

# U.S. EPA RAINWORKS CHALLENGE: THE UNIVERSITY OF TEXAS AT ARLINGTON'S EXPERIENCE, & ROLE FOR NORTH TEXAS

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# OUTLINE

- **Introduction**
- **Green Infrastructure (GI) & US EPA Campus Rainworks**
- **UTA Rainworks Challenge 2012-2021**
- **The Technical Challenge & Exhibit, 2022-2023**
- **The UTA's GI Report, 2023**
- **Lessons Learned**

### What is “Green Infrastructure (GI) or (BGI)”?

- **A more nature friendly means of managing urban flood-risk,**
- Practices that **restore or mimic natural** hydrological processes. While “gray” stormwater infrastructure is largely designed to convey stormwater away from the built environment,
- BGI uses **soils, vegetation, landscape forms,** and other media to manage rainwater where it falls through capture, storage, and evapotranspiration.
- BGI has **community benefits,** including reducing stormwater flooding impacts, improving water and air quality, reducing urban heat island effects, creating habitat for wildlife, and providing aesthetic and recreational value (EPA, 2023; Lamond & Everett, 2019; Abbott et al., 2013).

## What is Campus Rainworks Challenge?

- **The Campus RainWorks Challenge is a Green Infrastructure (GI) design challenge** for American colleges and universities organized by **U.S. EPA**.
- **It engages with the next generation of environmental professionals**, foster a dialogue about the need for innovative stormwater management techniques, and showcase the environmental, economic, and social benefits.
- Since **2012**, this challenge has invited multidisciplinary faculty, students, staff, and professionals to **produce evidence-based ideas to promote solutions**.
- The Campus RainWorks Challenge initiatives invites students to be part of the solution today and in the **future as a liaison**.

## GOALS

*Campuses are used as incubators of future design professions, and the testing ground for innovative GI and climate change responsive design practices.*

## PURPOSE

- This presentation aims to **review the projects explored, and the lessons learned** from EPA's RainWorks **initiatives** (challenges and the pilot) within the past ten years while highlighting what is next for GI and climate action research, education, practice, and service.



# QUESTIONS

- What is EPA's **mission** with GI Initiatives?
- What UTA has participated and is **achieved** within the **past ten years**?
- What is **faculty advisor's experience** to teach, research and serve its community through this challenge, and pilot in this period?
- **What is next?** How can GI and EPA's Rainwork initiatives be **implemented and scaled up** on and off campuses?
- Can UTA be used as **Urban Lab** for GI/BGI research and demonstration in North Texas Region?

## Rainworks Challenge, the Pilot, Exhibit & Report, UTA Experience

- Since **2012**, UTA CAPPAs' **Landscape Architecture Studio-5 is competing** in EPA's Campus RainWorks Challenge. In its **10 year** of this challenge U.S. EPA decided to run a pilot and sponsored it.
- *EPA's Campus RainWorks Challenge Pilot* is intended to **highlight the merits of past Campus RainWorks challenge/competition designs** (2012 through 2021) and **create new incentives to advance green infrastructure implementation** at institutions of higher education.
- Intended to **bridge the communication** between academic departments (researchers, teachers), operational staff (facilities), administrators, and community.
- EPA invited the UTA faculty advisor and UTA to participate as **one of two national institutions invited to participate due to its previous participation and successes** in this challenge.
- UTA and EPA Design Team started the pilot in the Spring with had a major **design charette and series of visioning sessions** (October 7<sup>th</sup> Design Charette). Dr. Taner R. Ozdil serves as the lead and initial point of contact.
- Pilot produced compendium of past work and a GI report for UTA Campus.



# UT ARLINGTON

# |CHALLENGE : 20122| COMPETITION SUBMISSION





Dallas



Arlington



UTA



# Trinity, Dallas

<https://www.dallasnews.com/news/education/2022/08/22/classes-continue-for-most-north-texas-students-despite-flooding-bus-disruptions/>



# Johnson, Arlington

<https://i.imgur.com/EtEroIK.jpg>

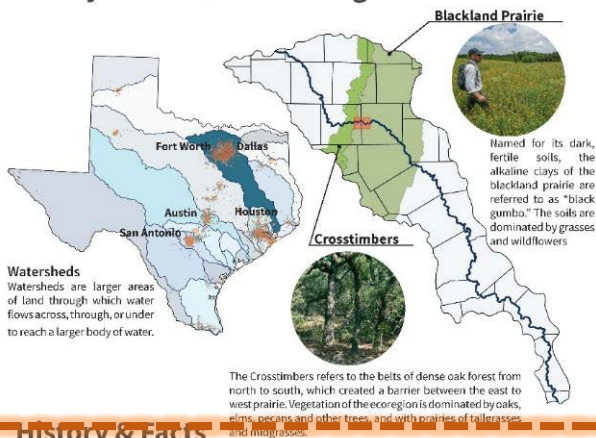


# Trading House, UTA

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UTA CAMPUS 2012-22  
Inventory & Analysis

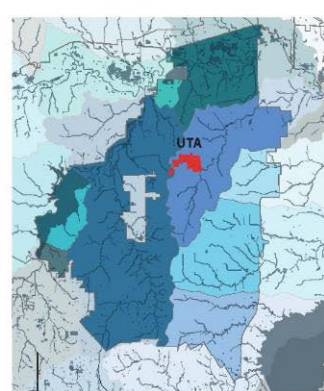
## Trinity River Basin & Ecoregions



## Regional Context

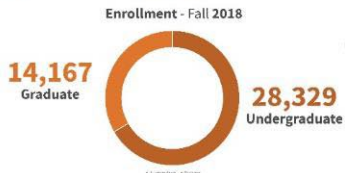


## Subwatersheds



## History & Facts

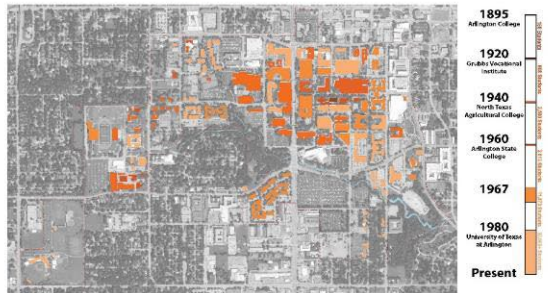
**5,000+** students live **on campus**  
**6,000** faculty + staff work **on campus**  
**5,000+** students live **adjacent to campus**  
 UTA students come from **every state** in the U.S.  
 UTA students come from **100+** countries in the world  
**Global** enrollment 2018-2019: **60,000**



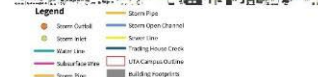
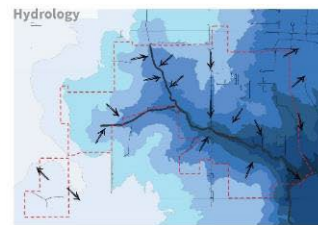
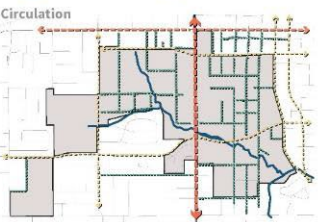
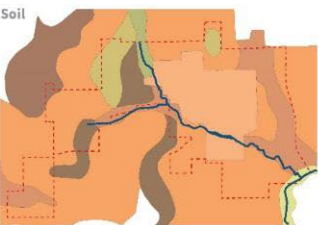
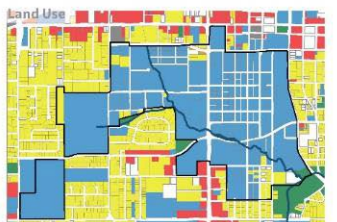
Undergraduate Diversity - Fall 2018



Graduate Diversity - Fall 2018



## Campus Inventory



SAMPLE  
STUDENT  
INVENTORY

# UTA DEVELOPMENT TIME LINE



**ARLINGTON COLLEGE**

Fall Student Enrollment: 150



1900-1920

1917: Approximately 12 acres

Arlington College was established in 1895 as a result of the local community wanting to improve education within the city.



**GRUBBS VOCATIONAL INSTITUTE**

Fall Student Enrollment: 808



1921-1940

As the first state-supported institution of higher education, Grubbs Vocational Institute became an extension of the Texas A&M University System.

The only remaining building from Grubbs Vocational Institute is Ransom Hall (completed in 1919).



**NORTH TEXAS AGRICULTURAL COLLEGE**

Fall Student Enrollment: 2,500



1941-1960

Grubbs Vocational Institute was renamed North Texas Agricultural College and then became Arlington State College in 1949.

In 1959, Governor Price Daniel established Arlington State College as a four-year institution and accreditation followed a few years later.



**ARLINGTON STATE COLLEGE**

Fall Student Enrollment: 2,013



1961-1980

1965: approximately 130 acres

In April 1965 Arlington State College became part of the University of Texas System. Then in 1967, the campus became officially known as The University of Texas at Arlington.



**UNIVERSITY OF TEXAS AT ARLINGTON**

Fall Student Enrollment: 11,873



1981-2000

1998: approximately 392 acres

During President Nedderman's term (from 1972-1992), the campus almost doubled enrollment and added a significant number of degree programs. To support this growth the campus enlarged its land holdings, built approximately 20 new buildings, and renovated others.



**UNIVERSITY OF TEXAS AT ARLINGTON**

Fall Student Enrollment: 21,180

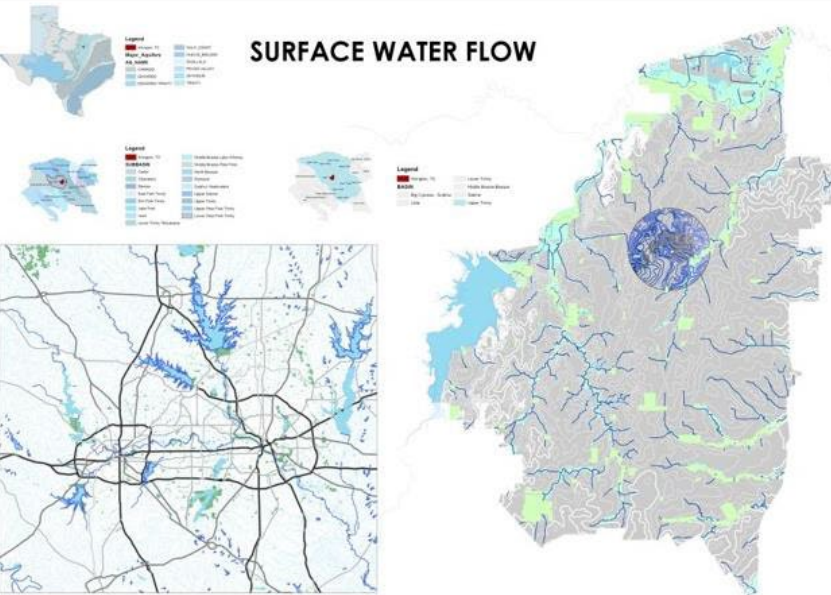


2001-PRESENT

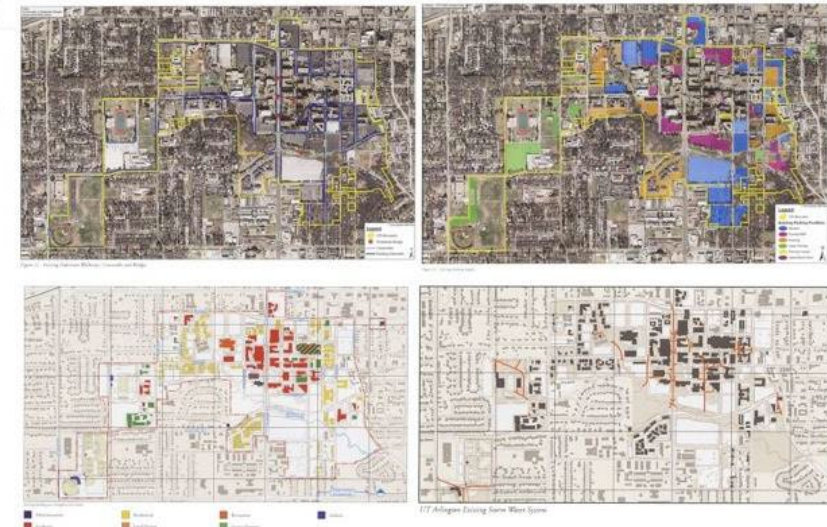
2005: approximately 406 acres

There have been a great number of changes to the university over the past seven years. New academic buildings have been constructed along with new residence halls and student apartments. Plans are underway for an addition and renovation of the Maverick Activities Center (MAC), an addition to the Engineering Lab Building, and the construction of a new Engineering Research Building.

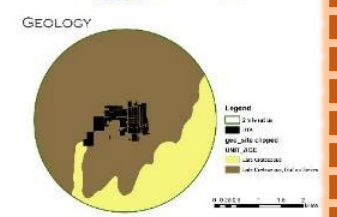
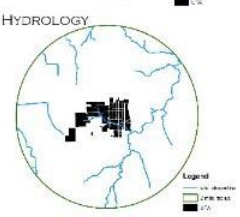
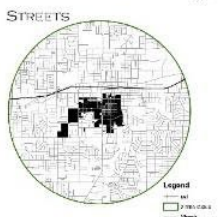
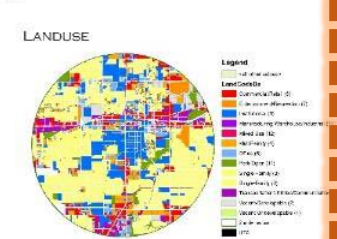
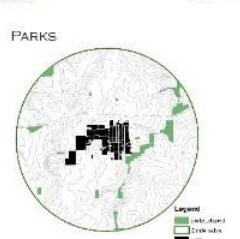
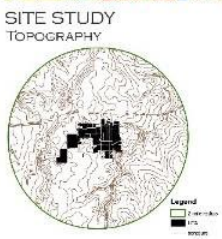
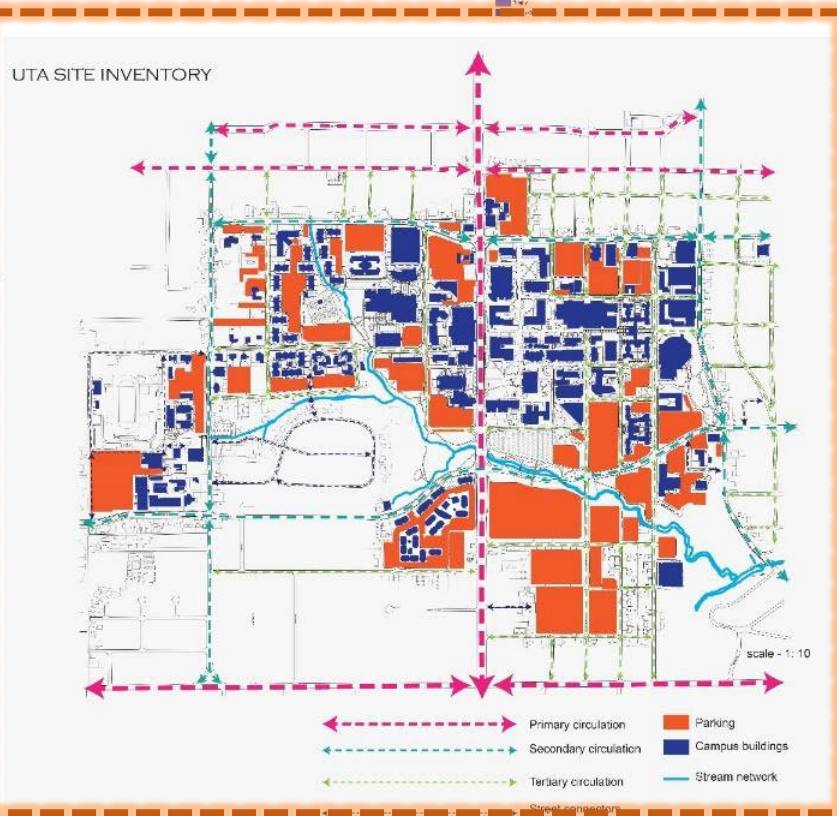
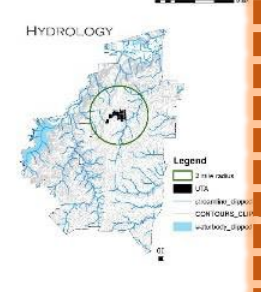
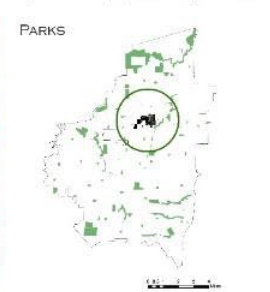
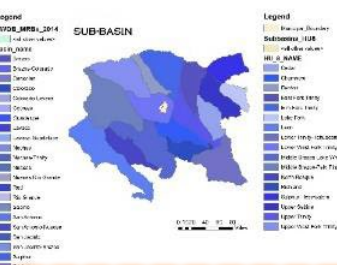
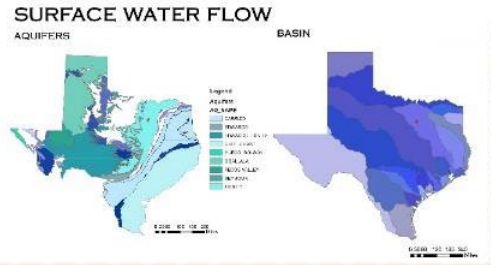
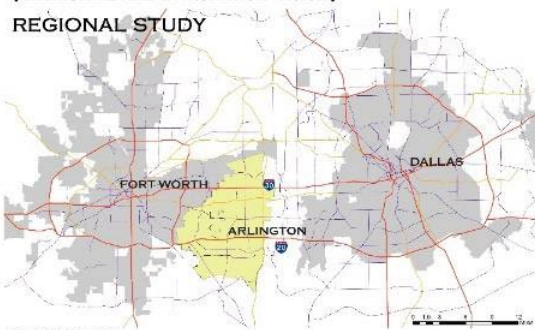
## SURFACE WATER FLOW



