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Rowlett Creek Watershed Protection Planning

Stakeholder Meeting #4

Thursday February 22nd ,2024

Texas Commission on Environmental Quality | EPA United States Environmental Protection Agency | Plano City of Excellence | Texas A&M AgriLife Research | Extension | North Texas Municipal Water District

Agenda

- 10:00 Welcome/Introductions
- 10:10 WPP Progress Update
- 10:20 Discussion and Next Steps
- 10:30 Low Impact Development Presentation
- 11:00 Adjourn

Funding Sources

- Funding provided by the Texas Commission on Environmental Quality through a Clean Water Act Section 319(h) grant from the U.S. Environmental Protection Agency, with local match funding from Texas A&M AgriLife Extension and the City of Plano

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

EPA United States Environmental Protection Agency

Plano City of Excellence

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Project Summary

- Writing of Watershed Protection Plan continues
- Chapter 1 approved by TCEQ and Steering Committee
- Chapter 1 now available for Stakeholder review
- Chapter 4 will be released after QAPP approved
- QAPP for current project is almost ready for resubmittal after addressing TCEQ comments
- Chapters 2 and 3 will begin after Chapter 4 is released and approved

Project Website

- https://agrilife.org/lid/rowlett-creek-watershed-characterization/
- Chapters available for download as Steering Committee approves them for release

Chapter 1- Introduction

- Watersheds
- Types of Pollution
- The Watershed Approach
- Watershed Protection Plans
- Adaptive Management
- Education and Outreach
- Problem Statement
- Response

Chapter 4- Pollutant Source Assessment

- Introduction
- Load Duration Curves
- Load Duration Curve Analysis
- Pollutant Source Load Estimates

