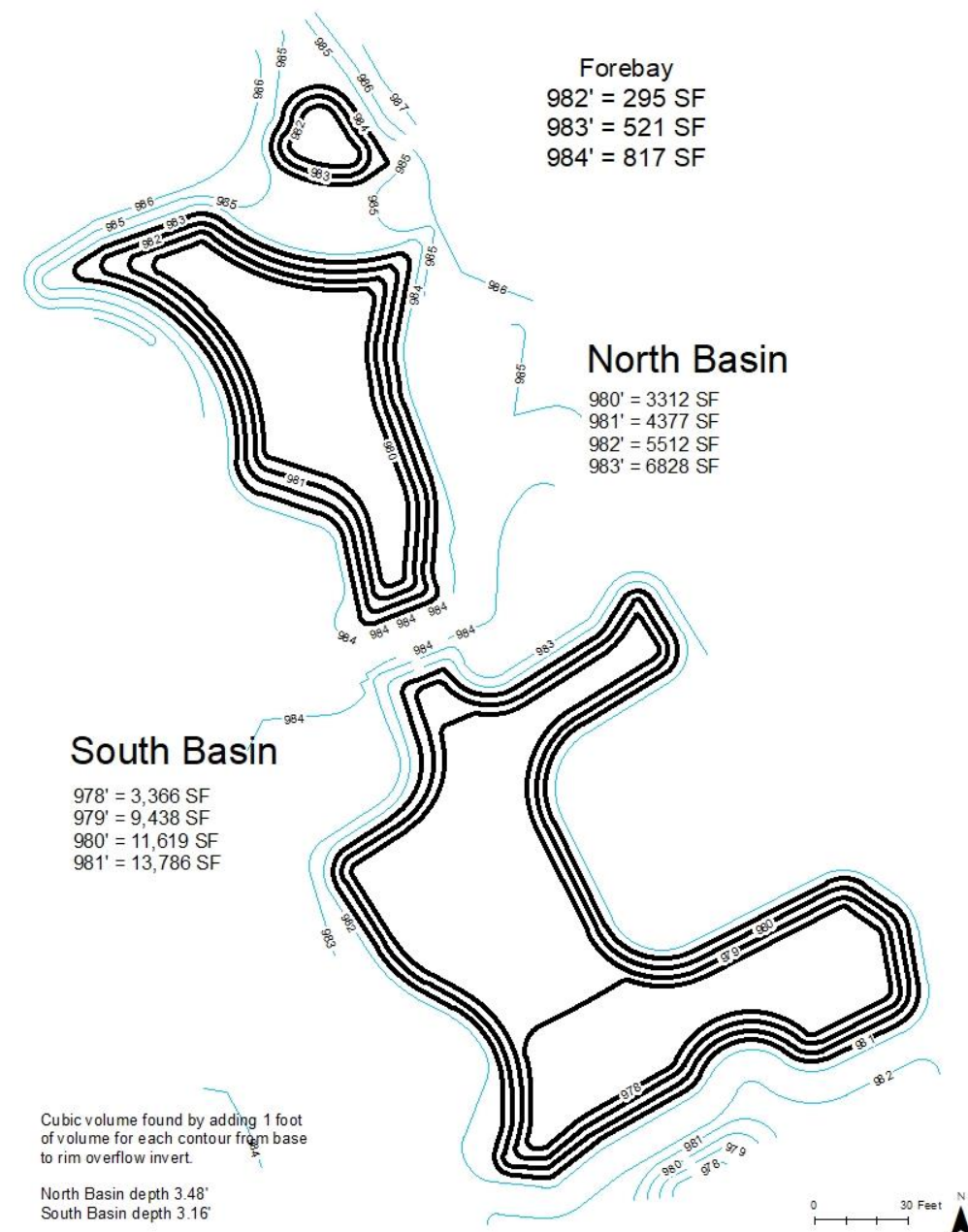
- Before vs. After
- Input vs. Output
- Flow monitoring
- Water quality
 - ✓ Total dissolved solids
 - ✓ Total suspended solids
 - ✓ E. coli
 - ✓ Nutrients
 - ✓ Metals