## UTA INVENTORY & ANALYSIS

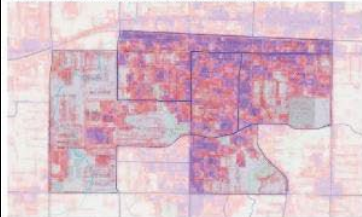


SAMPLE  
STUDENT  
INVENTORY



SAMPLE STUDENT INVENTORY

### IMPERVIOUS SURFACES



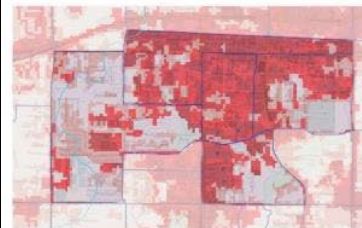
### PLANTABLE SPACE



### CANOPY COVERAGE



### DEVELOPMENT DENSITY



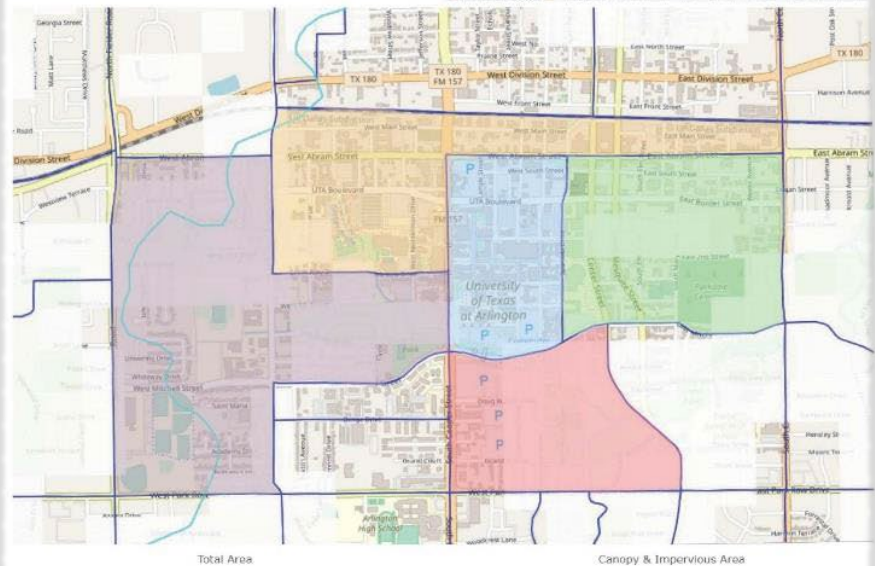
### CARBON STORAGE, SEQUESTRATION & CO2

Block	Area	Carbon Storage	Carbon Sequestration	CO2
484301223002	10000	10000	10000	10000
484301223003	10000	10000	10000	10000
484301223004	10000	10000	10000	10000
484301224004	10000	10000	10000	10000
484301224001	10000	10000	10000	10000

### TRANSPIRATION, RAINFALL INTERCEPTION & AVOIDED RUNOFF

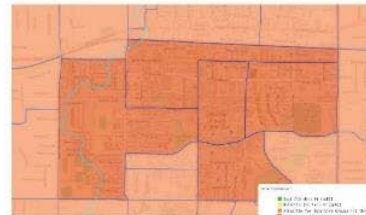
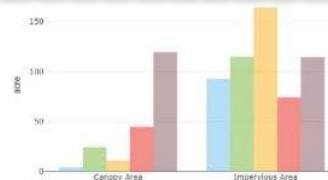
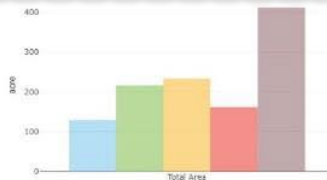
Block	Area	Transpiration	Rainfall Interception	Avoided Runoff
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484301223003	10000	10000	10000	10000
484301223004	10000	10000	10000	10000
484301224004	10000	10000	10000	10000
484301224001	10000	10000	10000	10000

### TOTAL AREA, CANOPY & IMPERVIOUS AREA BASED BY BLOCK

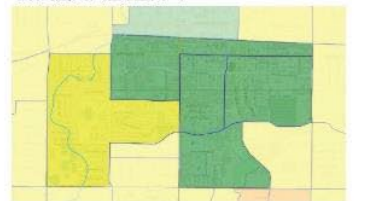


### REPORTED HEALTH INCIDENCES

Block	Area	Health Incidences
484301223002	10000	10000
484301223003	10000	10000
484301223004	10000	10000
484301224004	10000	10000
484301224001	10000	10000



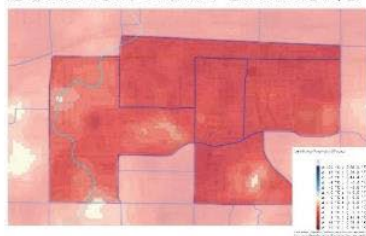
### WALKABILITY



### PRIORITY AREAS : BASED ON CANOPY COVERAGE, IMPERVIOUS SURFACES & DENSITY



### SURFACE TEMP. CHANGES

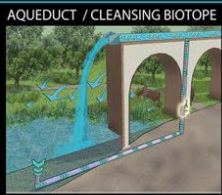


SAMPLE STUDENT INVENTORY



UTA CAMPUS 2012-22  
Vision(s)





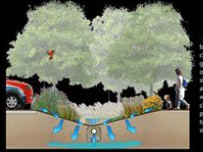
The aqueduct and cleansing biotope form one of the most visible features on the site. The aqueduct itself carries untreated stormwater from the biotope. But it also serves as a structural structure for the south of the University of Texas at Arlington campus. A pump system draws water as it flows through to purify it and send it back into the drainage system. This water feature is purposed to be a wetland pond after museum's entrance. Any overflow from the pond during major storm event must connect through series of rain gardens before reaching the creek.



The most extensive low impact development strategy on the site is the permeable paving. The museum visitor parking lot replaces traditional asphalt with permeable paving. The road deck is a porous in-situ concrete made under the parking lot, allowing it to filter through sand or gravel and recharge the groundwater. A similar effect is created by implementing permeable walking surfaces as well as both the promenade and museum's walk along the creek. Some water would trickle through into the ground, while the rest would flow into nearby rain gardens and bioswales.

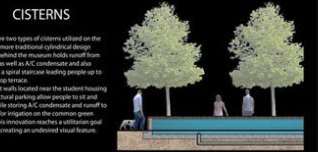


One innovative sustainable solution is incorporated into the museum rooftop. It addresses the divergence in benefits of intensive and extensive green roof strategies. By combining the roof surface and installing smart banners, insulation, water caps, fiber fabric, and finally a growing medium as well as plants, the roof can be used for a variety of purposes. The smart banners can be enjoyed while the majority of the green roof is extensive in nature, absorbing the water and energy benefits of a green roof and reporting low maintenance. This just another example of combining green strategies to solve a sustainable, economical, and visual issue.



RAIN GARDEN

A variety of rain garden types are used on the site. Both vegetated and vegetated roof, capture rain garden, and green space of water, while the others are more extensive and reduce the overall runoff. A series of terraced rain gardens along the creek act as stepped filters for the water to pass through into the creek. The cisterns serve a similar purpose, while also providing a visually rich feature to the landscape. This innovation reaches a trifecta goal without creating an uninvited visual feature.



CISTERNS

There are two types of cisterns utilized on the site. The most traditional cylindrical design, located under the museum, holds water from the roof as well as A/C condensate and also serves as a visual staircase leading people up to the walking terrace. The small walls located near the student housing and mechanical parking allow people to sit and relax, while storing A/C condensate and runoff to be used for irrigation on the campus green space. This innovation reaches a trifecta goal without creating an uninvited visual feature.

**CONCLUSION**

Every feature of this design serves a dual purpose to serve the humans on the campus as well as to protect its share of the Trinity River watershed. The HydroScape, created for the University of Texas at Arlington and created by Herbert such as the aqueduct and museum that provide communication and attract visitors to the campus from around the neighborhood. This project aligns with UTA's strategic vision for the College Park, in providing an educational addition to its social district and linking through green infrastructure and low-impact development, the university will further its reputation as a forward thinking institution and a major force behind the city of Arlington.

"HYDROSCAPE"

Student Team:  
Kent Elliott  
Blake Sampler

SUBMISSION BOARDS  
Honorable Mention - Video  
Ranked in the top 8 out of 218  
Master Plan Category

2012-13 SUBMISSION BOARDS

HYDROSCAPE

CHALLENGE

The site is located on along Tardighouse Creek at the University of Texas at Arlington in North Central Texas. Following the campus southern edge. The creek is lined with a green strip that is interrupted by large parking lots on either side, resulting in an inaccessible space and large amount of runoff pouring south into the creek. The challenge of this project is to transform this inhospitable space into a runoff-to-development connector and connecting to a defined, attractive campus edge.

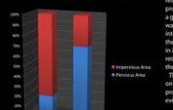
SOLUTION

The solution to this problem is to define a green, both vegetated and sustainable, edge for the UTA Arlington Campus, by connecting to the rest of campus and creating a museum and research facility. This project provides symbolic and economic benefits to the institution. On a green scale, it also benefits the Trinity River watershed by reducing water on the site, reflecting it with native vegetation, and restoring it back into the system. This green vision has provided a maximum benefit for the runoff at every point on site. The design results in a 72% reduction in impervious area and a 22% decrease in peak storm runoff. This reduces the site back to pre-development conditions, slowing down the water and removing pollutants.

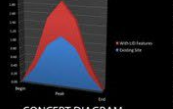
ANALYSIS WATERSHEDS



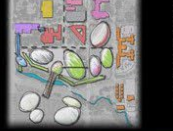
IMPERVIOUS SURFACES



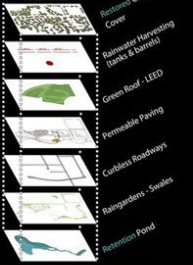
PEAK RUNOFF



CONCEPT DIAGRAM



TREATMENT TRAIN



SOILS

The soils on site have been assessed at the point of being called every "Urban Soils" by the USDA Soil Survey.

FAUNA

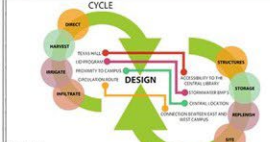
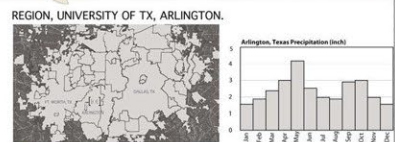
Fauna observed living in the creek include Texas Southern, Red Eared Sliders, and Alligator Snapping Turtles.

POLLUTION

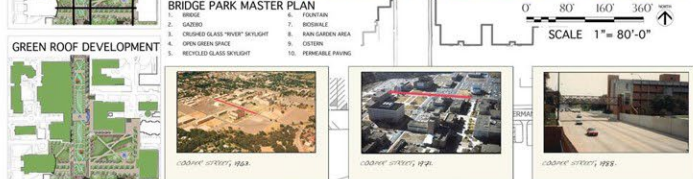
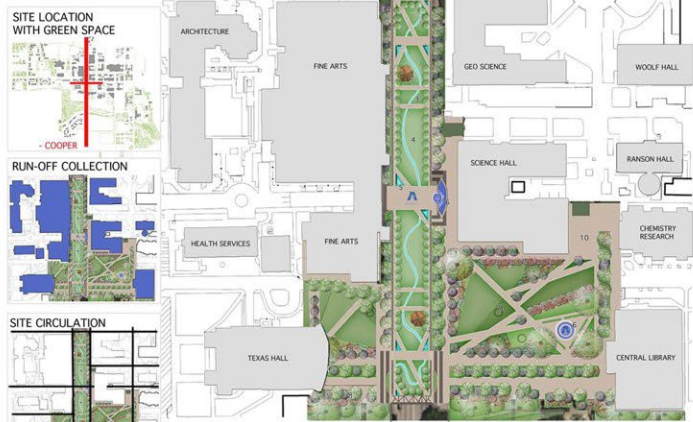
Present conditions permit chemical pollutants and trash to be swept into the creek. Conditions in this problem. These issues contribute to pollution problems in the Trinity River.



# PERFORMATIVE SYSTEMS & URBAN ECOLOGY



VISION  
THE FUTURE OF OUR UNIVERSITY SPACE  
CAMPUS INFRASTRUCTURE DEPENDS  
ON OUR ABILITY TO DESIGN AND IMPLEMENT  
PERFORMATIVE SYSTEMS IN ORDER TO PRESERVE OUR  
URBAN ECO SYSTEM. IT IS OUR VISION TO CREATE A GREEN  
CONNECTION THAT IS SUSTAINABLE AND MODULAR. THE  
DESIGN WILL IMPROVE WATER QUALITY BY MITIGATING  
STORMWATER RUNOFF AND WILL EMBRACE NATURAL  
PROCESSES. A CENTRAL BRIDGE PARK AND RAINGARDEN  
COURTYARDS FOR THE CENTRAL LIBRARY AND TEXAS HALL  
WILL BE UNIQUE AMENITY AREAS THAT WILL BE  
ATTRACTIVE TO THE U.T.A. CAMPUS AND THE CITY OF  
ARLINGTON.



DEVELOPMENT PROCESS

STORMWATER STATISTICS

STRUCTURAL DIAGRAM

BRIDGE PARK ENTRANCE

ADA ACCESS

BRIDGE PARK VIEW

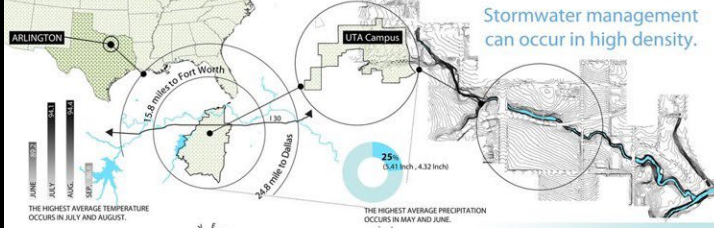
COURTYARD

RAINWORKS CHALLENGE | LID COMPETITION

"PERFORMATIVE SYSTEMS"

Student Team:  
Devin Guinn  
Geoffrey Hall  
Jonathan Walker

Master Plan Ctg.



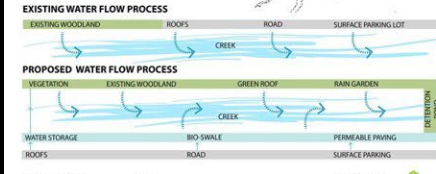
**PROBLEM STATEMENT**  
 The site is a part of Johnson Creek Watershed which is tributary of Trinity River. The University of Texas at Arlington is the largest single landowner in Johnson Creek Watershed. Trading house creek, which is tributary of Johnson creek flows across the site. The storm water runoff from campus flows to Trading house creek. The southern part of the campus fall under 100 year floodplain. The proposed storm water management aims to reduce the local flooding caused by impervious surfaces on campus. This is done by incorporating Low Impact Development in the proposed campus expansion.

**SOLUTION**

BEFORE DESIGN	AFTER DESIGN
SURFACE PAVING: 16.6 ACRES	PAVING LOTS: 5-STORY STRUCTURAL PARKING: 0.1 ACRES
EXISTING ROAD: 1.16 ACRES	SURFACE PAVING: 21 ON-STREET PARKING SPACES: 20.00 ACRES
WALKWAYS: 2.01 ACRES	GREEN SPACE: 3.01 ACRES
GREEN SPACE: 6.50 ACRES	GREEN ROOFS: 2.50 ACRES
	OTHER ROOFS: 2.80 ACRES

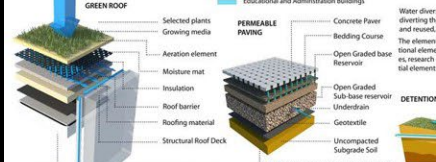
Percentage increase on green space: 200%  
 Percentage increase on walkways: 38%  
 Percentage reduction on surface parking: 99%

- RECOMMENDED LID PLANTS**
- Anisopogon glomeratus
  - Taxodium distichum
  - Eriopogon caryocarpus
  - Ulmus crinitifolia
  - Lagerströmia indica
  - Equisetum hyemale
  - Physalis virginiana
  - brevoortii
  - Muhlenbergia lindheimeri
  - Alyce confertifolia



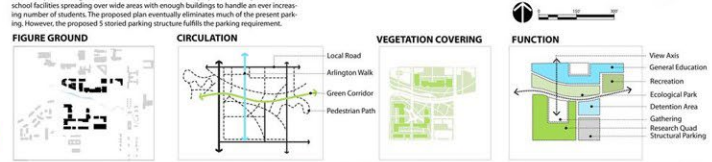
**LEGEND**

- Arlington Walk in Planning
- Ecological Seaming
- Research Center
- Campus South Expansion
- Arlington Walk terminates as green plaza in research quad
- Expanding school facilities
- Tying two units with vegetation covering, introducing ecological planning and native plants to connect north and south parts of campus
- Increase recreational area and increase density
- Collect concrete of surface parking for gabion construction for walkways



Water diversification is applied as a flood protection technique. The design of diversification includes diverting the storm water runoff towards areas where it can be evaporated, infiltrated, captured and reused, and the water quality can be improved.