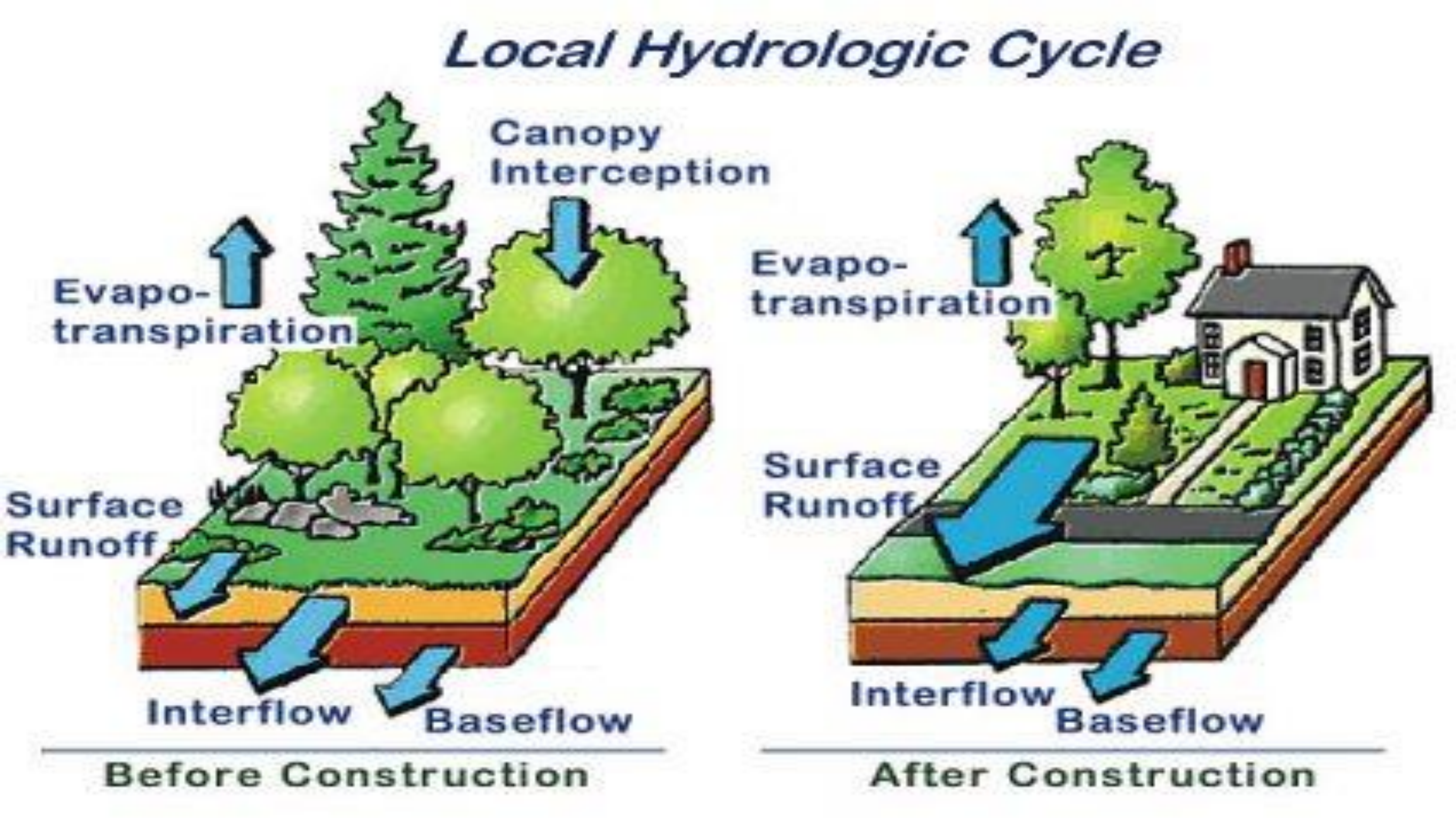
Next Chapters

- Chapter 2- Rowlett Creek Watershed Characterization
- Chapter 3- Water Quality

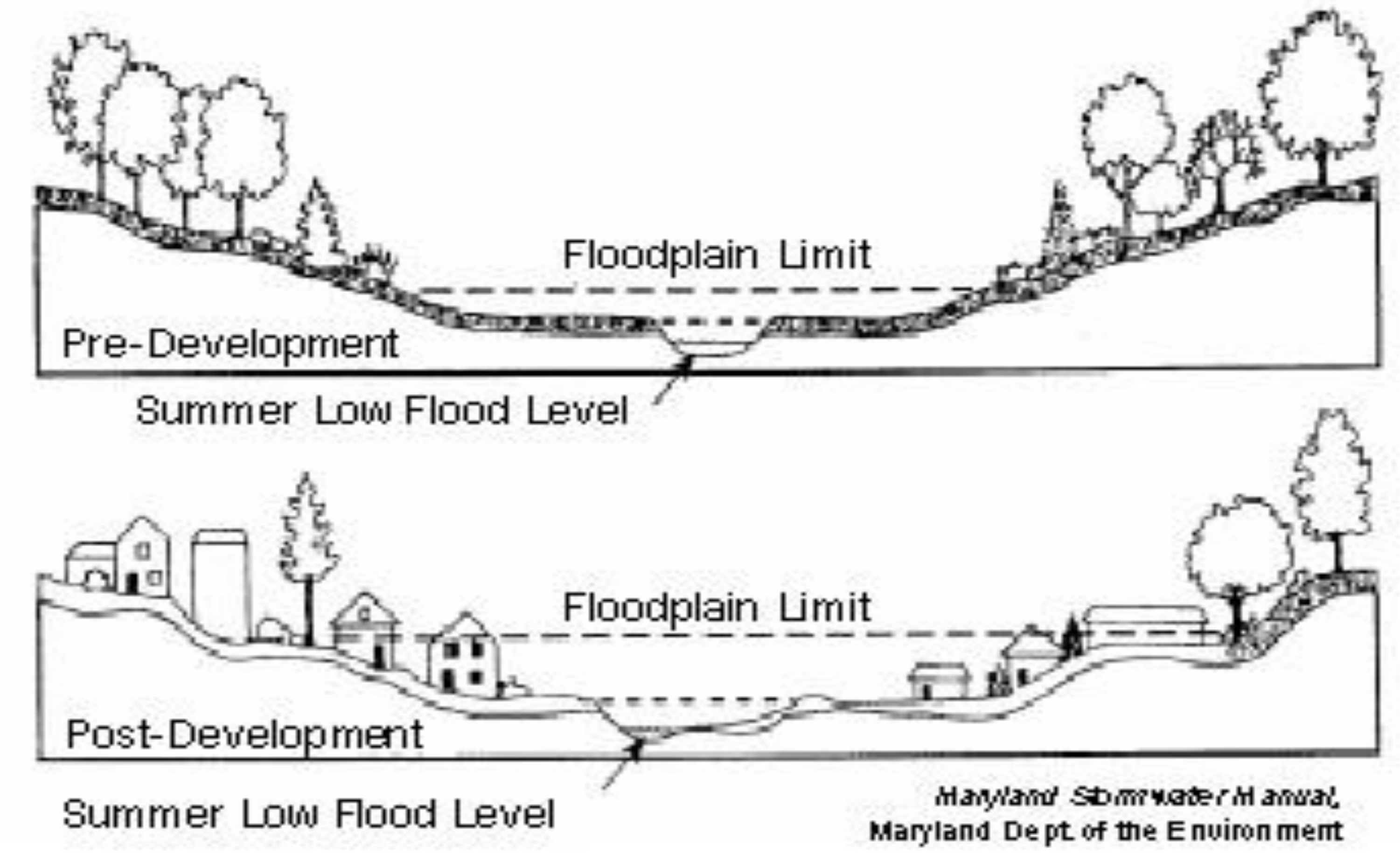
Nature-based Solutions for Water Quality and Flood Resiliency

Fouad H. Jaber, PhD, PE
Professor and Extension Specialist
Biological and Agricultural Engineering
Texas A&M AgriLife Extension
Dallas Research and Extension Center

Urban vs. Natural



Why is Stormwater a Concern?



Why is Stormwater a Concern?

Eutrophication

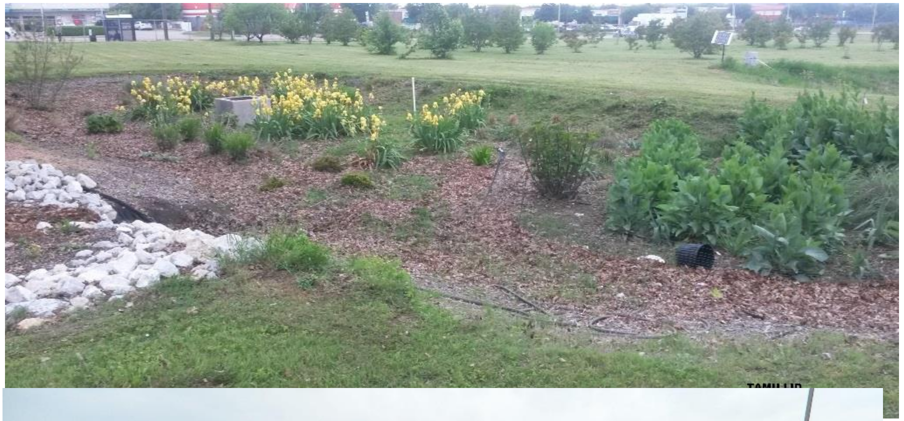
- Impacts due to urbanization:

  Impact to aquatic habitat:
  Degradation of habitat structure, loss of pool-riffle structure, reduction in base flow, increased stream temperature, and decline in abundance and biodiversity.