UTSA BIORETENTION BASIN EFFICIENCY

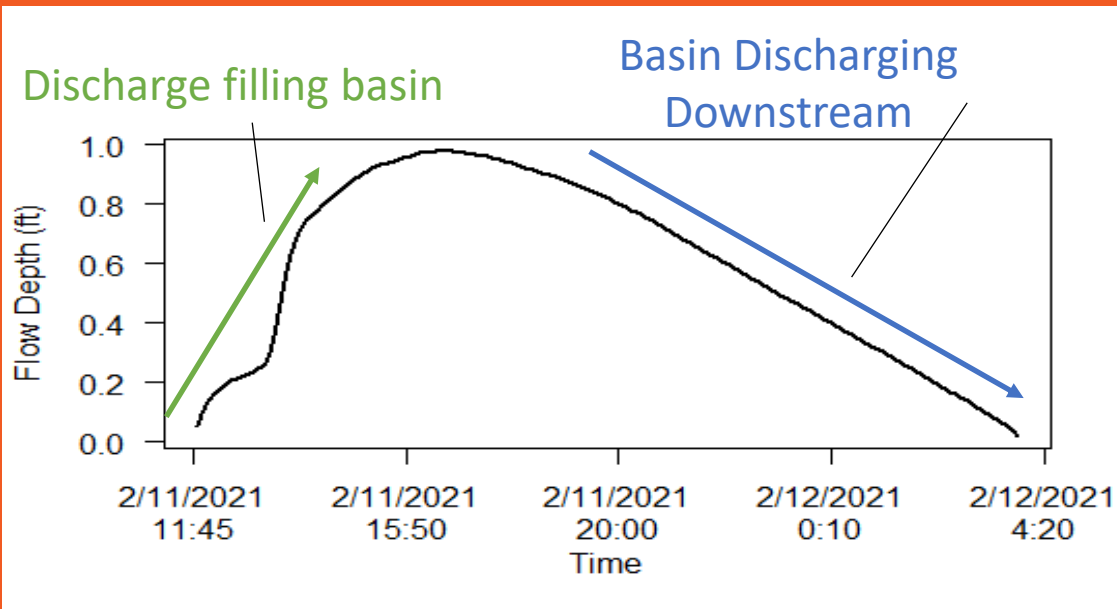
Monitoring

- Bioretention basin mitigates downstream peakflows
 - Holds nearly 400,000 gallons of water