The elements of designed space can be categorized as functional, structural and experiential. Functional elements include green roof, bio-swale, and detention pond. Structural elements include bridges, research quad, structural parking space, campus addition, green roadway Mitchell Street. Experiential elements include boardwalks, biking and walking trails, and pathways.



“UTA CAMPUS VISION”

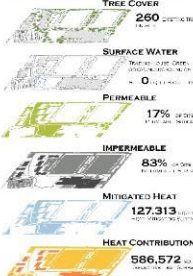
Student Team:  
 Chiyang Xu  
 Chunling Wu  
 Anjana Pradhananga

Master Plan Ctg.

# ECO-FLOW

A WATER-SENSITIVE PLACEMAKING RESPONSE TO CLIMATE CHANGE

## EXISTING PROBLEMS

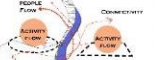


- COLLECT** (Rainwater and Air Conditioning)
- CLEAN** (Quality Management)
- PROTECT** (Protect the Green)
- PROVIDE** (Provide the Green)

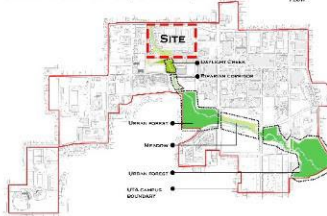
## PROJECT GOALS

- 1. USE INFRASTRUCTURE DESIGN TO IMPROVE THE QUALITY OF THE ENVIRONMENT
- 2. PROVIDE A SUSTAINABLE AND AFFORDABLE HOUSING SOLUTION
- 3. PROVIDE A SUSTAINABLE AND AFFORDABLE HOUSING SOLUTION
- 4. PROVIDE A SUSTAINABLE AND AFFORDABLE HOUSING SOLUTION
- 5. PROVIDE A SUSTAINABLE AND AFFORDABLE HOUSING SOLUTION

## CONCEPT



## CAMPUS ECOLOGICAL PLAN



## HYDROLOGY



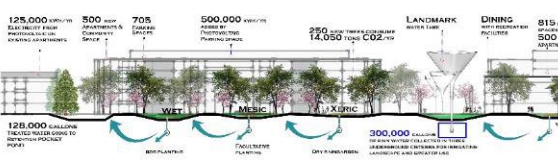
## MICRO CLIMATE



## VALUE TO CAMPUS



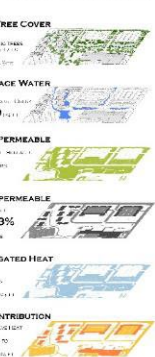
## RAIN GARDEN TREATMENT TRAIN SECTION



## OUTCOMES

- 25% VOLUME OF RETENTION FROM EXISTING CONSTRUCTION
- 596,642 GAL OF RAINWATER COLLECTED
- 623,000 GAL OF RAINWATER COLLECTED
- 100% AREA OF IMPERVIOUS SURFACE
- 3% LOSS OF IMPERVIOUS SURFACE
- 93% OF IMPERVIOUS SURFACE
- 25% WALKABLE SURFACE
- 80% OF EXISTING SURFACE
- 300 sq ft OF OPEN SPACE
- 3 RETENTION POCKETS
- 1,162 sq ft OF OPEN SPACE
- 5,000 GAL OF RAINWATER COLLECTED

## PERFORMANCE



## RESILIENCY

- 1. REDUCE IMPERMEABLE SURFACE
- 2. REDUCE IMPERMEABLE SURFACE
- 3. REDUCE IMPERMEABLE SURFACE
- 4. REDUCE IMPERMEABLE SURFACE
- 5. REDUCE IMPERMEABLE SURFACE
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- 9. REDUCE IMPERMEABLE SURFACE
- 10. REDUCE IMPERMEABLE SURFACE

## GREEN INFRASTRUCTURE

GREEN INFRASTRUCTURE IS A DESIGN APPROACH THAT USES NATURE TO ADDRESS WATER AND CLIMATE CHALLENGES. IT INCLUDES GREEN ROOFS, PERMEABLE PAVEMENT, PLANTING, AND OTHER STRATEGIES THAT HELP MANAGE RAINWATER AND IMPROVE AIR QUALITY. GREEN INFRASTRUCTURE CAN BE INTEGRATED INTO EXISTING AND NEW DEVELOPMENT TO REDUCE FLOODING, IMPROVE WATER QUALITY, AND REDUCE CARBON EMISSIONS.

"ECO-FLOW"

Student Team; Jake Schwarz, Baishakhi Biswas & Sherry Fabricant, Ahoura Zandiataashbar  
**First Place**, Master Plan Category

# INNOVATION PARK GREEN INFRASTRUCTURE VISION FOR UT ARLINGTON

### INVENTORY-ANALYSIS

CAMPUS HYDROLOGY

EXISTING SITE CONDITIONS

TOTAL SITE AREA: 26 acres  
IMPERVIOUS AREA: 18.67 acres  
RUNOFF DEPTH: 25.91 in./year

ESSENTIAL STORMWATER POLLUTION FROM RAINFALL COLLECTED BY EXISTING INFRASTRUCTURE AND RUNOFF DRAINAGE SYSTEMS

Site and nearby streets such as campus roads, streets, and parking lots are paved with impervious surfaces.

UT ARLINGTON CAMPUS AREA - 68 ACRES  
TOTAL SURFACE PARKING AREA - 96 ACRES

PERCENTAGE OF IMPERVIOUS SURFACES

PERCENTAGE OF GREEN SURFACES

### VISION-GOALS

- STORMWATER MANAGEMENT
- CLIMATE CONTROL
- FLOOD MITIGATION
- SOLAR ENERGY
- HABITAT ECOLOGY
- POLLUTION REDUCTION

### CLIMATE CHANGE PROJECTIONS

ADJUST YEAR: 2050

WETTER WINTER

WARMER WINTER

PROJECTED CHANGE IN TEMPERATURE (year 2050)

PROJECTED CHANGE IN RAINFALL (year 2050)

### ADAPTATION + MITIGATION STRATEGY

- RETAIN + REUSE**: Capture and store water to use in areas with high water demand.
- FILTER + DETAIN**: Filter pollutants and store water for later use.
- ACTIVATE + RECREATE**: Reduce heat waves of dense parking and create active spaces.
- ADAPT + MITIGATE**: Reduce heat waves and improve air quality.

### SITE LOCATION

### CAMPUS MASTER PLAN

EXISTING

PROPOSED SITE DEVELOPMENT

TOTAL SITE AREA: 26 acres  
IMPERVIOUS AREA: 10.41 acres  
RUNOFF DEPTH: 7.40 in./year

STORMWATER POLLUTION FROM RAINFALL COLLECTED BY EXISTING INFRASTRUCTURE AND RUNOFF DRAINAGE SYSTEMS

Site and nearby streets such as campus roads, streets, and parking lots are paved with impervious surfaces.

UT ARLINGTON CAMPUS AREA - 68 ACRES  
TOTAL SURFACE PARKING AREA - 96 ACRES

PERCENTAGE OF IMPERVIOUS SURFACES

PERCENTAGE OF GREEN SURFACES

### SITE DEVELOPMENT

PRECIPITATION

EXPOSURE + TRANSPORTATION

AGRIUM TECHNOLOGY

GROUNDWATER RECHARGE

EXPOSURE + TRANSPORTATION

STORMWATER INFILTRATION

AGRIUM TECHNOLOGY

GROUNDWATER RECHARGE

EXPOSURE + TRANSPORTATION

### HABITAT GARDEN

PLAZA

# INNOVATION PARK GREEN INFRASTRUCTURE VISION FOR UT ARLINGTON

### SCHEMATIC MASTER PLAN

LEGEND

- 1. Existing Building
- 2. New Building
- 3. Existing Parking
- 4. New Parking
- 5. Existing Green Space
- 6. New Green Space
- 7. Existing Road
- 8. New Road
- 9. Existing Stormwater Infrastructure
- 10. New Stormwater Infrastructure
- 11. Existing Utility
- 12. New Utility
- 13. Existing Landscape
- 14. New Landscape
- 15. Existing Tree
- 16. New Tree
- 17. Existing Tree
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- 98. New Tree
- 99. Existing Tree
- 100. New Tree

### AERIAL LOOKING WEST

### VIEW AT BRIDGE LOOKING SOUTH

### BOARDWALK LOOKING NORTH

### TYPICAL BIOSWALE SECTION

### SECTION A-A

### HABITAT IMPROVEMENT

## "INNOVATION PARK AT UT ARLINGTON"

Student Team; Loyal Bitar-Ghanem, Kerry G.Harrison, Riza Pradhan, Somayeh Moazzeni

Honorable Mention, Master Plan Category

2015-16 SUBMISSION BOARDS

# CONVEYANCE

COMMUNICATING ECOLOGY THROUGH DESIGN



## MASTER PLAN

Scale 1" = 60'



COMPOSITE

20 acre site  
is a critical stormwater drainage point



DRAINAGE + WINDS

460 acres  
of campus stormwater converges



CIRCULATION

85% students  
commute to campus



GREEN SPACE

16%  
lurf with trees and channelled creek



IMPERVIOUS COVER

82%  
impervious cover speeding up water to site

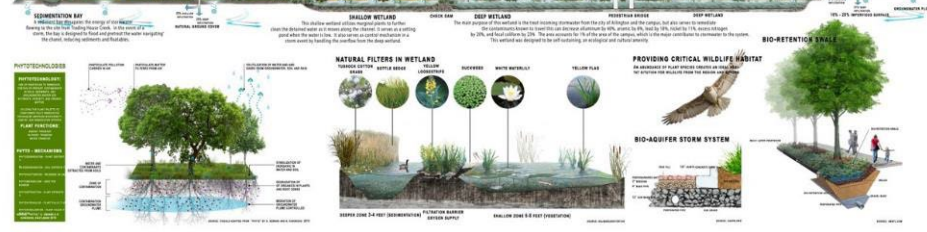
## OUTCOMES

293% INCREASE IN GREEN INFRASTRUCTURE & LID SYSTEMS

8.25% RETENTION	5.68% WET LANDS	8.21% RAIN GARDENS	19.1% PERMEABLE PAVING	14.2% WHITE ROOF SYSTEMS	5.6% EXTENSIVE GREENROOF	10.2% GRASS TURF
--------------------	--------------------	-----------------------	---------------------------	-----------------------------	-----------------------------	---------------------

EFFECT NOW + MEDIAN CLIMATE CHANGE MODEL  
DECREASED RUNOFF BY 65% + INCREASED INFILTRATION BY 344%

INCREASED TREE CANOPY BY 108%  
RESULTING IN A 108% INCREASE IN CO2 SEQUESTRATION, OVER 44,619 LBS  
7,256 PHOTOVOLTAIC PANELS  
GENERATING OVER 2.6 MILLION KW OF POWER PER YEAR AND OVER \$350,000 YEARLY



“CONVEYANCE”

Student Team; Molly Plummer, Reza Paziresh, Ann Podeszwa, & John Watkins,

This project is part of UNESCO's SDG Local Project Archive - <http://localprojectchallenge.org/>

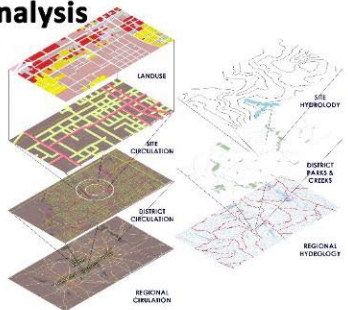
Master Plan Category

2016-17 SUBMISSION BOARDS





## Analysis



Arlington lies in the humid subtropical region of the Eastern United States, an urban form which is a climate zone characterized by hot, humid summers and mild to cool winters.

Average High Temp: **94.4 F**  
July/August

Average Low Temp: **35.1 F**  
January

Average High precipitation: **5.41"**  
July

Average Annual precipitation: **39.6"**

Average Annual snowfall: **1"**

Average (light) wind: **12.8 mph**  
March/April

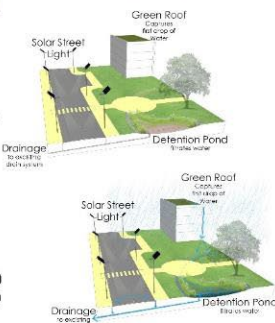
Average (prevail) wind: **8.7 mph**



**Increase Permeable Surface 17% to 41%**

Improve Air quality

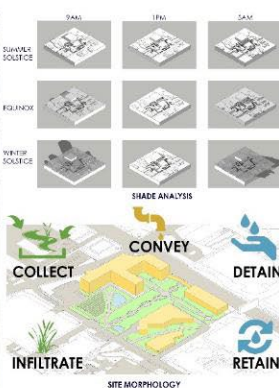
## Function Diagram



## Section



**Decrease Impermeable Surface 83% to 59%**



- Legend**
1. Bioswale
  2. Green Roof
  3. Retention Pond
  4. Detention Pond
  5. Parking
  6. Bridge
  7. Sky Light
  8. Rain Garden
  9. Landmark
  10. Court Yard

## EPA Campus Rainworks Challenge

Environmental Education and Stewardship Through Implementation

The Eco-Lab Center will serve as a model for other institutions to follow. The Center will not only help mitigate the environmental issues associated with storm water run-off, but also provide the university with a living laboratory where faculty and students can research, implement, and test green infrastructure systems.

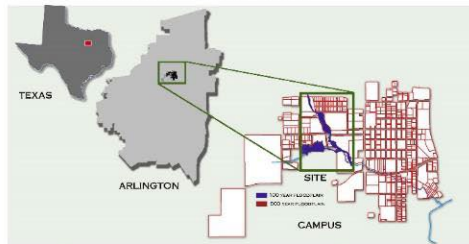
Team Members: Steven Nunez, Mohamed Amer, Ali Khoshkar | Instructor: Dr. Tanner Ozell | Studio V | University of Texas at Arlington | Fall 2017

**"COELESCE"**  
Student Team;  
Mohamed Amer  
Ali Khoshkar  
Steven Nunez  
Master Plan Ctg.

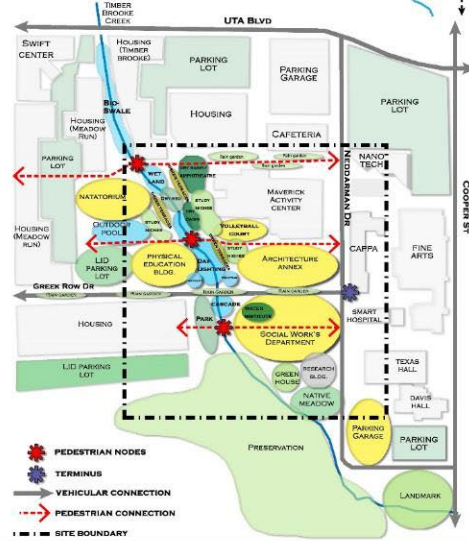
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BOARD 2017-18

# WEST CAMPUS

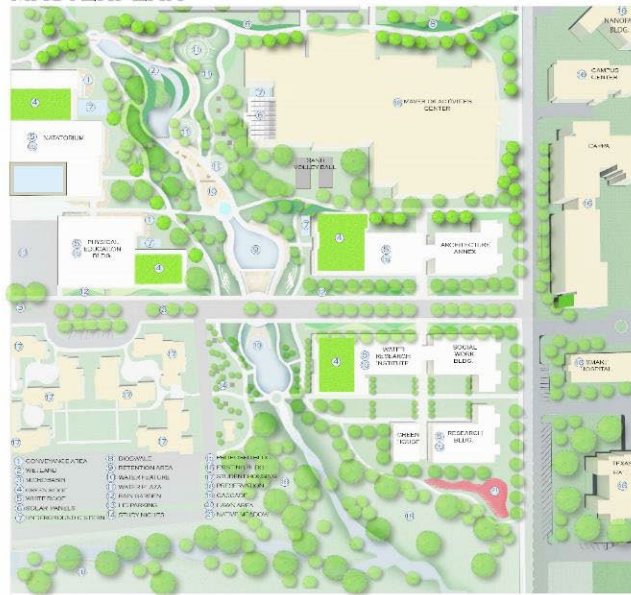
[ENVIRONMENTAL INTEGRATION VISION]



## CONCEPT



## MASTERPLAN



## BIRD'S EYE PERSPECTIVE - GREEK ROW DR

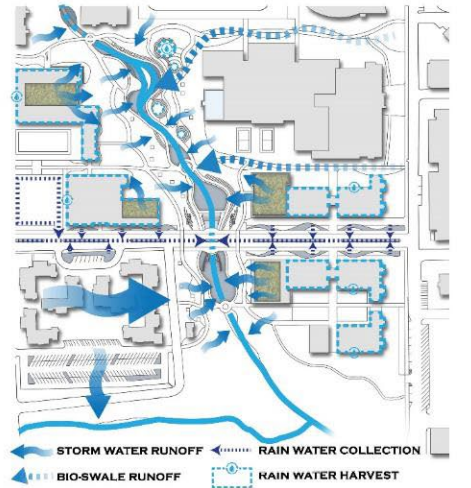


## PERFORMANCE

	BEFORE	AFTER
WATER RUNOFF VOLUME	4,001,148 GAL	2,984,772 GAL
HEAT CONTRIBUTION	1,276,994 FT <sup>2</sup>	702,113 FT <sup>2</sup>
MITIGATED HEAT	680,854 FT <sup>2</sup>	1,004,580 FT <sup>2</sup>
PERMEABLE PAVING	0	21,419 FT <sup>2</sup>
PERMEABLE (%)	35%	54%
IMPERVIOUS SURFACES (%)	65%	46%
TREE COVERAGE	181 TREES	44% ADDED

200 SOLAR PANELS PRODUCE 927,246,000 KWH OF ENERGY PER YEAR

## HYDROLOGY



*"WEST CAMPUS"*  
 Student Team;  
 Crystal Kazakos  
 Annabeth Webb  
 Juan Fuentes  
 Niveditha Gangadhar

Master Plan Ctg.