Fish kill at Lake Granbury.

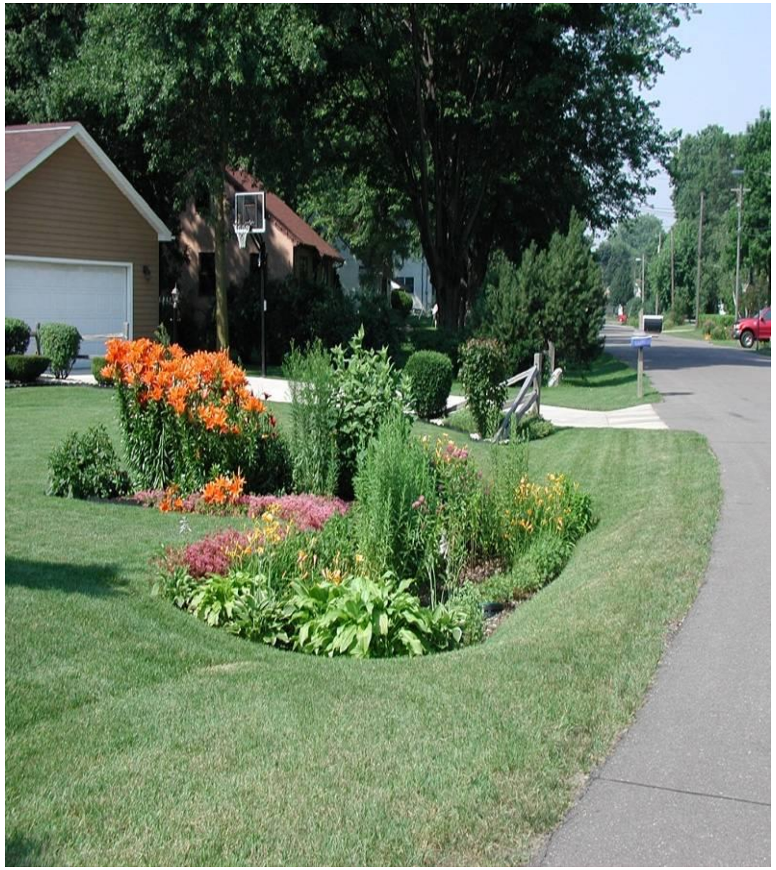
Green Stormwater Infrastructure

- Rain garden-bioretention areas
- Porous pavements
- Green roofs
- Rainwater harvesting



What is a Rain Garden (Bioretention)?

A rain garden is a beautiful landscape feature consisting of a planted shallow depression that collects rainwater runoff from roofs, parking lots and other impervious surfaces.



Home Rain Garden

Bioretention in Parking Lot

Bioretention in Road Median

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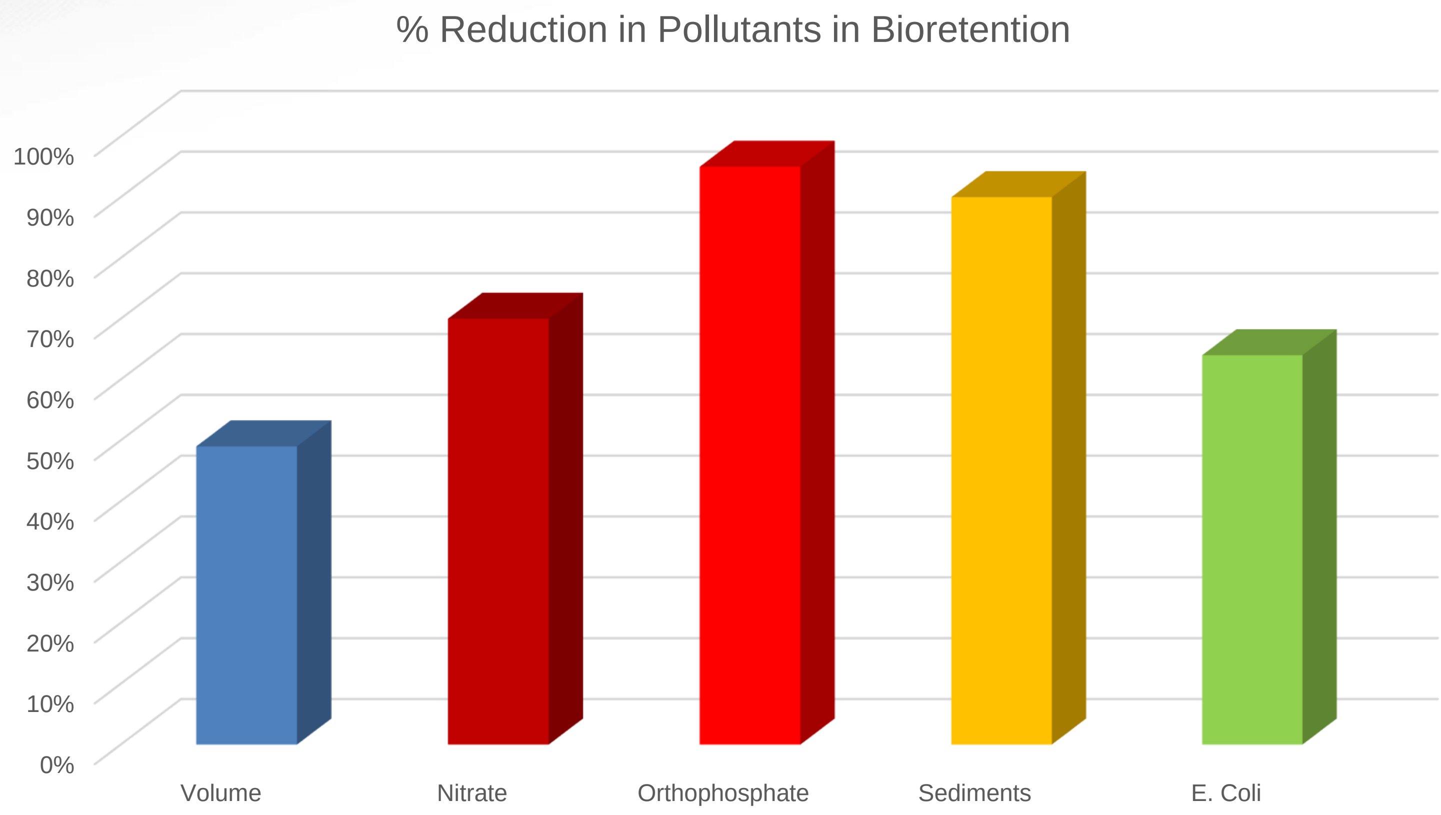
Volume and Pollutants Reduction