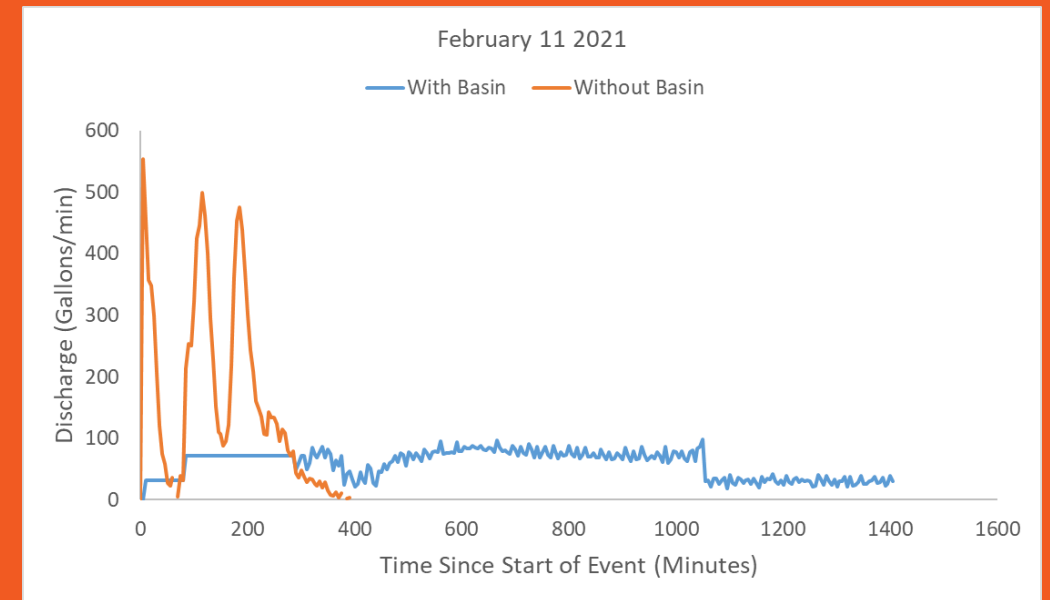


UTSA BIORETENTION BASIN EFFICIENCY

Monitoring



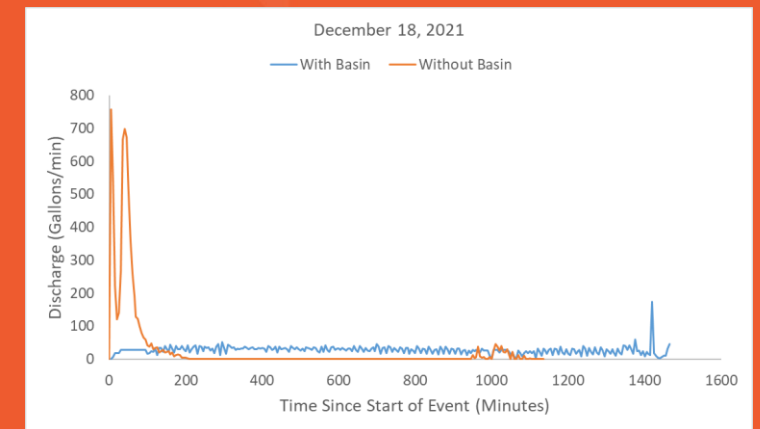
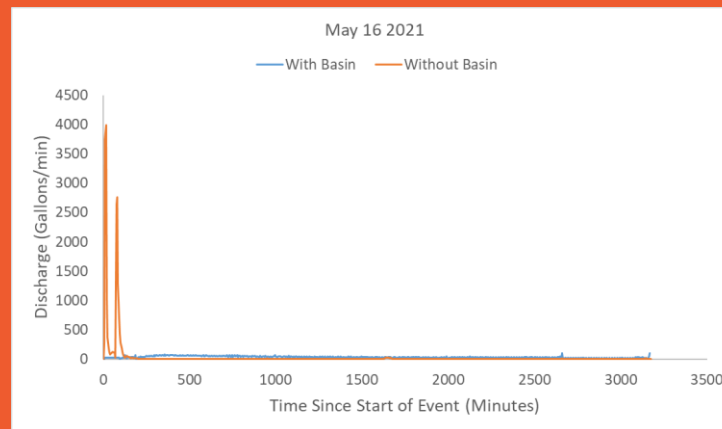
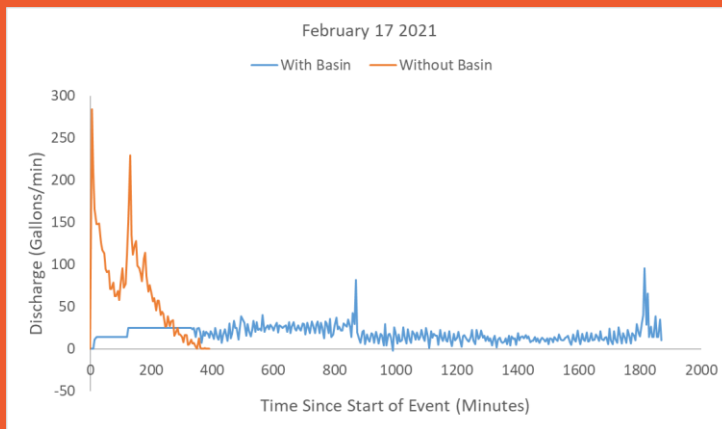