SUBMISSION  
 BOARD 2018-19

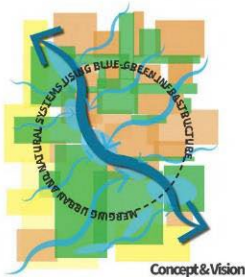
# CONFLUENCE

THE MERGING OF URBAN AND NATURAL SYSTEMS

The joining of streams was the original meaning of *confluence*, and in its later meanings, we still hear a strong echo of the physical merging of waters. Today, at the University of Texas at Arlington, we envision a resilient campus where urban and natural systems are merged using blue-green infrastructure (BGI) to clean, capture, and connect for a new *CONFLUENCE*.

## How CONFLUENCE works:

- **Merge Urban & Natural Systems**  
Integration of blue-green infrastructure (BGI)
- **Capture & Clean Runoff**  
Reduce water velocity & improve water quality
- **Connect Community & Nature**  
Enhance biodiversity & create social opportunities



- Legend**
- 1 UTA South Entry Retention Pond
  - 2 Post Oaks Amphitheater
  - 3 Floating Bio-Wetlands
  - 4 Riparian Prairie Detention Ponds
  - 5 Cultural Heritage Center
  - 6 Prairie Rehabilitation & Urban Farming Demonstration Gardens
  - 7 Berechiah Home and Cemetery Memorial Arboretum
  - 8 Permeable Pedestrian Mall & Alley
  - 9 Aqua Arbor Fountain Plaza
  - 10 W. Neddelman Bypass
  - 11 Texas Hall Entrance Plaza
  - 12 Trading House Creek Parking Garage
  - 13 UTA Maverick Alumni Center
  - 14 Pocket Prairie Community Garden
  - 15 CAPPA Annex
  - 16 Natatorium
  - 17 Kinesiology Building
  - 18 Green Roofs
  - 19 Street Planters
  - 20 Rain Gardens
  - 21 White Roofs on New Buildings
  - 22 Solar Roof Panels
  - 23 Daylight Trading House Cr



"CONFLUENCE"

Student Team;  
Melissa Lemuz  
Angeles Margarida  
Monte McMahan  
Luiz Rojo  
Michael Webb

This project is part  
of UNESCO's SDG  
Local Project  
Archive -  
[http://localproject  
challenge.org/](http://localprojectchallenge.org/)

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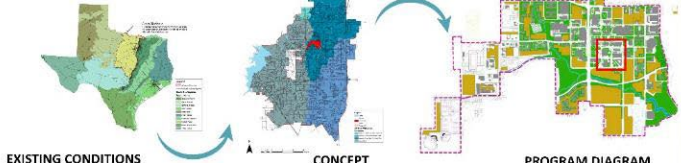
Prj.III  
 "THE PATH FORWARD"  
 Student Team;  
 Michael Shuey,  
 Nusrat Jahan Nipu,  
 Reza Mabadi,  
 Kathleen Stanford

First Place  
 Master Plan Ctg.

Video-1 Path  
<https://www.youtube.com/watch?v=iUgd1IE-m-k>

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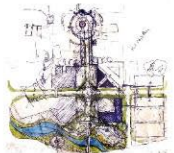
**INVENTORY + ANALYSIS**



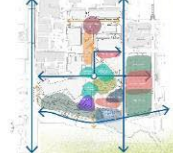
**EXISTING CONDITIONS**



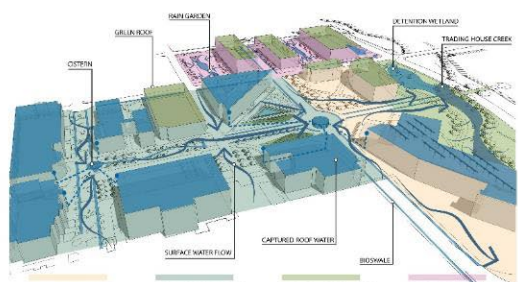
**CONCEPT**



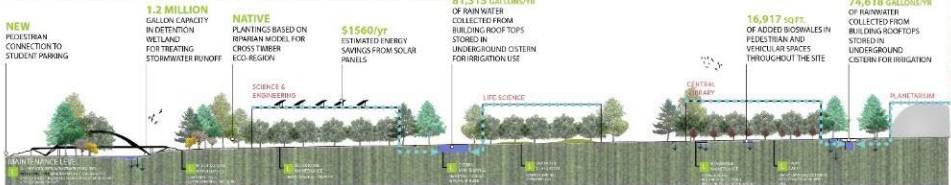
**PROGRAM DIAGRAM**



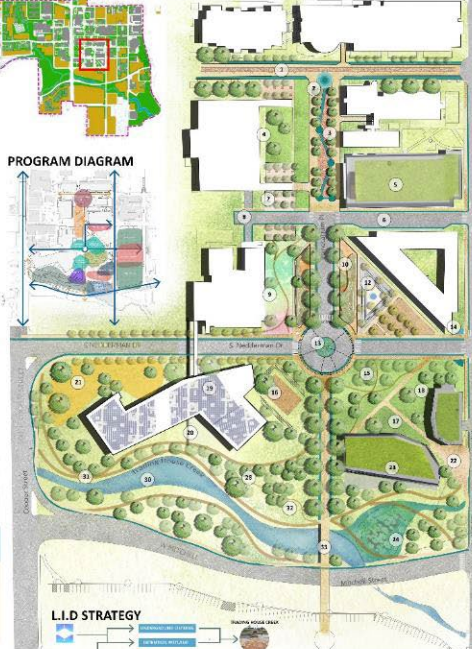
**PROPOSED HYDROLOGY + PHASING DIAGRAM**



**SECTION ELEVATION OF PLANETARIUM PLACE + MAINTENANCE PROGRAM**



**SCHEMATIC MASTER PLAN**



**L.I.D. STRATEGY**



**EXISTING SURFACES**



**STORMWATER**



**LANDSCAPE PERFORMANCE**



1. CENTRAL COURTYARD
2. COURTYARD WITH F&N GARDEN
3. COURTYARD WITH F&N GARDEN AND BARRIQUADE
4. GREEN LAWN
5. GREEN ROOF ON EXISTING GARAGE
6. BIOMIMICRY
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**THE NEW HEALTH SCIENCE QUARTER**



**LEARN - WITH ALL NEW OUTDOOR CLASSROOMS**



**REST - IN THE SUNNY LAWN AREAS OR THE SHADY READING NOOKS**

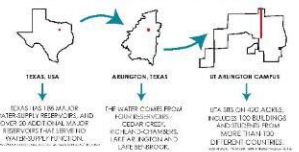


**CONNECT - WITH AND EXPLORE NATURE**



# ONE | ONE PLANET. ONE PEOPLE. ONE CAMPUS.

## INVENTORY AND ANALYSIS



## PROPOSED MASTER PLAN



**80%** ESTIMATED REDUCTION IN SUSPENDED SOLIDS

**70%** ESTIMATED REDUCTION IN METALS

**70%** ESTIMATED REDUCTION IN BACTERIA

"ONE"

Student Team;  
Anjelyque Easley,  
Bonnie Blocker,  
Nikki Simonini

Honorable  
Mention  
Master Plan Ctg.

Video-2 One  
<https://www.youtube.com/watch?v=OzdL6lU2KVg>

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## GOALS

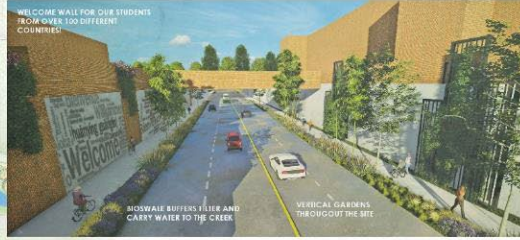
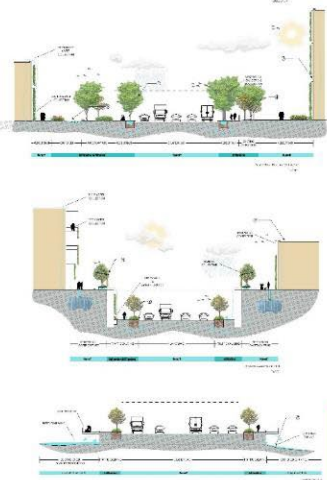
We seek to **CLEAN** our water and air to create a thriving ecosystem through the addition of bioswales and native plants. We want to **CONNECT** a campus divided by a highway. We aspire to **PROMOTE** an image of sustainability and diversity for our campus.

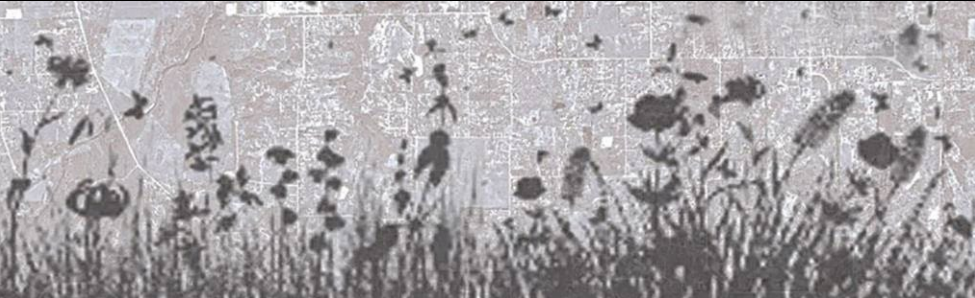
## SITE PRE-POST CONDITIONS

ACRES IMPACTED: 56

BEFORE:	AFTER IMPLEMENTATION:
Impervious Surfaces: 41.53 acres	Impervious Surfaces: 36.46 acres
Permeable Surfaces: 14.47 acres	Permeable Surfaces: 19.54 acres
Surface Water runoff: 70.67 cu.ft./sec	Surface Water runoff: 62.70 cu.ft./sec

## LID INFRASTRUCTURE ADDED





# UTA CAMPUS 2022-23 Project Exhibit, & Pilot

# PROJECT, EXHIBIT, & PILOT

- *There was no competition to go after in 2022 but our desire to change the world one project at a time as a Landscape Architecture Studio has not changed!*
- The project & the exhibit showcased UTA campus visions for four separate sites instructed parallel with the Pilot. Selected sites respond to Trading House Creek.



# UTA CAMPUS VISION

## EPA RAINWORKS PILOT

COOPER BEGIS +

AVERY DEERING-FRANK +

AMANDA HINTON +

JESSIE HITCHCOCK +

ANN JOSEPH +

VIOLET LAM +

OREN MANDELBAUM +

JOSIAH MILLER +

PHOEBE MUN +

DR. TANER OZDIL +

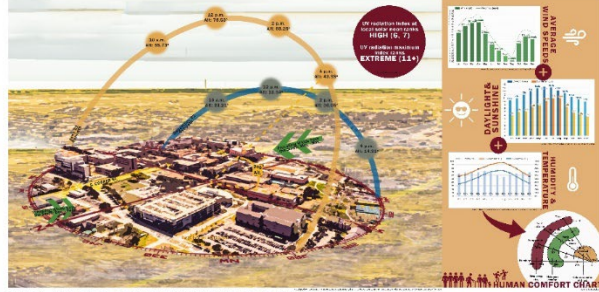
# UTA CAMPUS 2022 Inventory & Analysis



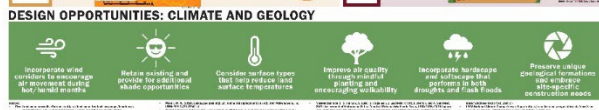
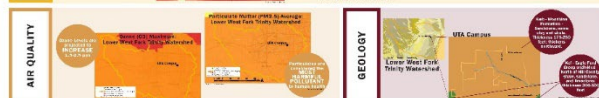
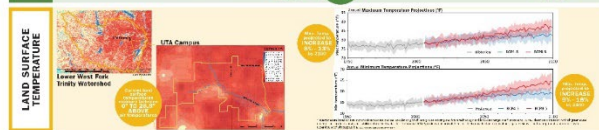
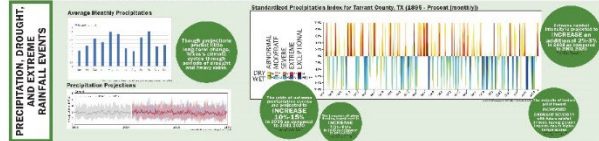


# UTA CAMPUS: EPA RAINWORKS CLIMATE AND GEOLOGY

## SOLAR MAP AND PREVAILING WINDS: UTA CAMPUS

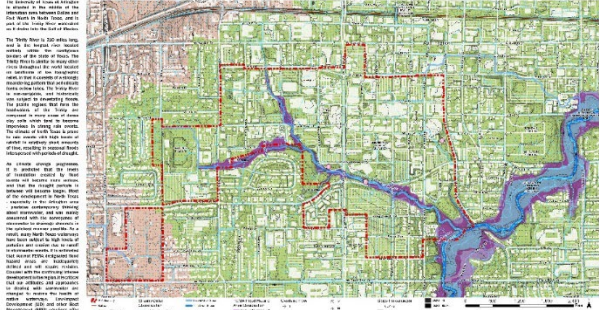


## LOCAL AND REGIONAL TRENDS AND PROJECTIONS

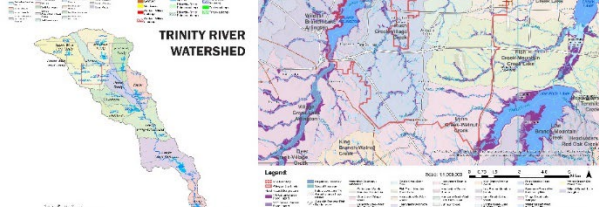


# UTA CAMPUS: EPA RAINWORKS HYDROLOGY

## UTA CAMPUS

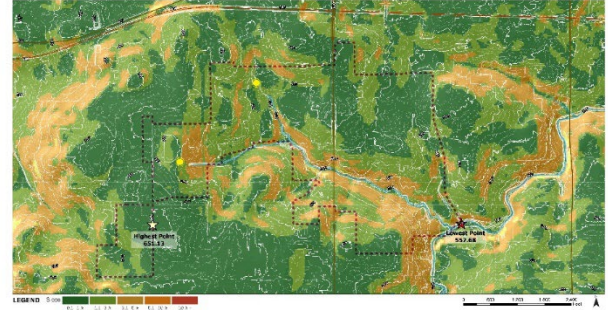


## STATE WATERSHED & GROUNDWATER

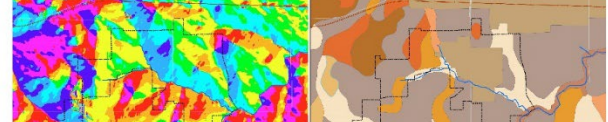


# UTA CAMPUS: EPA RAINWORKS PHYSIOGRAPHY AND SOIL

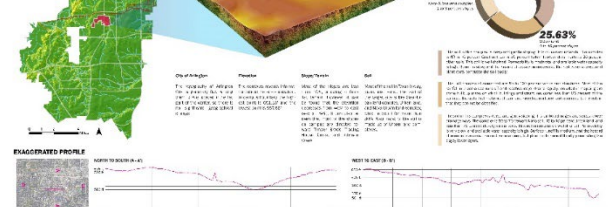
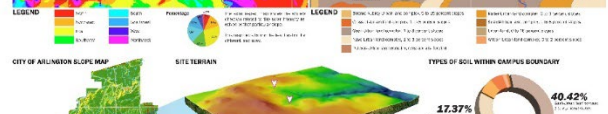
## SLOPE AND ELEVATION MAP



## SOLAR ASPECT MAP



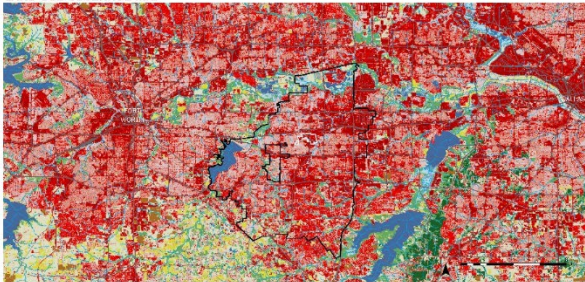
## SOIL MAP





# UTA CAMPUS: EPA RAINWORKS FLORA AND FAUNA MAPS 1

## LAND USE COVERAGE MAP



Land use is classified as the spatial arrangement of land based on the nature of the land use, present and future. The land use reflects the different vegetation, urban and agricultural use patterns, water bodies, etc. It is used in understanding the availability and condition of the land. The ecological use of land provides a basis for one of the effects of the urban land use change. Environmental suitability is an index that identifies specific, suitable regions, and it is used to determine the nature of the land cover. One of the types of land use change and one of the most significant is the loss of land due to the effects of urban growth, natural disasters, and human activities or as a result of climate change.