Jaber, 2015


Alice Branch
South Oak Cliff
Renaissance Park
E Overton Rd


Welcome to
South Oak Cliff
Renaissance Park


What is a Rain Garden?
Texas A&M AgriLife Extension
The Nature Conservancy

What is Porous Pavement?

- Porous pavement is a permeable pavement surface with a gravel reservoir underneath.
  - it temporarily stores surface runoff before infiltrating it into the subsoil
  - provides water quality treatment
  - often appears as traditional asphalt or concrete but is without "fine" materials
  - could also allow for grass growth

Types of Permeable Pavement

Paver blocks

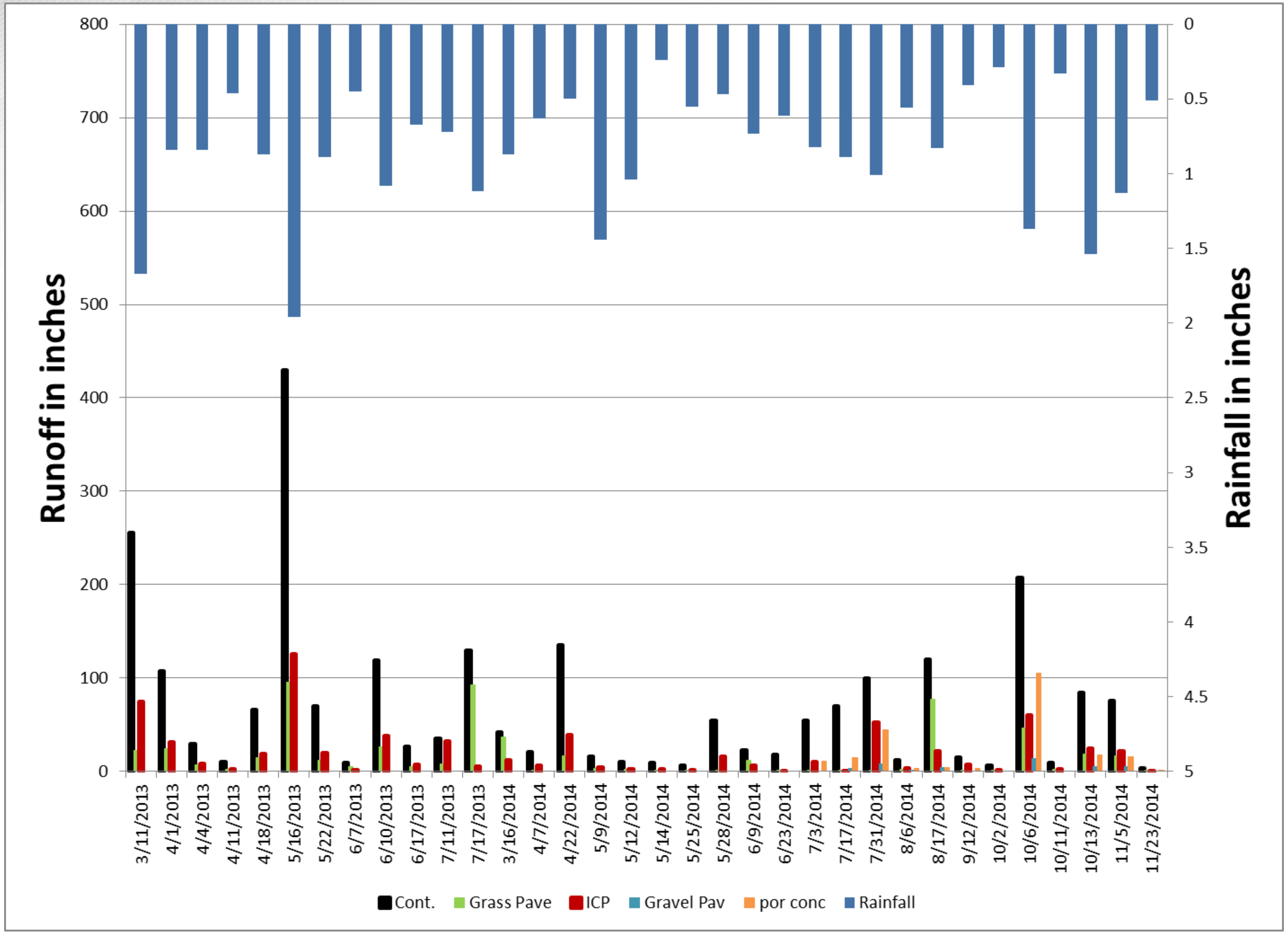
Porous asphalt

Porous concrete

Turf Paver

Expanded shale mix

Results: Volume



Jaber, 2015

Volume and total suspended solids reduction rates

Reduction Rate	PICP	Pervious Concrete	Grass Pavers	Gravel Pavers
Volume	71%	74%	78%	93%
TSS	57%	48%	84%	48%