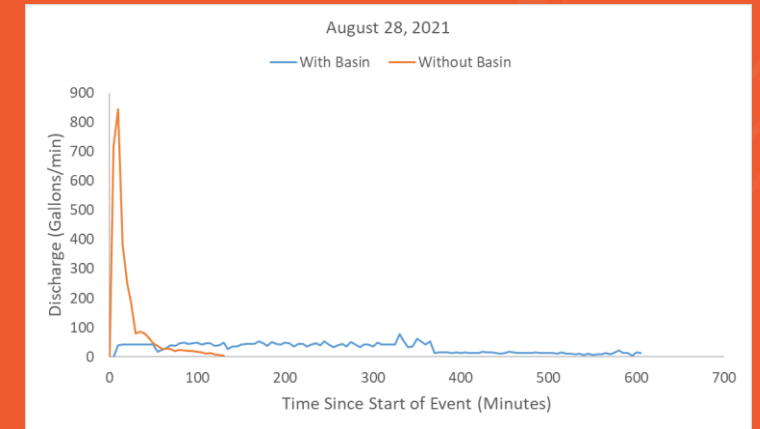
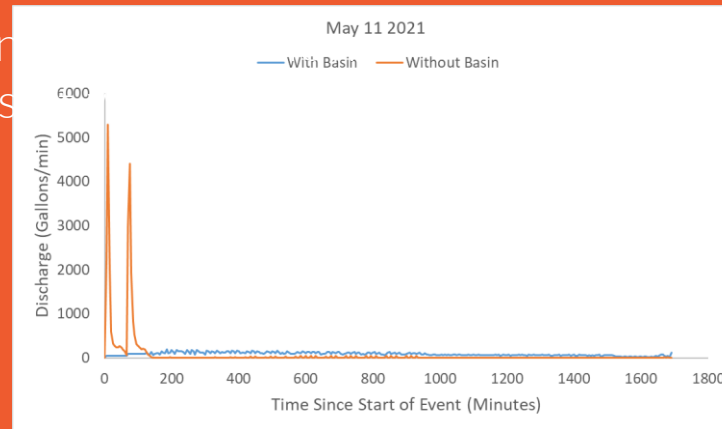
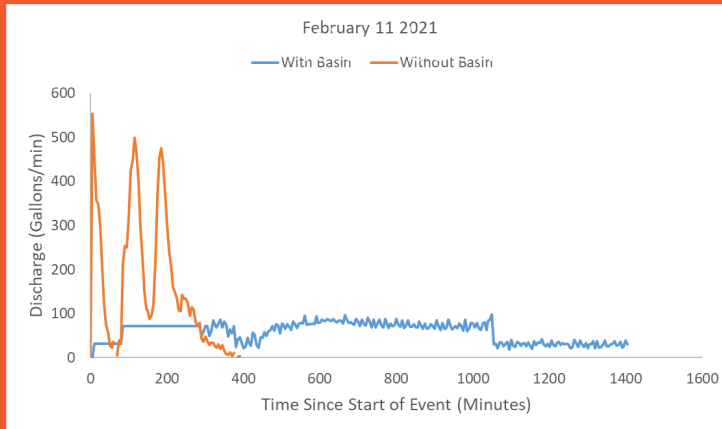
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UTSA BIORETENTION BASIN EFFICIENCY