## SITE IMAGERY



## DFW TREE CANOPY COVERAGE MAP 2019



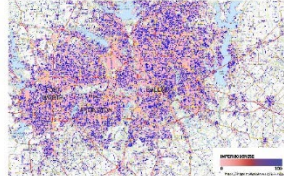
As urban surfaces increase, they do so at the expense of vegetation. This leads to a decrease in tree canopy cover, which in turn leads to a decrease in the amount of shade and cooling provided by trees. This leads to a decrease in the amount of shade and cooling provided by trees. This leads to a decrease in the amount of shade and cooling provided by trees.

## MONARCH MIGRATION



Monarch butterflies are a species of butterfly that is known for its long migration from the United States and Canada to Mexico. The migration is a seasonal phenomenon that occurs every year. The butterflies travel from their birthplace in the U.S. to their wintering grounds in Mexico. The migration is a remarkable feat of navigation and endurance.

## DFW IMPERVIOUS SURFACE MAP 2019



Impervious surfaces are surfaces that do not allow water to infiltrate the ground. This leads to a decrease in the amount of water that is absorbed by the ground, which in turn leads to a decrease in the amount of water that is available for plants and animals. This leads to a decrease in the amount of water that is available for plants and animals.

## BIRD MIGRATORY FLIGHTS



Bird migratory flights are a seasonal phenomenon that occurs every year. The birds travel from their birthplace in the U.S. to their wintering grounds in Mexico. The migration is a remarkable feat of navigation and endurance. The birds travel from their birthplace in the U.S. to their wintering grounds in Mexico.



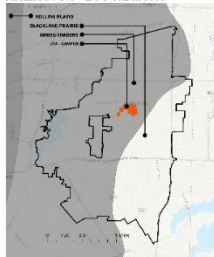
# UTA CAMPUS: EPA RAINWORKS FLORA AND FAUNA

## ECO-REGIONS

There are 10 ecoregions across the state of Texas, each with its own unique characteristics. The ecoregions are defined by their climate, geology, and biology. The ecoregions are defined by their climate, geology, and biology. The ecoregions are defined by their climate, geology, and biology.



## ARLINGTON - ECO-REGIONS



## CROSS TIMBERS

Cross-timber ecoregion is characterized by its diverse mix of tree species. The ecoregion is defined by its climate, geology, and biology. The ecoregion is defined by its climate, geology, and biology. The ecoregion is defined by its climate, geology, and biology.

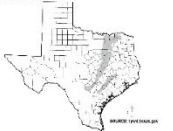


## TREES



## BLACKLAND PRAIRIE

Blackland Prairie ecoregion is known for its rich soil and diverse plant life. The ecoregion is defined by its climate, geology, and biology. The ecoregion is defined by its climate, geology, and biology. The ecoregion is defined by its climate, geology, and biology.



## SHRUBS



## URBAN WILDLIFE IN ARLINGTON



## THREATENED ANIMALS



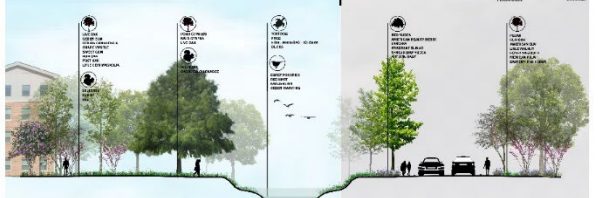
## ENDANGERED SPECIES



## PROTECTED BIRDS



## PROTECTED BIRDS

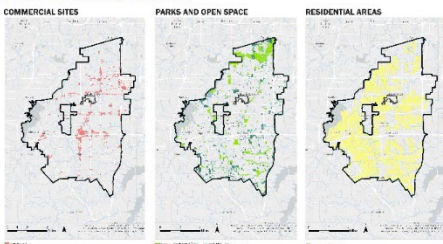
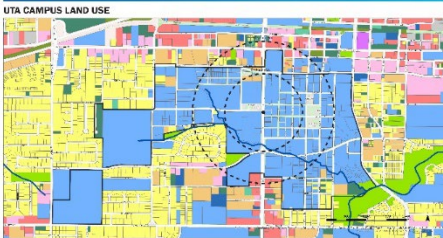


## UTA CAMPUS

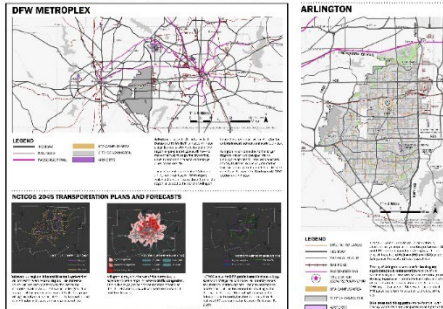
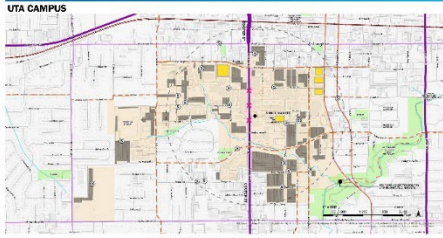
## ARLINGTON



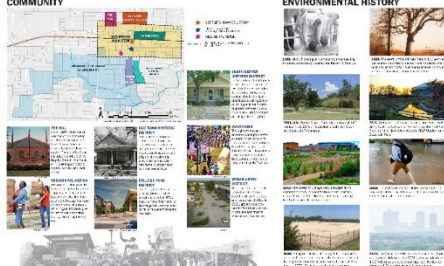
# UTA CAMPUS: EPA RAINWORKS LAND USE AND OPEN SPACE



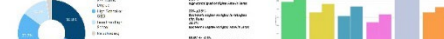
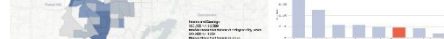
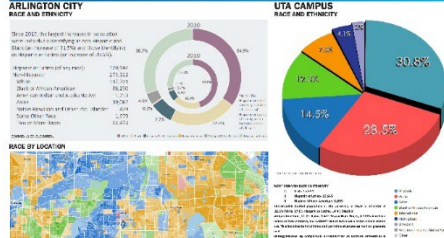
# UTA CAMPUS: EPA RAINWORKS CIRCULATION AND MULTI-MODAL MAPS



# UTA CAMPUS: EPA RAINWORKS HISTORY AND COMMUNITY



# UTA CAMPUS: EPA RAINWORKS DEMOGRAPHICS AND ECONOMICS



**CONCLUSION**

A concluding text block summarizing the findings of the demographic and economic analysis.

Student Team : Cooper Begis, Oren Mandelbaum, Avery Deering-Frank, Violet Lam

**UTA CAMPUS VISIO**

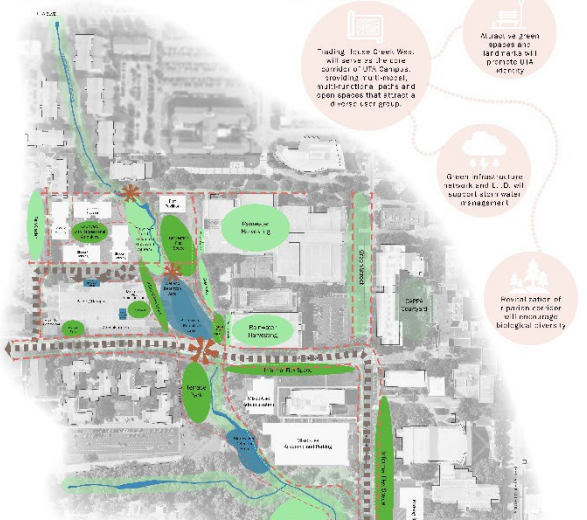
**2022-23**

# TRADING HOUSE CREEK WEST

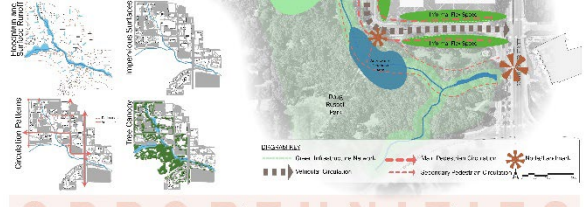
UTA CAMPUS: EPA RAINWORKS

## Conceptual Diagram

## Project Vision and Goals



## Existing Site Conditions

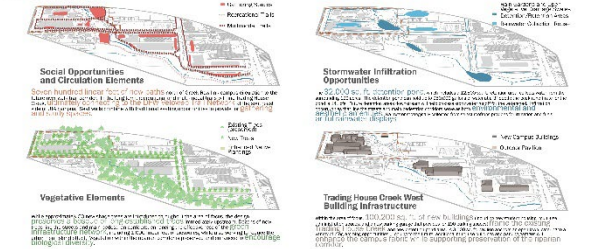


► Night Light Green Park: provides permeable paving and green infrastructure  
 ► Light Green Park: provides permeable paving and green infrastructure  
 ► Medium Green Park: provides permeable paving and green infrastructure  
 ► Heavy Green Park: provides permeable paving and green infrastructure  
 ► Very Heavy Green Park: provides permeable paving and green infrastructure  
 ► Ultra Heavy Green Park: provides permeable paving and green infrastructure

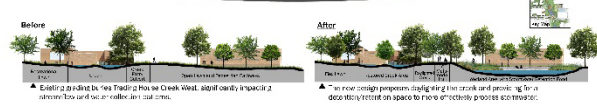
## SCHEMATIC DESIGN



## PERFORMANCE



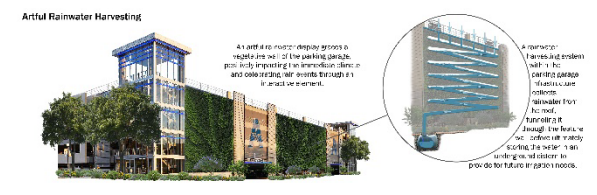
## Trading House West Amenities



## Open Spaces and Active Green Streets



## Artful Rainwater Harvesting



### GOAL OF THE PROJECT

- \* To utilize green infrastructure to reduce erosion and pollution caused by stormwater runoff from the western portion of campus while improving water infiltration and utilizing water collection.
- \* To create new residential housing and green spaces without losing access to parking and traffic circulation.
- \* To take advantage of larger spatial conditions to create a pedestrian corridor that ties this portion of the campus to the rest of the western campus.

### VISION STATEMENT

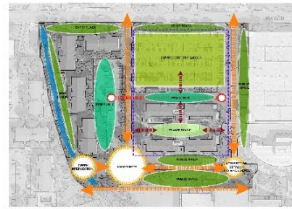
To create new residential areas and green spaces while utilizing green infrastructure to reduce the university's impact on the surrounding environment.

## MAVERICK RESIDENTIAL QUAD



FIGURE GROUND MAP

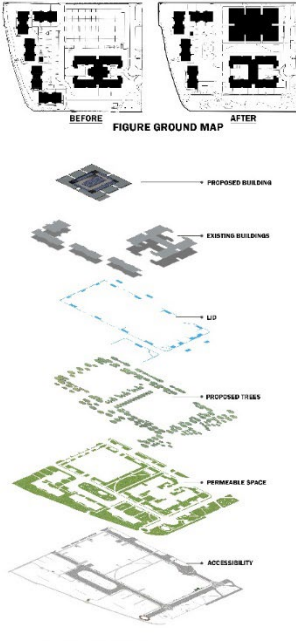
### SITE INVENTORY



GREEN AND OPEN SPACE DIAGRAM



CONCEPT DIAGRAM



DESIGN LAYER DIAGRAM

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PROPOSED SCHEMATIC PLAN



CREEK NODE (VIEW-A)



FUNNEL NODE (VIEW-B)

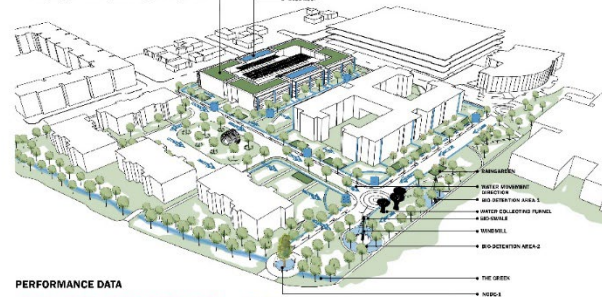


SECTION - AA'

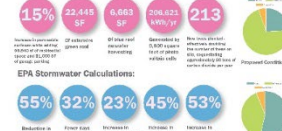
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### HYDROLOGY PERFORMANCE DIAGRAM



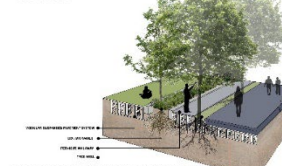
### PERFORMANCE DATA



### EPA Stormwater Calculations:



THE STAGE

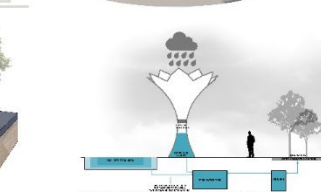


SUSPENDED PAVEMENT SYSTEM DETAIL



THE PAVILION

THE FUNNEL



WATER COLLECTING FUNNEL DETAIL

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# ART AND DESIGN QUAD VISION UTA CAMPUS EPA RAINWORKS

**ESTABLISHMENT OF AN ART AND DESIGN QUAD THAT PROVIDES SUSTAINABLE FACILITIES AND GATHERING SPACES FOR STUDENTS, FACULTY, AND THE ARLINGTON COMMUNITY.**

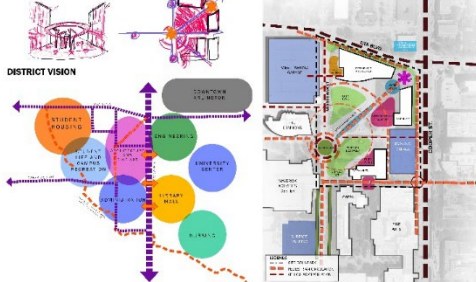
- GOALS**
- CAPTURE AND TREAT 40% OF STORMWATER ON SITE
  - CREATE A NEW ENTRY EXPERIENCE ON NORTH END OF SITE FROM COVERED LOT
  - REDUCE NET ENERGY AND WATER CONSUMPTION THROUGH WATER REUSE AND SOLAR ENERGY



**SITE INVENTORY**



**SITE CONCEPT**



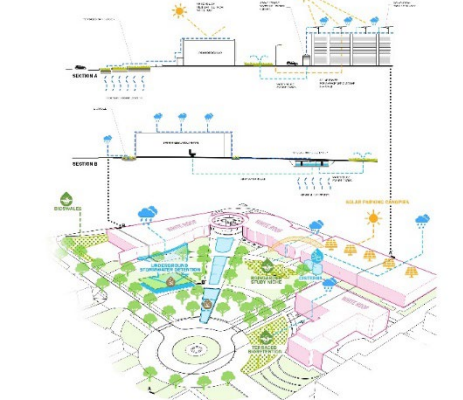
**DISTRICT VISION**



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 CAPPA (CENTRAL ARCHITECTURAL CENTER) | UTA CAMPUS | ARLINGTON, TEXAS |  
 ARCHITECTURE | UTA CAMPUS | ARLINGTON, TEXAS |

01

**LID ELEMENTS**

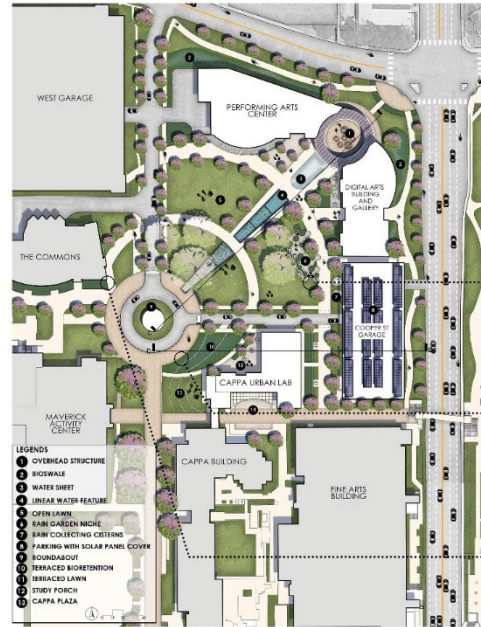


**PERFORMANCE**



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 CAPPA (CENTRAL ARCHITECTURAL CENTER) | UTA CAMPUS | ARLINGTON, TEXAS |  
 ARCHITECTURE | UTA CAMPUS | ARLINGTON, TEXAS |

02



STUDIO Y | FALL 2022 | DR. TANER OZDIL | AVERY DEERING-FRANK, VIOLET LAM |  
 CAPPA (CENTRAL ARCHITECTURAL CENTER) | UTA CAMPUS | ARLINGTON, TEXAS |  
 ARCHITECTURE | UTA CAMPUS | ARLINGTON, TEXAS |

03



STUDIO Y | FALL 2022 | DR. TANER OZDIL | AVERY DEERING-FRANK, VIOLET LAM |  
 CAPPA (CENTRAL ARCHITECTURAL CENTER) | UTA CAMPUS | ARLINGTON, TEXAS |  
 ARCHITECTURE | UTA CAMPUS | ARLINGTON, TEXAS |

04

Student Team: Avery Deering Frank, Violet Lam

# UTA INNOVATION DISTRICT

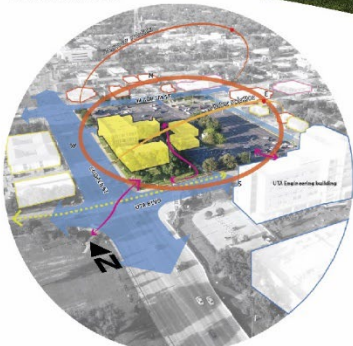
## EPA RAINWORKS PILOT



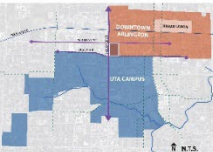
### GOALS

- Stitch together the UTA Campus and Downtown Arlington through a mixed-use development that appeals to users in both districts.
- Utilize both green infrastructure and smart technology to transform a surface parking lot into a vibrant sustainable district that can showcase sustainable development in our urban environments.
- Encourage local economic development and public activity by creating amenities to attract visitors.