TAMU LID(c)

Green Roofs

Volume Reduction

Event	Rainfall	C	H	H reduction	S	S reduction	SD	SD Reduction
Date	inches	gals	gals	%	gals	%	gals	%
05/09/14	Total Volume Reduction from C			65.39%		76.05%		75.33%
05/12/14								
06/09/14								
07/03/14								
07/17/14	0.89	6.7	1.47	0.78	0.1	0.99	2	0.70
07/31/14	1.01	7.7	6.1	0.21	0.24	0.97	1.18	0.85
08/06/14	0.56	2.7	0	1.00	0	1.00	0.29	0.89
08/17/14	0.83	4.7	1.18	0.75	0	1.00	0.29	0.94
10/06/14	1.37	15.8	5.54	0.65	2.47	0.84	4.1	0.74
10/13/14	1.54	22	11.9	0.46	8.7	0.60	9.3	0.58
10/13/14	1.54	22	11.9	0.46	8.7	0.60	9.3	0.58
11/05/14	1.13	9.02	0.17	0.98	0.35	0.96	0.29	0.97
11/23/14	0.51	2.5	0	1.00	0	1.00	0	1.00
12/23/14	0.53	3.89	0.59	0.85	0.35	0.91	0	1.00
01/12/15	0.63	4.5	0.66	0.85	2.4	0.47	0.94	0.79
01/23/15	1.17	7.58	3.56	0.53	3.63	0.52	3.28	0.57
02/02/15	0.72	35.7	25	0.30	1.12	0.97	0	1.00
02/25/15	2.22	15.58	8.63	0.45	1.36	0.91	5.66	0.64
03/06/15	1.1	2.36	0	1.00	1.35	0.43	0.17	0.93

Jaber, 2015

Rainwater Harvesting as a Stormwater BMP

- Retains water on-site
- All water applied on high infiltration areas (yard)
- Reduces total volume and peak flow
- Conserves water