Monitoring

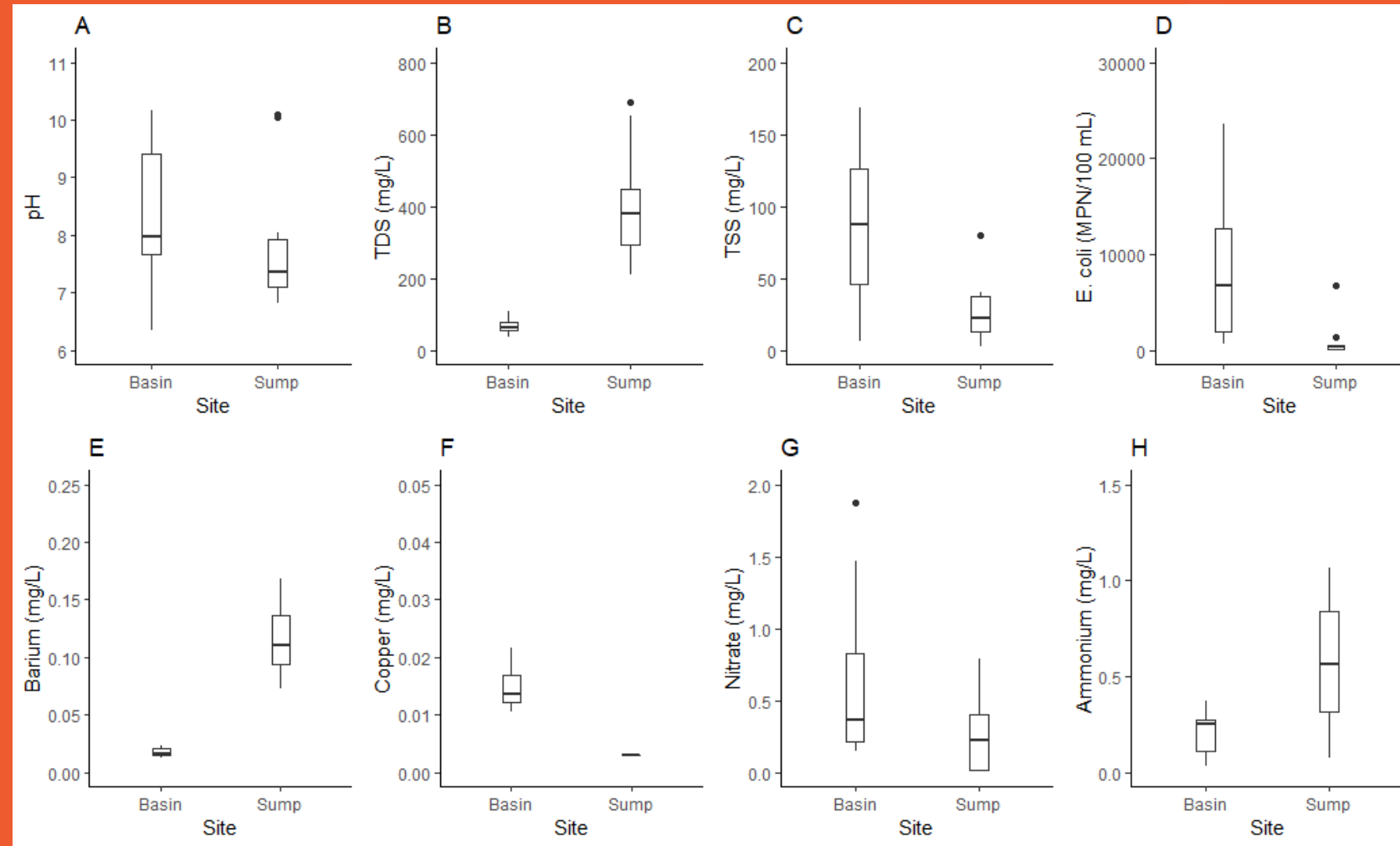
down
gallons



Primary Findings

Basin mitigates pollution delivery

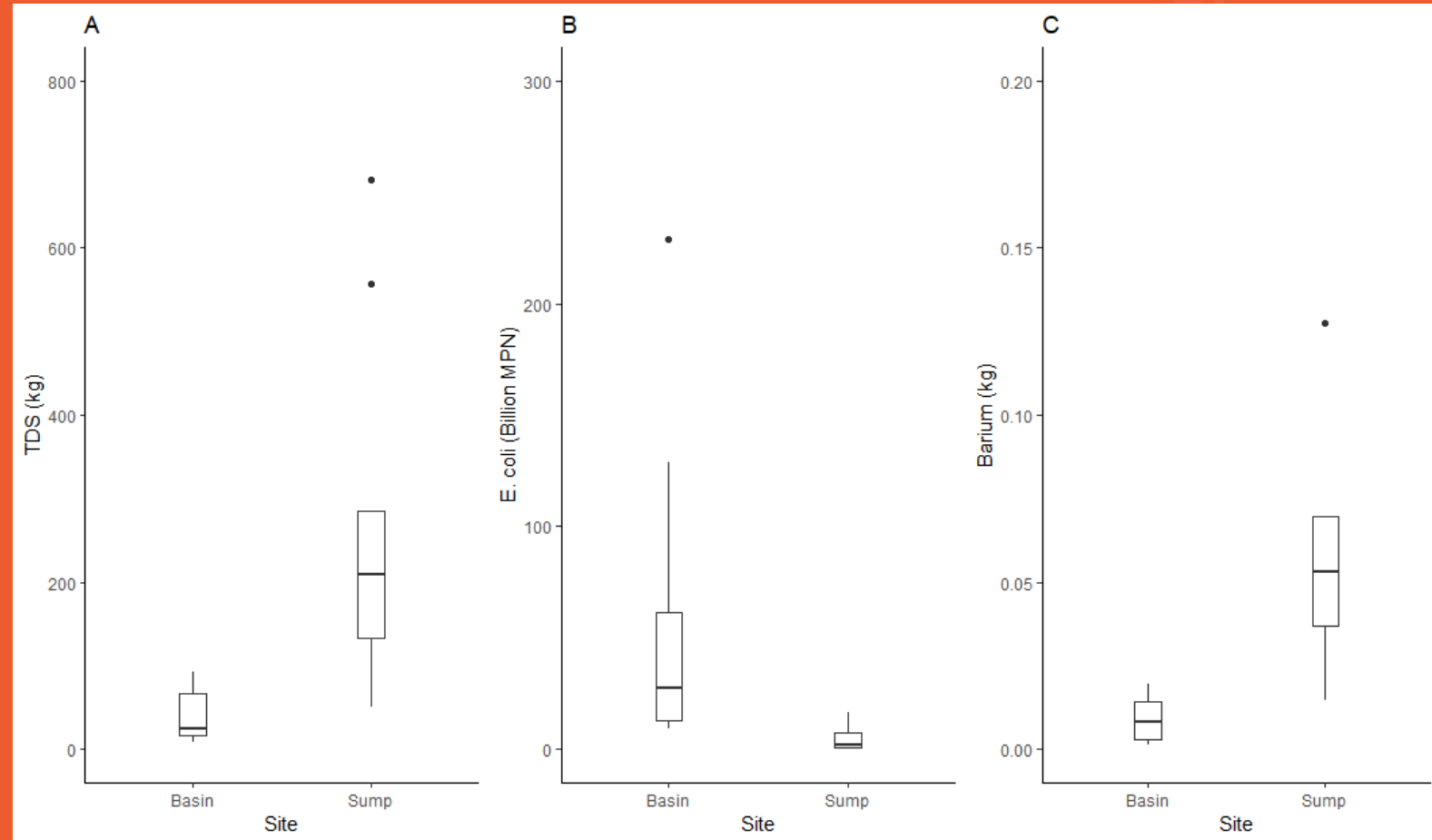
- First flush concentrations of total suspended solids, nitrate, copper



Primary Findings

Basin mitigates pollution delivery

- E. coli loads significantly reduced



Primary Findings

- Basin mitigates pollution delivery
 - ✓ E. coli loads significantly reduced
 - ✓ First flush concentrations of total suspended solids
 - ✓ First flush concentrations of nitrate
 - ✓ First flush concentrations of copper
- Potential concerns
 - ✓ Increase in total dissolved solids
 - ✓ Increase in arsenic concentrations