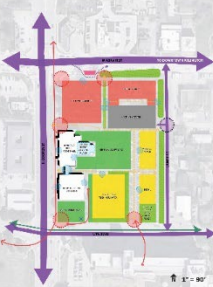
### SITE INVENTORY



### DISTRICT MAP AND CONTEXT



### SITE CONCEPT PLAN



### SITE HYDROLOGY



### SCHEMATIC DESIGN AND VISION



### RAINGARDEN SECTION DETAIL



### SITE CIRCULATION



### WATER FLOW



### PERFORMANCE CALCULATION

**STORMWATER RUNOFF**  
 PERM. IMPERVIOUS: 100%  
 EXISTING: 41.2% (2,335,000 SF)  
 PROPOSED: 51.2% (2,935,000 SF)

**IMPERVIOUS SURFACE**  
 TOTAL SITE AREA: 276,000 SF  
 IMPERVIOUS: 142,314 SF (51.2%)  
 PERVIOUS: 133,686 SF (48.8%)

**TREE PRESERVATION**  
 21 EXISTING TREES WERE PRESERVED TO THE PROPOSED DESIGN

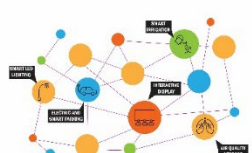
**GREEN INFRASTRUCTURE**  
 APPROXIMATELY 10,000 SF OF GREEN INFRASTRUCTURE AND INFILTRATION SPACES ADDED

**BUILDING ADDITIONS**  
 500,000 SF OF BUILDING SPACE ADDED

**LEGEND**

1	IMPERVIOUS ROOFS/TOP OF HILL	12	DECK/POOL
2	PERVIOUS CONCRETE	13	SHARED-USE/OPEN SANDY/POOR SOIL
3	PERVIOUS ASPHALT	14	PERVIOUS ASPHALT
4	PERVIOUS GRAVEL	15	PERVIOUS GRAVEL
5	PERVIOUS PAVEMENT	16	PERVIOUS PAVEMENT
6	PERVIOUS STONE	17	PERVIOUS STONE
7	PERVIOUS SAND	18	PERVIOUS SAND
8	PERVIOUS GRAVEL	19	PERVIOUS GRAVEL
9	PERVIOUS ASPHALT	20	PERVIOUS ASPHALT
10	PERVIOUS STONE	21	PERVIOUS STONE
11	PERVIOUS SAND	22	PERVIOUS SAND

### SMART TECHNOLOGIES



### SECTION A-R



### SUNKEN COURT PLUMB AND FEATURE RAINGARDEN



### COURTNER PLAZA AND WATER FEATURE



### VIEW FROM AIRRAILS ST/ NORTH ENTRY



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01



CALL FOR EXPERTISE  
 ARCHITECTURAL PLANNING  
 AND PUBLIC AFFAIRS  
 TEXAS COLLEGE OF ARCHITECTURE  
 UNIVERSITY OF TEXAS AT ARLINGTON

STUDIO V | FALL 2022 | DR. OZDIL | DASOM PHOEBE MUN, OREN MANDELBAUM

02



CALL FOR EXPERTISE  
 ARCHITECTURAL PLANNING  
 AND PUBLIC AFFAIRS  
 TEXAS COLLEGE OF ARCHITECTURE  
 UNIVERSITY OF TEXAS AT ARLINGTON

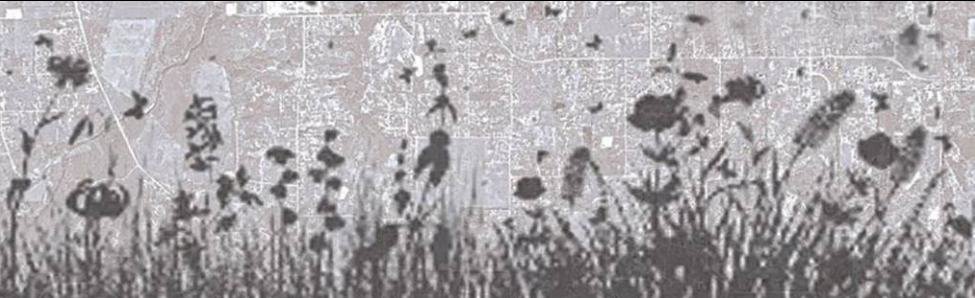
STUDIO V | FALL 2022 | DR. OZDIL | DASOM PHOEBE MUN, OREN MANDELBAUM

03



CALL FOR EXPERTISE  
 ARCHITECTURAL PLANNING  
 AND PUBLIC AFFAIRS  
 TEXAS COLLEGE OF ARCHITECTURE  
 UNIVERSITY OF TEXAS AT ARLINGTON





# UTA CAMPUS 2022-23 Pilot & The Charet

# PILOT: CRW Technical Assistance

- Direct assistance to two campuses: University of Texas Arlington (UTA) and Morgan State University (MSU)
  - Brainstorming sessions with core team
  - One day design charrette
  - Final report
  - Create a resource to share with campuses nationwide
- Engage extensively with facilities staff to understand opportunities and barriers for green infrastructure implementation.



# PILOT TEAM



## Funded By

- U.S. EPA - Clark Wilson, Office of Wasterwater Management

## UTA Core Team & Presenters

- Taner R. Ozdil, Center for Metropolitan Density (CfMD), & Landscape Architecture, CAPP
- Jeff Johnson, Don Lange, John Hall, & (Bill Poole) UTA Facilities
- Meghna Tare, UTA Office of Sustainability
- Lyndsay Mitchell, Gincy Thoppil, Patricia Sinel, The City of Arlington

## UTA Student Representatives:

- Hanan Boukhaima, Ph.D. Student in Public Affairs and Planning, CAPP
- Oren Daniel Mandelbaum, Master Student in Landscape Architecture, SASLA,

## Consulting Team

- Lot Locher, [One Architecture & Urbanism](#)
- Justine Shapiro-Kline, [One Architecture & Urbanism](#)
- Joyce Coffee, [Climate Resilience Consulting](#)
- Christopher Riale, [Sherwood Design Engineers](#)
- Rachel Still, [Sherwood Design Engineers](#)

**Thank you:** Matt King (EPA), Susanna Perea (EPA Region 6), Doug Breuer

Mark Meyer & Jim Manskey (TBG Partners) Catherine Soto (UTA), Joowon Im (UTA),

Ann Thuruthy & Angelica Villalobos (UTA GRAs)



Facilities Management



Office of Sustainability

● one architecture

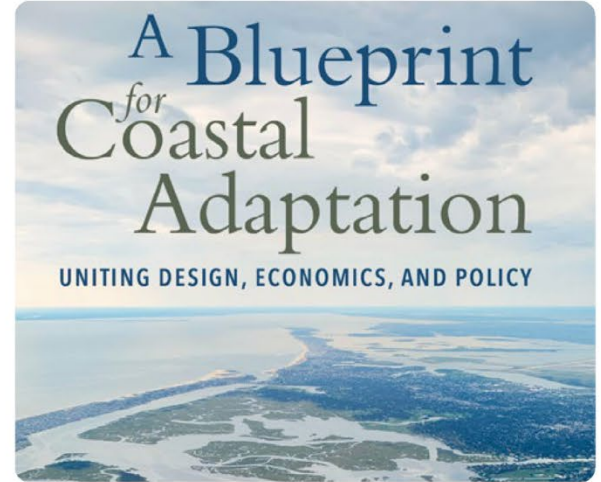
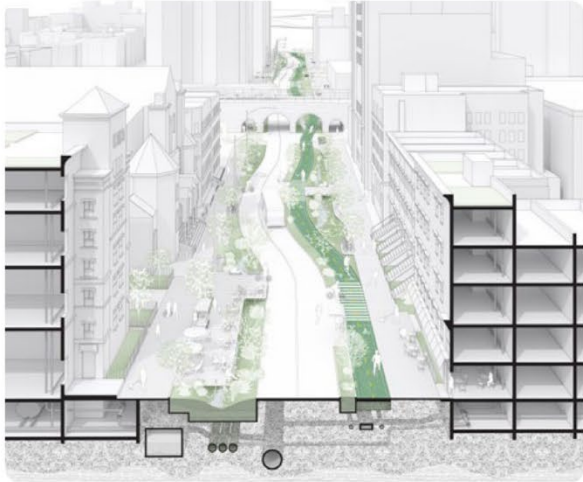


# GI & CAMPUS PLANNING

One Architecture & Urbanism  
New York & Amsterdam

Sherwood Design Engineers  
San Francisco, New York & Atlanta

Climate Resilience Consulting  
Chicago



# OBJECTIVES

## RainWorks Objectives:

- **Explore current needs and opportunities** to advance blue-green infrastructure, climate resilient design and implementation,
- **Explore environmental, economic, and social benefits** of green-blue infrastructure for the campus, community, and watershed,
- **Foster communication** between key campus, city, and metropolitan area community and stakeholders,

## UTA Objectives:

- **Establish a framework**, goals, and objectives to guide upcoming campus planning and design efforts,
- **Build consensus** among campus, city, and community stakeholders
- **Establish priorities and direction for future BGI** research and campus projects
- Identify opportunities
- **Showcase campus leadership and student work on BGI, Equip UT Arlington as Urban Lab.**
  - 10-year worth of our campus designs &
  - 2023 Studio Project and Exhibit (run parallel with the pilot)

# GI & CAMPUS PLANNING

## Unique Considerations for Campus GI Planning?

### Scale

integrate buildings, landscape, and infrastructure strategies; engage systems thinking and watershed planning

### Users

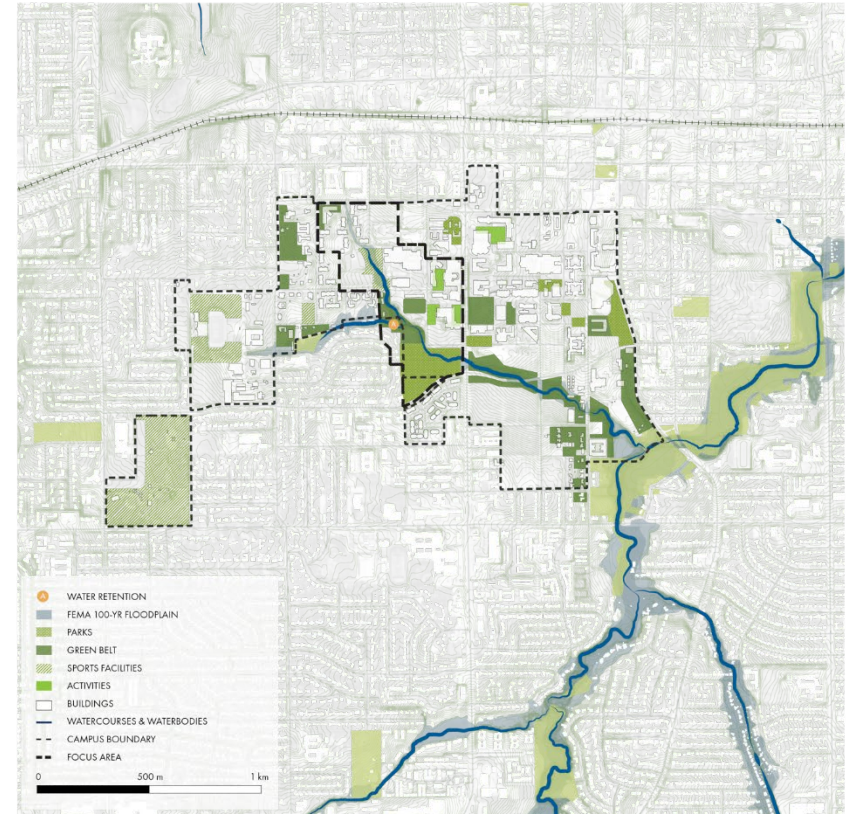
plan for and with staff, faculty, students + local residents

### Context

align with campus master plans and capital planning cycles

### Impact

advance research through pilots and project implementation; lead by example



# CHARETTE:

- Creating focus: carving out time and space to focus on green infrastructure
- Making concrete: design tools and practices help synthesize diverse inputs and visualizations make ideas spatial and tangible
- Advancing collaboration: bringing together a range of campus, community, and governmental participants who don't interact regularly
- Building momentum: taking Campus RainWorks competition proposals one step farther



# DESIGN & FACILITATION

## AGENDA:

Friday, October 7, 2022 | on campus

08:30 Welcome

09:00 Introduce charrette agenda & goals

09:10 Campus context & initiatives

10:10 Campus tour

11:10 Breakout: challenges, opportunities & principles 

11:50 Report back 

12:15 *Lunch break*

12:45 Breakout: objectives & design strategies 

02:15 Presentations 

03:00 Takeaways & implications

03:20 Closing remarks & adjourn

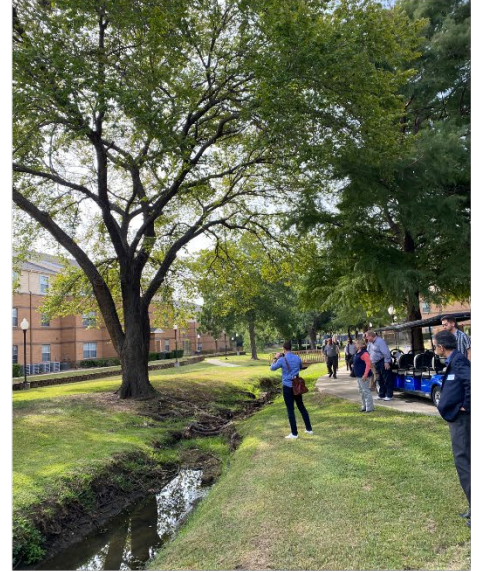
Breakout topics:

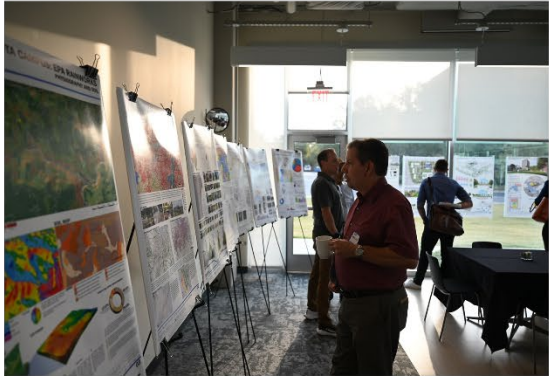
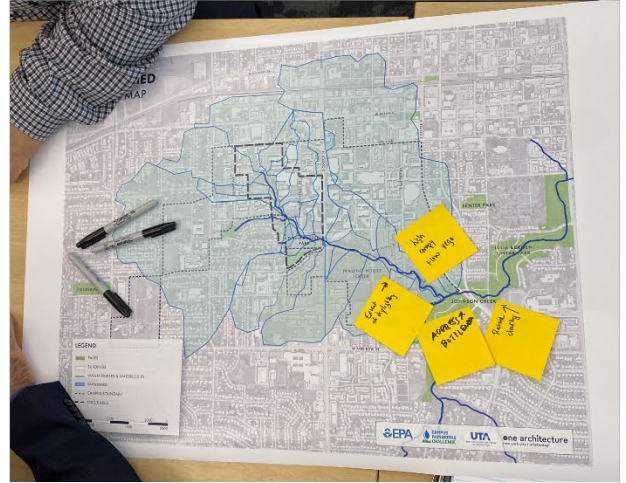
1. Healthy water, healthy creek
2. Climate resiliency on campus
3. Connecting communities
4. Trails for people and nature



# PROJECT, EXHIBIT, & PILOT

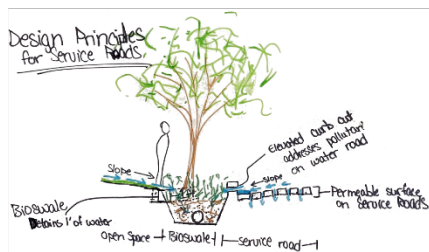
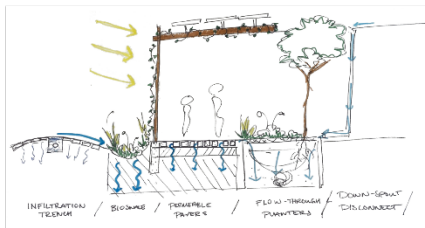