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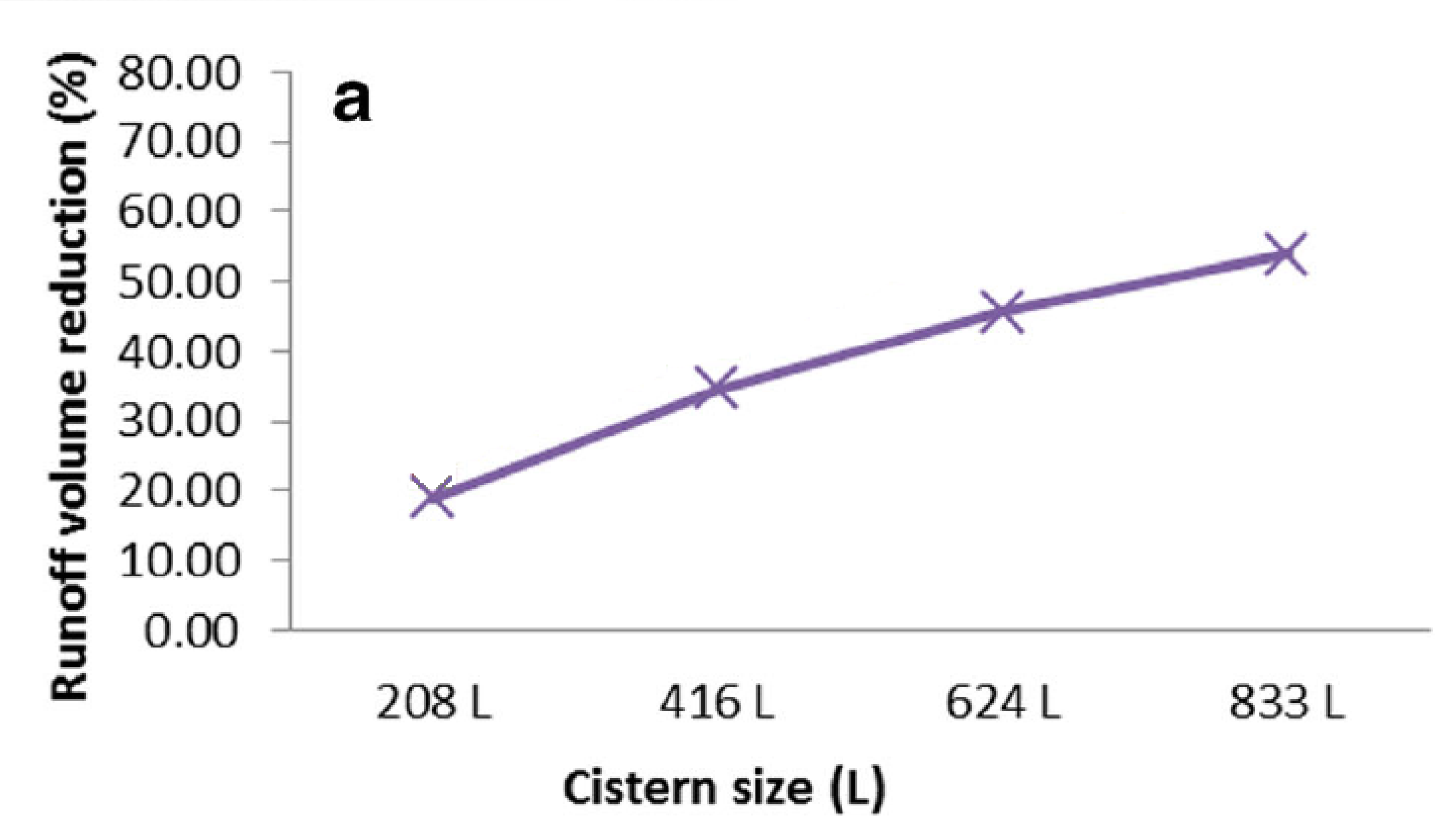
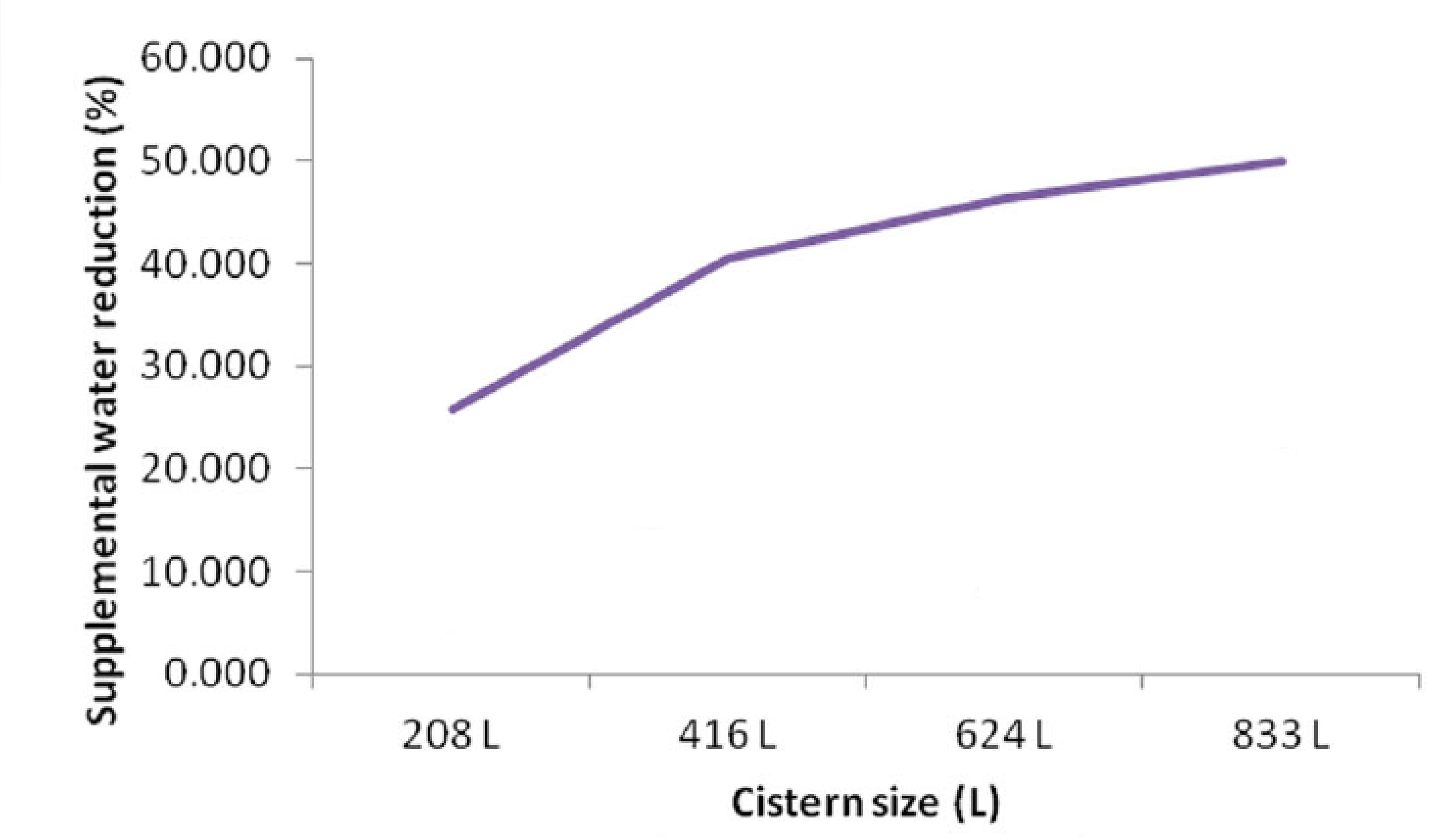
Runoff Reduction from RWH