UTSA OTHER BENEFITS

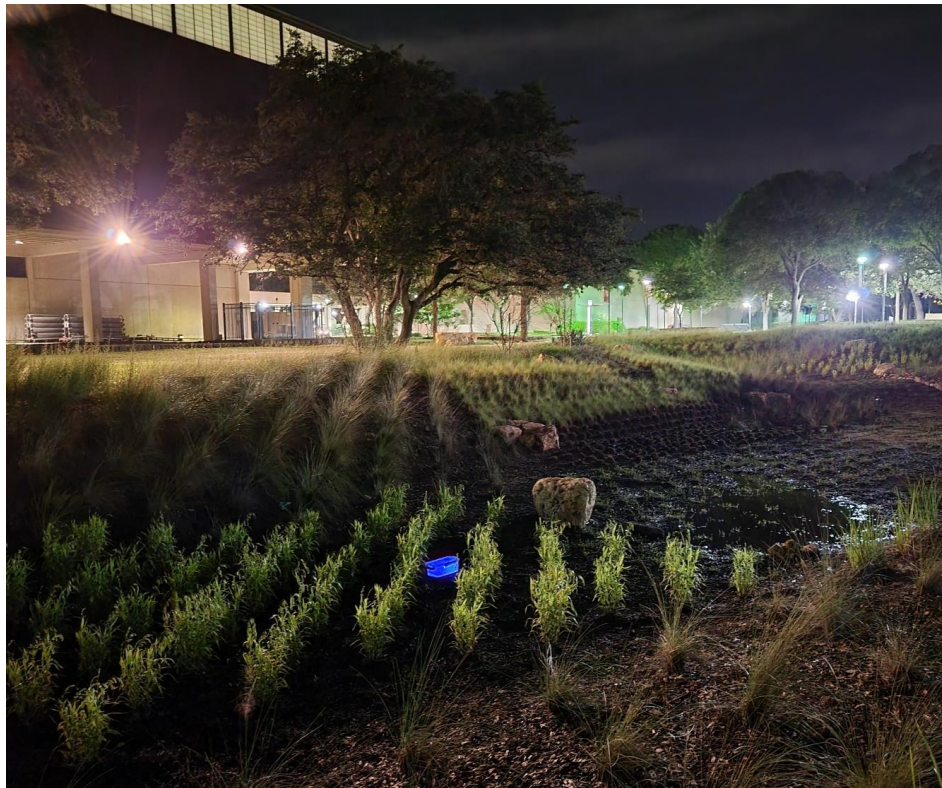
A Respite

- Educational signs
- Student research projects
- Wellness
- Environmental Quality and Net Zero Goals
- Leadership in Energy and Environmental Design
- Community Engagement



UTSA OTHER BENEFITS

A Respite



UTSA DELIVERABLES

Final Reports

1. Final report
Details monitoring results
2. Business Plan
Summarizes costs/benefits
Discusses transferability
3. Maintenance Plan



STORMWATER CONTROL

IN A CAMPUS SETTING

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Conclusions

Does rooftop harvesting and linked stormwater treatment over pervious cover improve water quality relative to untreated stormwater routing to stream channels and relative centralized, non-linked stormwater routing over a sand filter basin?

- **Yes – reduced loads of ecoli, concentrations of some of the other pollutants**
- **San filter basins were not performing well**

Conclusions

What is the efficacy of LID BMPs' ability to remove solids and pollutants, reduce temperatures in stormwater effluent and provide aesthetic alternative treatments for storm water?

- **Bioretention basin, bioswale are functional green spaces**




Conclusions

What are the viability and benefits of incorporating LID BMPs into the UT System construction standards?

- Cisterns provide some irrigation
- Stormwater retention, mitigates downstream peakflows
- Functional pollutant removal
- Aesthetic green space
- Educational benefits
- Student involvement and retention

BIOSWALE CLEAN-UP



TUESDAY, MARCH 22ND
8:00-11:00AM

The University of Texas at San Antonio
UTSA Department of Integrative Biology

UTSA RECOMMENDATIONS

Value

Linked stormwater treatment provided numerous benefits

- Increased stormwater retention
- Improved water quality
- Aesthetic landscape
- Educational opportunities
- Costs were high (~\$3 million)
- Maximizing cost-benefit
- Target areas with known pollutant issues
- Areas where public can be engaged



UTSA RECOMMENDATIONS

Maintenance

Maintenance Plan

Currently does not require specialized maintenance

- Reduced need for specialized plant expertise
- General herbicides can be applied, basin removed copper



UTSA RECOMMENDATIONS

Critical Construction Considerations

- Ensuring delivery of materials that meet specifications
- Onsite knowledge about bioretention basin materials to check deliveries against specifications
 - Size, washing, material type
- Technical guidance manual could have recommendation that project scope mandate contractor ensure material meets specifications within a given time period
- Critical value is considered inline with project cost



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