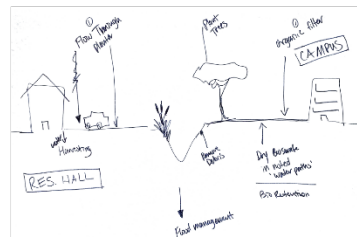


# CHARRETTE OUTCOMES

## GREEK ROW CONCEPTS



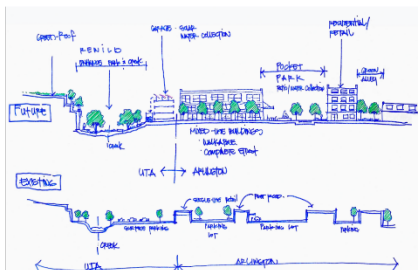
## RESIDENTIAL TRANSECT



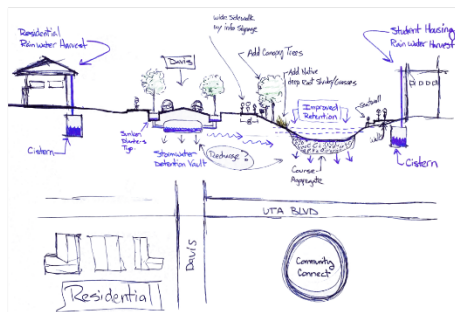
## CAMPUS TRANSECT



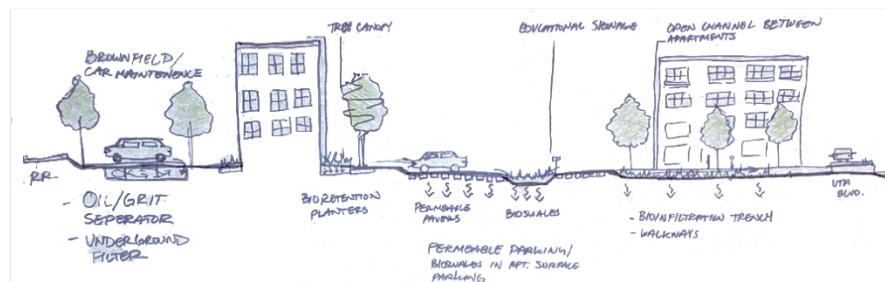
## COOPER ST TRANSECT



## UTA BLVD TRANSECT

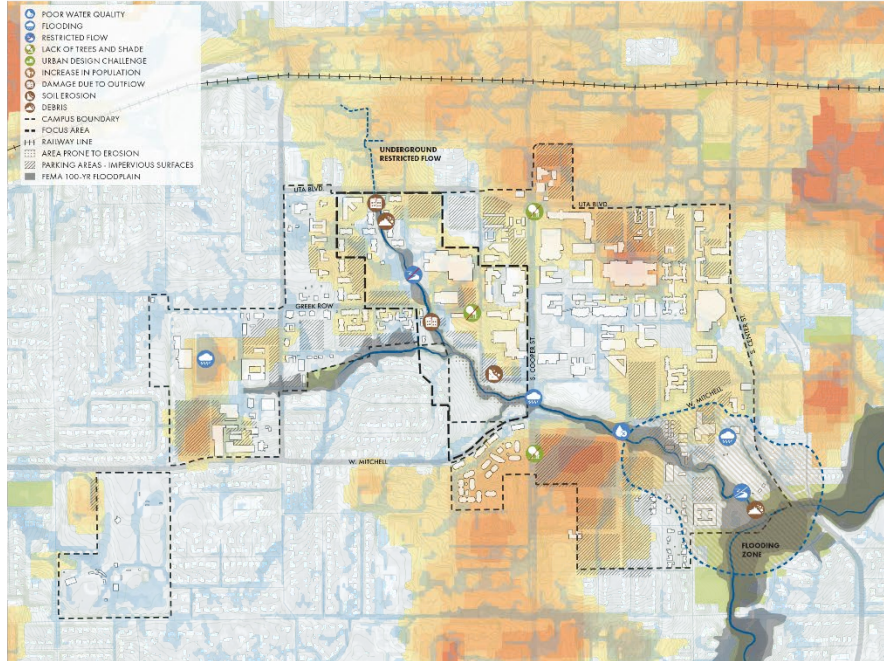


## BROWNFIELD TRANSECT

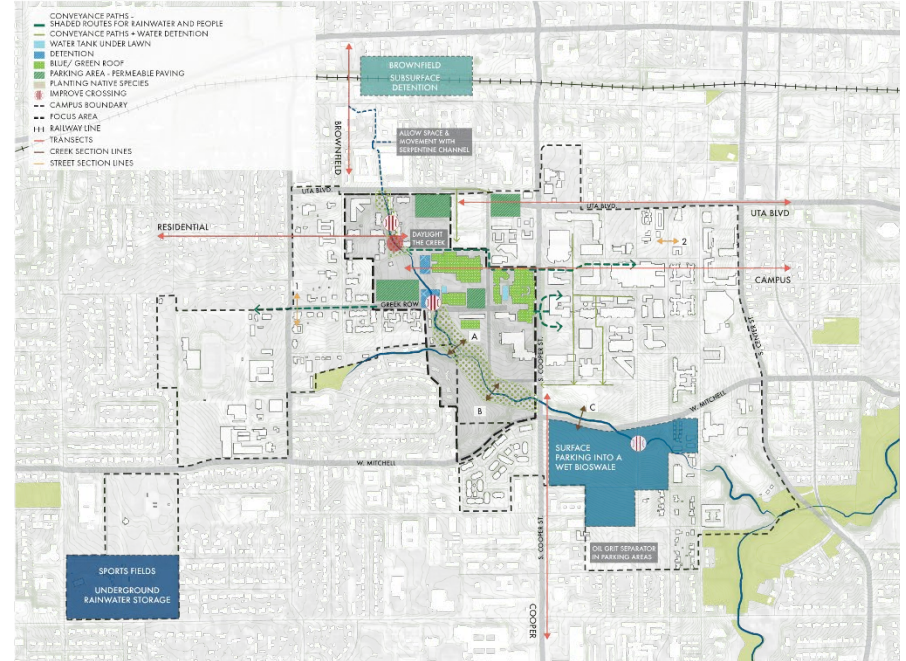


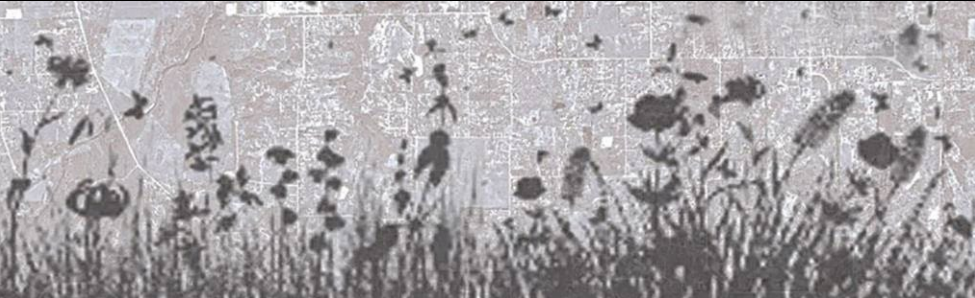
# CHARRETTE OUTCOMES

## SYNTHESIS OF CHALLENGES



## SYNTHESIS OF OPPORTUNITIES





# UTA CAMPUS 2022-23 THE REPORT

# UTA GI REPORT

1. Introduction
2. Existing campus & community conditions
3. RainWorks charrette
4. Strategic green infrastructure framework
5. Green infrastructure measures & considerations
6. Campus design & planning opportunities for green infrastructure
7. Next steps: pilots, funding, implementation & maintenance
8. Appendix



## EXISTING CAMPUS CONDITIONS

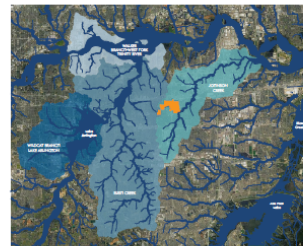
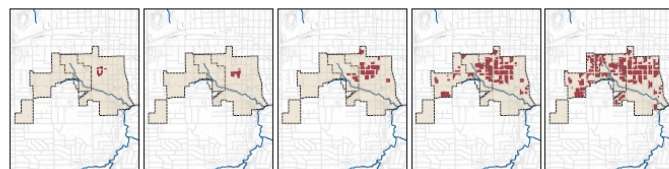
This chapter provides an overview of UTA campus ecological and geological systems, which inform the behavior of water, current stormwater management practices, potential for green infrastructure, and anticipated impacts of climate change. It briefly looks at the community conditions, campus surroundings, and the City of Arlington's characteristics to understand the relationship between the university and the wider context. It also summarizes UTA's past submissions to the Campus RainWorks programs.

### COMMUNITY & CAMPUS OVERVIEW

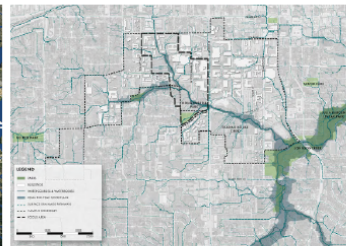
The City of Arlington is located between the cities of Fort Worth and Dallas. It forms a major part of the rapidly-growing metropolitan area, with nearly 400,000 residents living across its almost 100-square-mile area. It has expanded hand-in-hand with the university in the decades since World War II.

The University of Texas at Arlington is a public research university founded in 1895 which has occupied its current campus in the southern edge of downtown Arlington since its founding. The university traces its roots back to Arlington College, which was established in September 1895 and became a public junior vocational college called Arlington State College (ASC) in 1949. Previously part of the Texas A&M University system, it joined the University of Texas system in 1965 to accommodate the expansion and development of the existing campus. As of Fall 2021, Arlington campus enrollment consisted of 45,949 students. Its 420-acre main campus is within walking distance of Downtown Arlington, including Arlington City Hall, Arlington Public Library (Main), Theatre Arlington, and numerous businesses, around which the City of Arlington has expanded over time.

Below the campus sits the Barnett shale formation, a major natural gas production site. Trading House Creek, a tributary of the Trinity River, runs along the southern portion of the campus. The campus sits within the Trading House Creek watershed, the Johnson Creek watershed, Lower West Fork Trinity River Watershed, and the Trinity River watershed. The green areas of the campus significantly increased in the last twenty years with the creation of Greene Research Quad, the five-acre Green at College Park, a sunken courtyard at Davis Hall, Brazos Park, and the Davis Street west campus edge.



Regional Watersheds



Campus Drainage

### ENVIRONMENTAL CONTEXT

Any discussion of green infrastructure planning must utilize an understanding of environmental conditions and natural systems. Green infrastructure harnesses plant and soil systems and conditions. Understanding environmental conditions is critical to optimize the efficacy of green infrastructure in terms of placement and size, for example, giving consideration to climatic conditions, soil characteristics, and location in the watershed, among other criteria.

#### A watershed (also called drainage basin, drainage area, catchment area) is:

an area of land within which all surficial stormwater drains to a common point.

GIS uses the raster of the Digital Elevation Model (DEM) to detect the differences in relative elevation between each cell of the raster, and formulates vectors that show how surface water conveys on the land based on elevations in the topography, known as surface drainage flow paths.

Delineated watersheds and stormwater pipe networks are typically highly correlated, since subsurface networks generally leverage gravity to convey water (instead of pumps).

opposite:  
UT Arlington campus growth, 1910 - 2001 (Source: UTA student work)

above:  
UT Arlington watershed context and drainage pathways (Source: Sherwood)

Contextual knowledge of watersheds and drainage flow paths is critical to understand how water conveys through an area, how much water is reaching a given point on campus, and where pollutants might be expected to accumulate. A watershed (also known as a drainage basin, drainage area, or catchment) is an area of land where all surface runoff generated within that area drains to one common point. Watersheds can exist on a variety of scales and depend on which common point is selected for analysis. For example, a location in the northwest corner of the campus can be located in a campus-scale watershed and simultaneously the Trading House Creek watershed, the Johnson Creek watershed, the Lower West Fork Trinity River Watershed, and the Trinity River watershed. For the purposes of this analysis, watershed analysis was restricted to campus-scale watersheds.

To understand campus-scale watersheds at UTA and their associated drainage

patterns, drainage paths of surface runoff and watersheds were generated with GIS based on a Digital Elevation Model (DEM) obtained from the United States Geological Service's online database, originally generated via LIDAR Satellite data. Delineated watersheds are derived from the topographical patterns of the ground that are represented in the DEM, and not the subsurface stormwater pipe network. Watersheds for pipe networks often align as stormwater pipe networks usually rely on gravity to convey water.

UTA is composed of 36 campus-scale watersheds that all drain to Trading House Creek. Generally, most stormwater that falls within these watersheds is intercepted by storm pipes and drains to the Creek at point-source outfalls. These pipe interceptions ultimately still convey water to the Creek, but concentrate the points at which stormwater drains so that the amount of water reaching the Creek at any one time is significantly increased, exacerbating water velocity issues and bank erosion. Stormwater within these watersheds is additionally not treated of pollutants before reaching the Trading House Creek system, disrupting water quality for downstream communities and wildlife.

**Build Environment & Impervious Area**  
An impervious surface is any material that prevents or significantly hinders the infiltration of water into soil below. Impervious surfaces include asphalt and concrete and are commonly found as roads,



## GREEN INFRASTRUCTURE MATRIX

MEASURE NAME	ECOLOGICAL CONSIDERATIONS		ECONOMIC CONSIDERATIONS		COMMUNITY CONSIDERATIONS				
	Location in Watershed	Ecological Co-Benefits	Relative Initial Cost	Relative Maintenance Cost	Integration with Neighborhoods	Environmental Stewardship	Aesthetic Value & Placemaking Potential	Permitting / Coordination Complexity	Benefit to MS4 Compliance
	Upper, Middle, Lower	Low, Medium, High	\$ / \$\$ / \$\$\$	\$ / \$\$ / \$\$\$	Low, Medium, High	Low, Medium, High	Low, Medium, High	Low, Medium, High	Low, Medium, High
Green Roofs	All	Medium	\$\$\$	\$\$\$	Medium	Medium	High	Medium	Medium
Rainwater Harvesting	All	Low	\$\$	\$	Medium	High	Medium	Medium	Medium
Oil Grit Separator	All	Low	\$	\$\$	Medium	Medium	Low	Medium	Low
Downspout Disconnect	All	Low	\$	\$\$	Medium	High	Low	Low	Low
Site Reforestation / Revegetation	All	High	\$\$\$	\$	High	High	High	Low	High
Infiltration Trench	Upper	Medium	\$	\$\$	Low	Medium	Medium	Low	Low
Permeable Pavers / Surfaces	Upper	Medium	\$\$\$	\$\$	Low	Low	High	Medium	Medium
Bioretention	Upper/Middle	High	\$\$\$	\$\$	Medium	High	High	Medium	High
Flow-Through Planters / Landscape Infiltration	Upper/Middle	Medium	\$\$	\$	Medium	Medium	High	Low	Medium
Dry Bioswales	Middle	Medium	\$\$\$	\$\$	Medium	Medium	High	Medium	Medium
Wet Bioswales	Middle	Medium	\$\$\$	\$\$	Medium	Medium	High	Medium	Medium
Dry Well	Upper/Middle	Medium	\$\$	\$\$	Low	Low	Low	Medium	Low
Organic Filter	Upper	Medium	\$\$	\$\$	Low	Medium	Low	Low	Low
Surface Sand Filters	Upper	Low	\$\$	\$\$	Low	Low	Low	Low	Medium
Dry Detention Pond	Lower	Medium	\$	\$\$	Low	Medium	Medium	Medium	High
Extended Dry Detention Pond	Lower	Medium	\$	\$\$	Low	High	Medium	Medium	High
Wet Pond	Lower	High	\$	\$\$	Medium	High	Medium	High	High
Pocket Pond	Lower	Medium	\$	\$\$	Low	Medium	Medium	Medium	Low
Underground Filter	Lower	Low	\$\$	\$	Low	Low	Low	Medium	Medium
Flood Management Area	Lower	Low	\$	\$	Low	Medium	Medium	Medium	Low
Stormwater Wetland	Lower	High	\$\$	\$	High	High	High	High	Medium
Pocket Stormwater Wetland	Lower	Medium	\$\$	\$	Medium	High	Medium	Medium	Low
Stream Restoration	Lower	High	\$\$\$	\$	High	High	High	High	Low

### Notes

#### Watershed Location:

Based on the priorities listed for each portion of watershed. Upper Watershed: Infiltrate, Convey Downstream; Middle Watershed: Slow Water Flows through storage, Divert Flows from Problem Areas, Convey Downstream; Lower Watershed: Absorb and Store.

#### Ecological co-benefits:

Evaluation considers the ancillary benefits associated with the incorporation of Green Infrastructure on campus, including the provision of habitat within the Green Infrastructure and the mitigation of Urban Heat Island Effect through the decrease of impervious area or the increase of tree canopy.