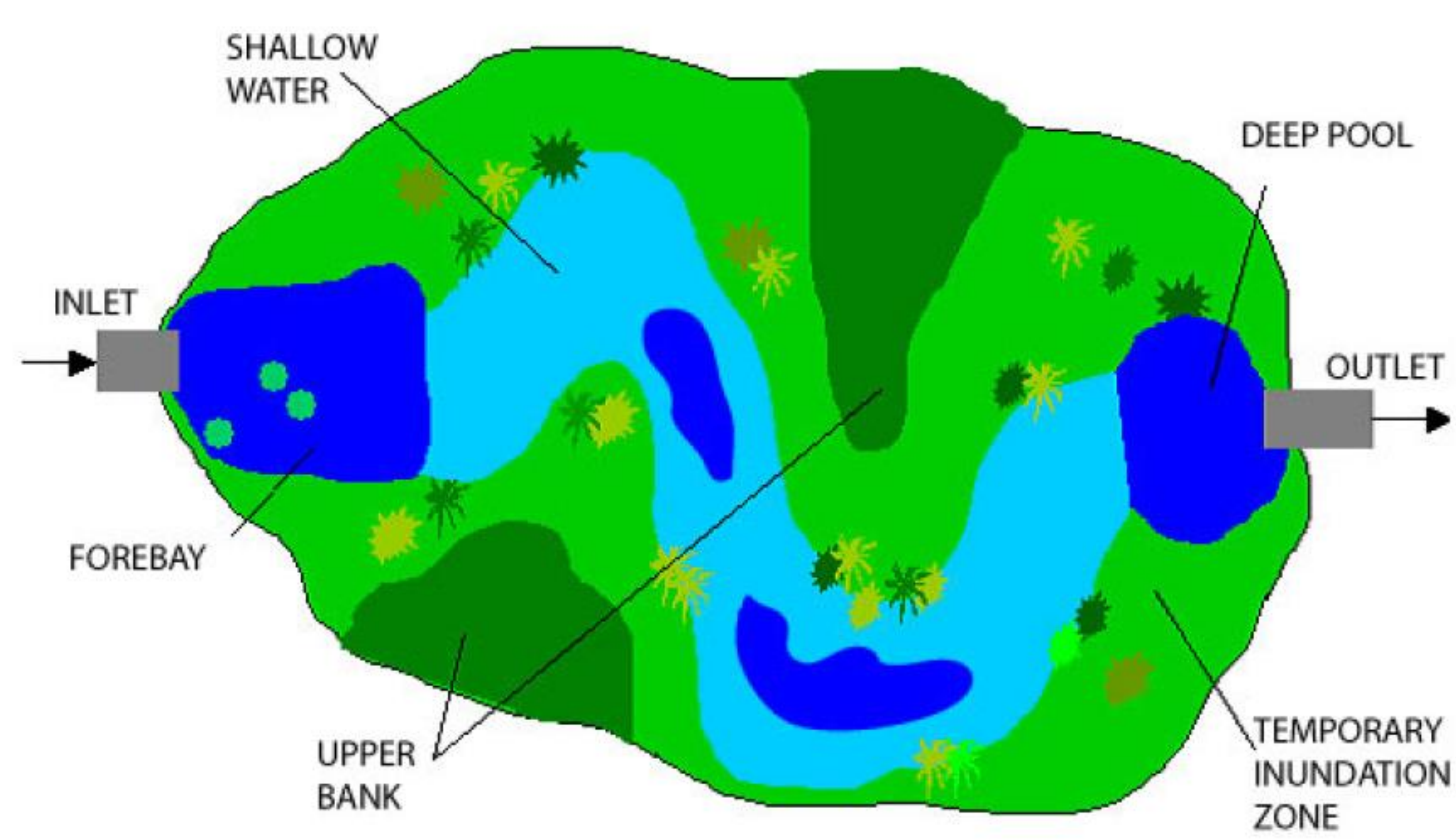
Water savings from RWH



Constructed Wetlands

- Constructed wetlands are best practices to reduce effects of urbanization on stormwater
- Stormwater wetlands are designed to improve water quality, improve flood control, enhance wildlife habitat, and provide education and recreation.

Wetland Features



Wetland Effectiveness in Pollutant Removal

Pollutant	Number of samples	Median pollutant removal percentage	Range
Total suspended sediment	35	78%	-29% to 99.5%
Soluble phosphorus	15	40%	-34.5% to 75%
Total phosphorus	35	51%	-9% to 99.5%
Ammonia (as NH_4)	19	43%	-55.5% to 72%
Nitrate-nitrogen	30	67%	-100% to 90%
Organic nitrogen	12	1%	-31% to 43%
Total Khedjahl nitrogen (TKN)	10	14.5%	-10.3% to 81%
Total nitrogen	22	21%	-25% to 83%
Copper	10	39.5%	2% to 84%
Lead	17	63%	23% to 94%
Zinc	16	53.5%	-73.5% to 90%

(Adapted from Brown and Schueler, 1997)

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Impact of GSI on Urban Density

Fouad H. Jaber and Mijin Seo

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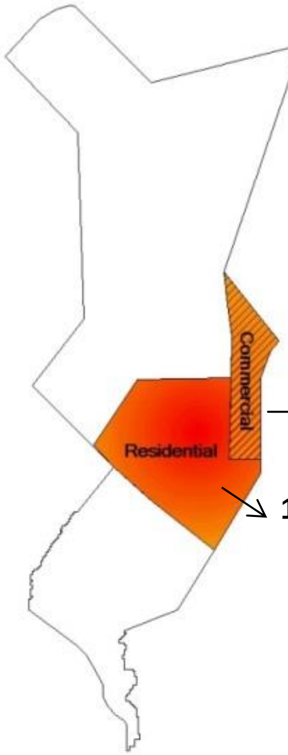
Urban Land Uses

Compact high-density urban design

A heavily developed area and maximized site perviousness



5% of total area

16% of total area (10 units/ac)

Conventional medium-density urban design

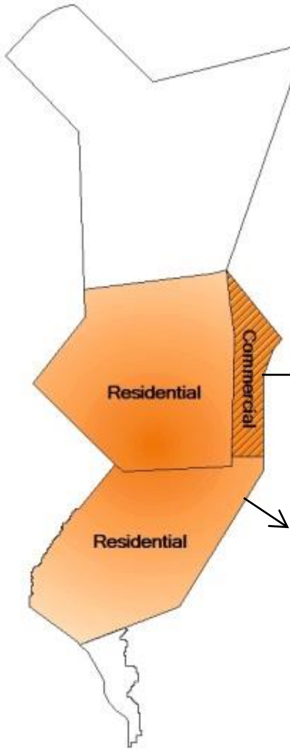
A typical pattern in the United States

5% of total area

51% of total area (3 units/ac)

Conservational medium-density urban design

Include conservational areas under the same base format with conventional urban form



5% of total area (0.23 FAR)

51% of total area (3 units/ac)

Source of designs: League City, designed by Edminster, Hinshaw, Russ and Associates, Inc. (EHRA)