#### Costs:

Due to the unavailability of data from the Integrated Stormwater Manual, costs were taken from [Volume 2 of the Georgia Stormwater Management Manual \(2016\)](#) and [NOAA Guidance for Cost Estimations of Nature Based Solutions \(2020\)](#). Costs are considered in terms of price per square foot (SF) that is treated by the measure.

#### Permitting:

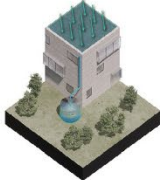
Evaluation based on the degree to which the GI either reduces the amount of impervious area or treats the stormwater that generates from impervious area on campus.

# UTA GI REPORT: MESASURES

## GREEN INFRASTRUCTURE MEASURES



Downspout Disconnect



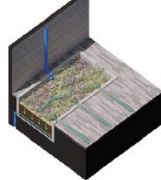
Rainwater Harvesting



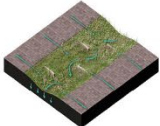
Green Roofs



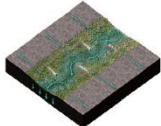
Permeable Pavers / Surfaces



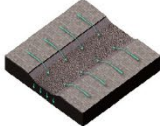
Flow-Through Planters



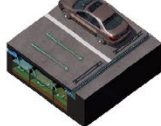
Dry Bioswales



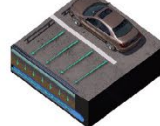
Wet Bioswales



Infiltration Trench



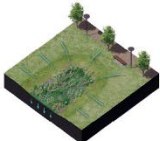
Oil / Grit Separator



Underground Filter



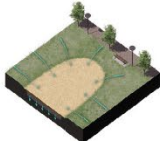
Dry Well



Bioretention



Organic Filter



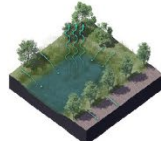
Surface Sand Filters



Dry Detention Pond



Extended Dry Detention Pond



Wet Pond



Pocket Pond



Pocket Stormwater Wetland



Stormwater Wetland



Site Reforestation / Revegetation



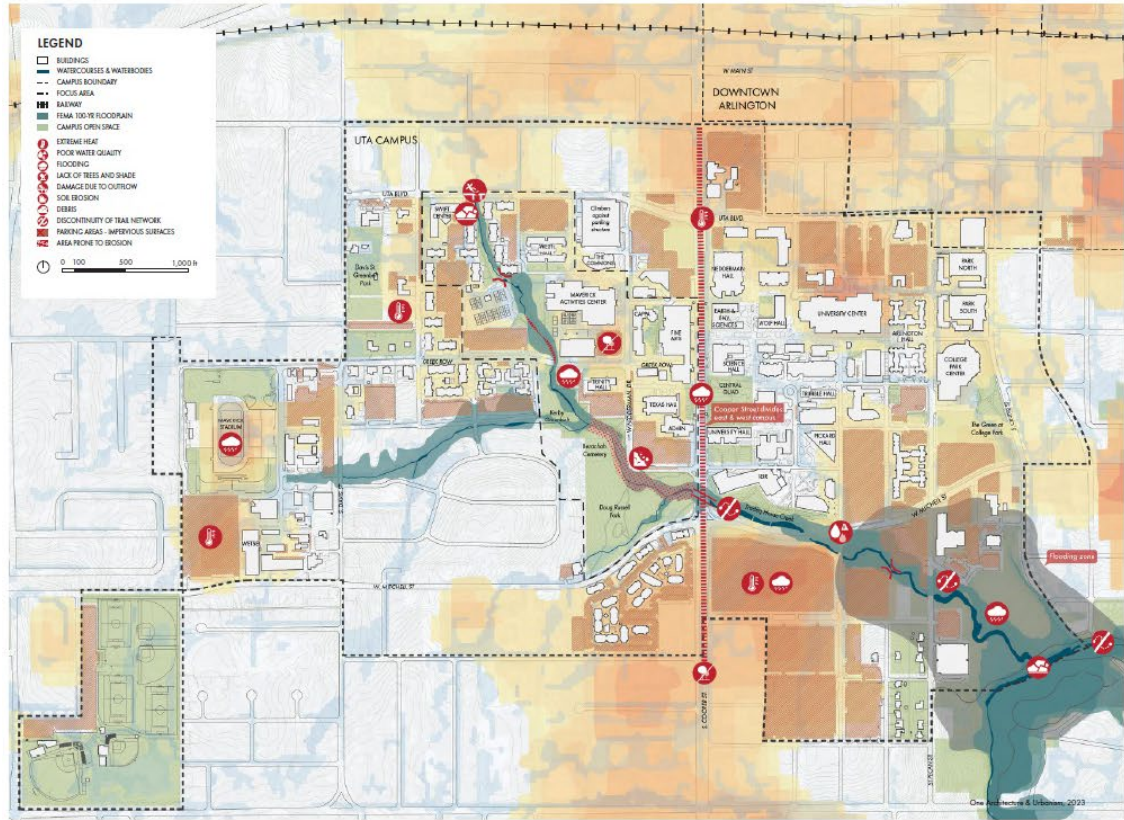
Stream Restoration



Flood Management Area

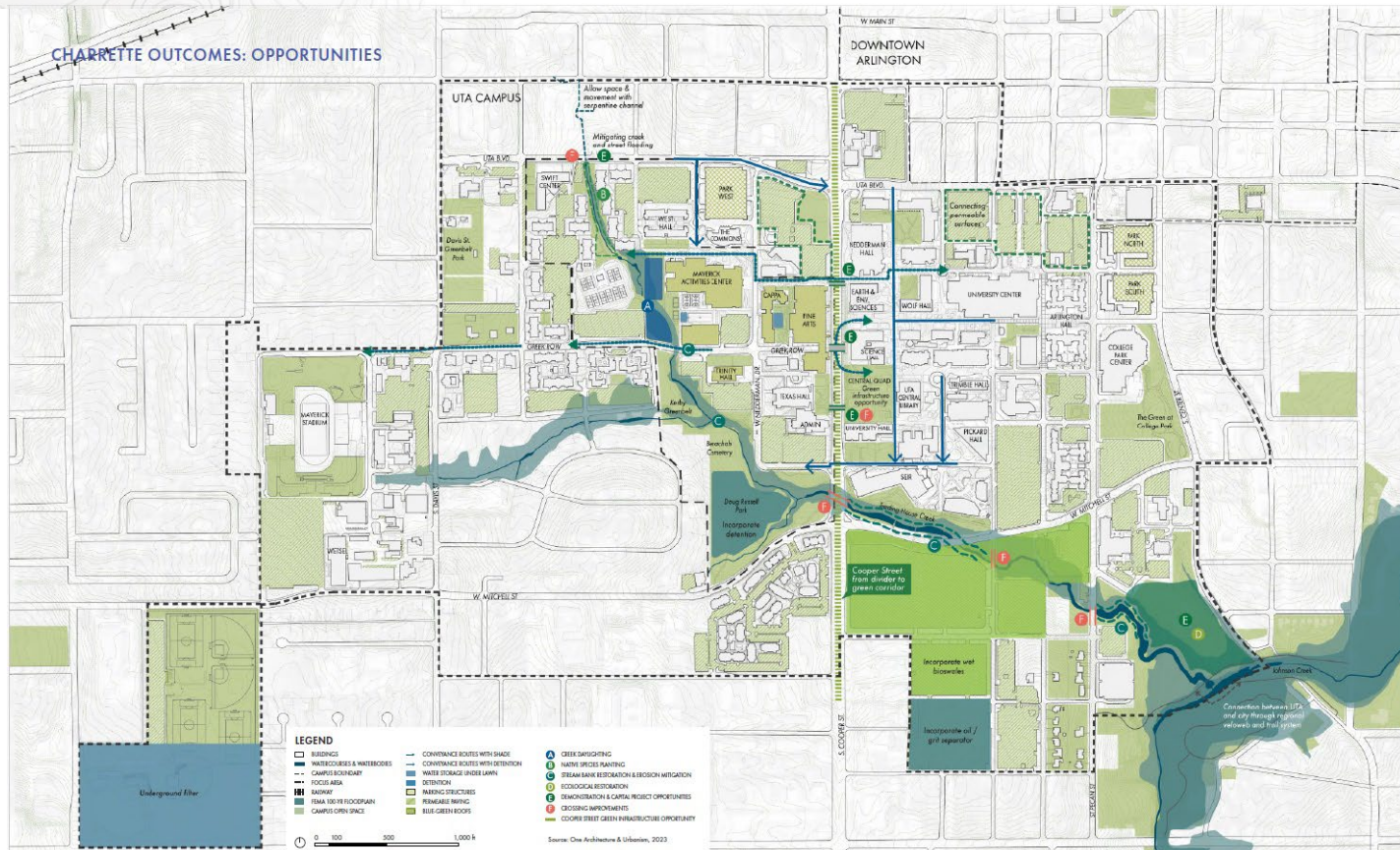
# UTA GI REPORT: CHALLENGES

## CHARRETTE OUTCOMES: CHALLENGES



Erosion along Trading House Creek (Source: ONE)

# UTA GI REPORT: OPPORTUNITIES



## VISION FRAMEWORK

A campus framework for designing, implementing, and maintaining green infrastructure for the greatest benefit requires an integrated understanding of the technical optimization of green infrastructure to capture and detain stormwater as well as the multiple benefits that the infrastructure provides to campus beyond stormwater management and heat mitigation. The framework must draw on and reference the existing environmental constraints and incorporate the opinions and needs of key campus stakeholders: UTA's staff, faculty, students, and visitors.

Watershed analyses are critical to properly locate and size green infrastructure measures and ensure their technical optimization. Individual measures have different intended designs that work in tandem to mimic the water cycle and range between infiltration of water into ground, conveyance of water throughout the watershed, and absorption/storage. These intended designs should be sited across the watershed based on what is naturally happening in the water cycle.

Location in the watershed generally dictates the sizing of green infrastructure interventions. As drainage pathways follow gravity and water seeks the lowest point, what begins as many small streams at the top of a watershed will continually combine and converge, picking up more water along the way until they reach one common study point. This phenomenon explains why watersheds are characteristically larger at the top and smaller at the bottom and results in areas of lower watersheds with larger volumes of water and correspondingly larger green infrastructure measures.

Understanding existing built context (buildings and roads) is also important to account for built impacts on drainage patterns. These in turn determine the prioritized design function, the size of the green infrastructure intervention, and help evaluate how much water is expected to reach the feature. In addition to technical optimization, green infrastructure should also be evaluated for its capacity to deliver co-benefits to the campus community.

Intended green infrastructure benefits should be agreed upon and prioritized by key stakeholders during a visioning process to ensure that future green infrastructure designs work in alignment with the desired outcomes. Discussing both the technical and non-technical implications of green infrastructure measures during visioning ensures that the greatest benefit is attained.

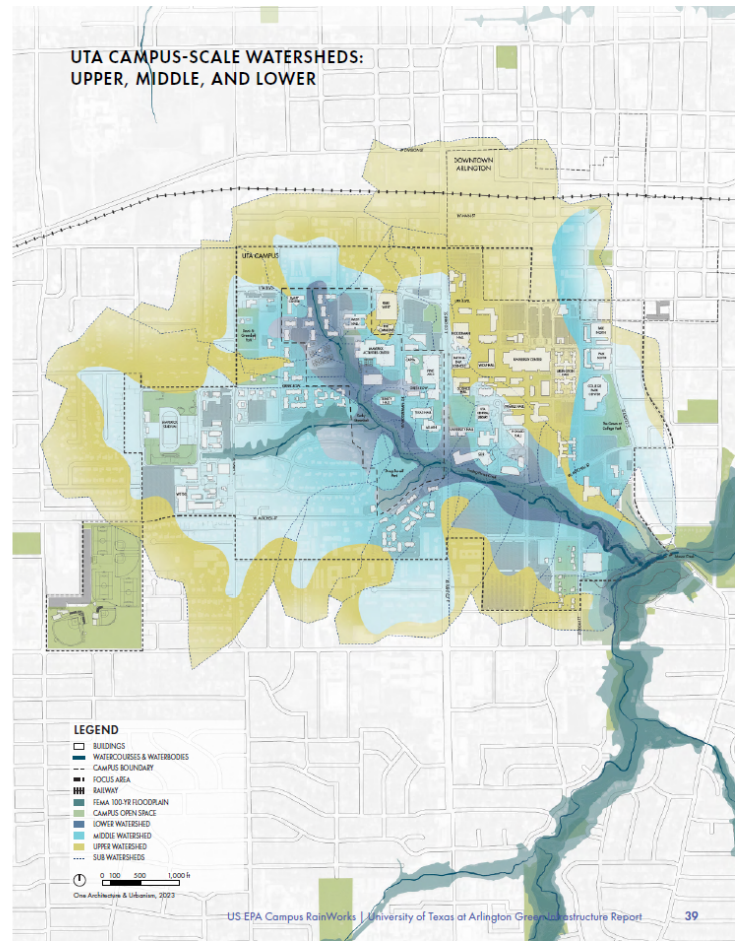
A watershed is typically organized into three portions, each with a distinct function and priorities:

**Upper Watershed: Infiltrate**  
Infiltration of stormwater into the ground via green infrastructure can mitigate runoff in upper portions of the watershed and reduce the volume of runoff that reaches lower portions of the watershed. Conveying water to the lower portions of the watershed is an additional priority to mimic surface runoff.

**Middle Watershed: Slow & Store**  
Middle watershed green infrastructure focuses on moving and slowing stormwater as it conveys toward inlets for existing gray stormwater infrastructure. These strategies include vegetated waterways, stormwater inlet optimization, and pockets of temporary storage (e.g. cisterns, bioretention areas with outlets). By slowing the rate at which stormwater reaches this gray infrastructure, stormwater can be more safely conveyed from the upper toward the lower watershed, while reducing the rate and frequency of overcapacity infrastructure.

**Lower Watershed: Restore**  
Lower portions of watershed leverage restoration strategies to recreate natural drainage patterns as well as ecological patterns of the area to re-establish the storage capacity and flood-tolerant vegetation that once mitigated further flooding downstream. This is especially important at the confluence of waterways where there may be additional backups of water due to hydraulic interactions.

## UTA CAMPUS-SCALE WATERSHEDS: UPPER, MIDDLE, AND LOWER



opposite:  
UTA campus hydrology and conceptual map of upper, middle, and lower watersheds (Source: ONE / Sherwood)

## REFLECTIONS & OUTCOMES:

- **Researched, taught and exhibited work about GI/BGI and Climate Responsive Design**
- **Showcased campus leadership the research and student work on GI/BGI**
- **Explored current needs and opportunities**
- **Discussed environmental, economic, and social benefits** (landscape performance)
- **Fostered communication among stakeholders**
- **Built awareness for GI/BGI, Climate Responsive Design, and Campus Planning**
- **Educated** campus and community about the importance of **systems thinking** and acting sustainably so that we can use resources responsibly while improving the livelihood of present and future generations (Office of Sustainability).
- **Established a framework**, to guide upcoming campus planning efforts (**Master Plan & Climate Action Plan**),
- **Established priorities and direction for future GI/BGI**
- **Identified opportunities for collaboration and partnership** (looking for new ones)
- **Utilizing UTA as Urban Lab and Resource Center for the Region** in GI Research and Demonstration (UN SDG)

# KNOWLEDGE CYCLE

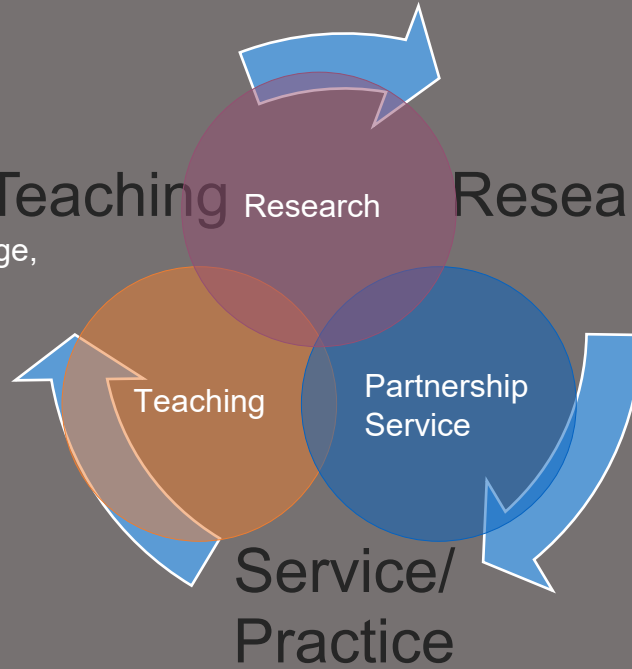
## **Projects & Competitions:**

Campus Rainworks Challenge,  
Urban Landscape Projects

Teaching Research Research

## **Knowledge:**

Ongoing Research Projects:  
LID, GI, Performance,  
Landscape Performance



## **Partners:**

Government, & Non-profit  
Private Owner/Developer  
Educational Institutions

# QUESTIONS?





# CONTACT

- **Taner R. Ozdil**, Ph.D., ASLA, Landscape Architecture, CAPPAA  
TOZDIL@UTA.EDU    Office: 817 272 5089
- **UTA GI Report** can be accessed from <https://rc.library.uta.edu/uta-ir/handle/10106/31708>
- News Release: <https://www.uta.edu/academics/schools-colleges/cappa/news-events/news/2023/09/13/uta-epa-greene-infrastructure>

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**END**