Post-LIDs results

- Final result values

Scenario	Volume (mm)	NO_3 (kg)	TP (kg)	Difference (% reduction)		
				SURQ (mm)	NO_3 (kg)	TP (kg)
UHD	374.66	430.92	431.64	52.97 (14%)	101.37 (24%)	46.45 (11%)
UHDLIDs	**321.69**	**329.55**	**385.19**			
UMD	473.32	591.87	449.55	135.51 (29%)	186.03 (31%)	110.69 (25%)
UMDLIDs	**337.81**	**405.85**	**338.86**			
UMC	462.73	577.19	443.46	117.80 (25%)	170.51 (30%)	97.43 (22%)
UMCLIDs	**344.93**	**406.68**	**346.03**			

- Volume: UMCLIDs > UMDLIDs > UHDLIDs
- NO_3 : UMCLIDs > UMDLIDs > UHDLIDs
- TP : UHDLIDs > UMCLIDs > UMDLIDs

Green Stormwater Infrastructure for Urban Flood Resilience

Opportunity Analysis for Dallas, Texas

Kathy Jack, Ph.D. ,
The Nature Conservancy

Fouad Jaber, Ph.D., P.E,
Texas A&M AgriLife Extension

Susan Alvarez, PE, CFM,
City of Dallas - OEQS

Nature.org/DallasGSI
Executive Summary

The Nature Conservancy

Texas A&M AgriLife Extension

Green Stormwater Infrastructure for Urban Flood Resilience:

Opportunity Analysis for Dallas, Texas.

Research question:

Where can green stormwater infrastructure (GSI) most effectively enhance urban flood management within the City of Dallas, Texas, when considering capacity, cost, and future impacts of climate change?

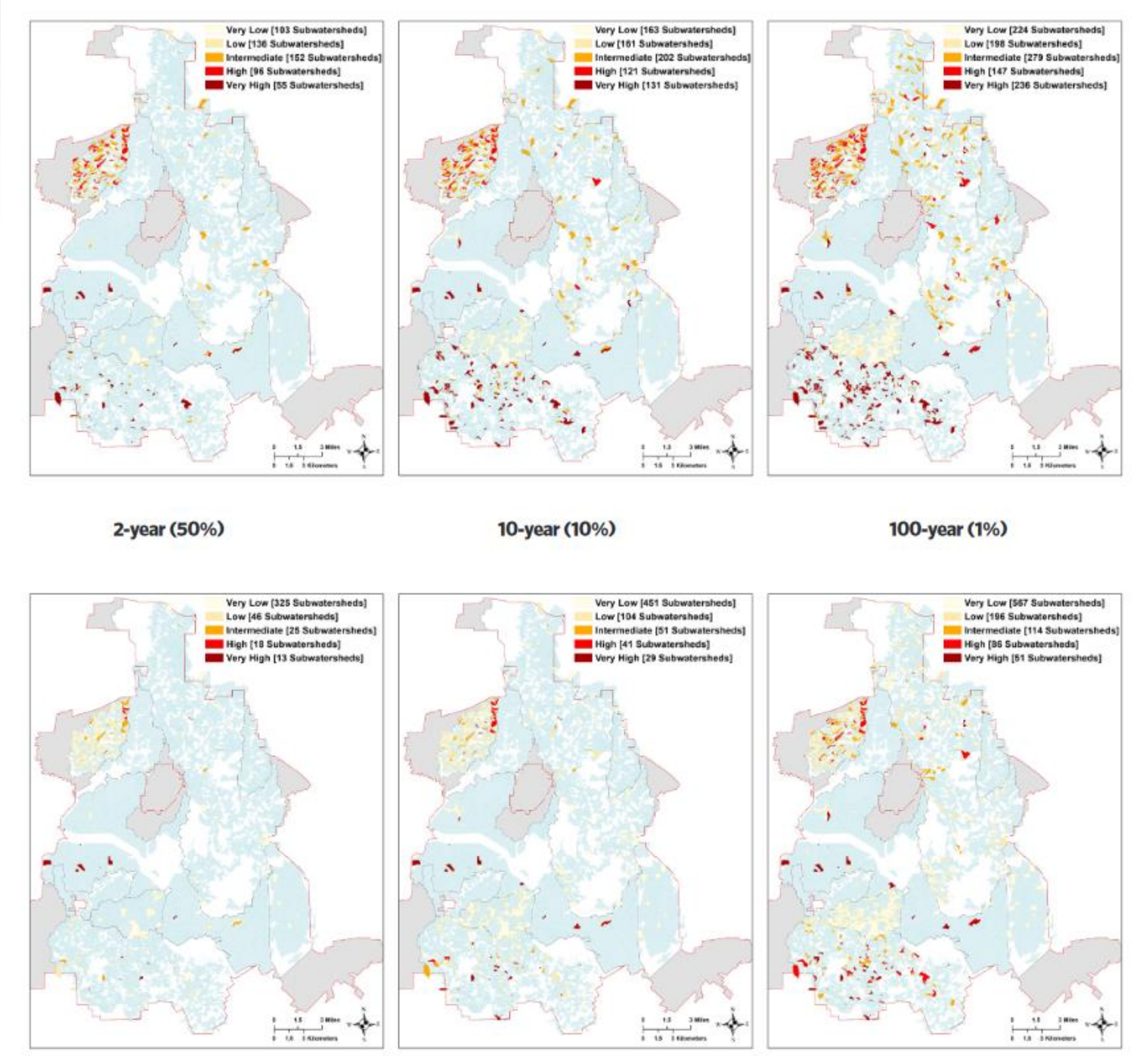
This study utilized hydrologic modeling (USEPA SWMM v. 5.1) and spatial analysis to help answer this question.

Dallas flooding. © Steven Luu.

The Nature Conservancy | Texas A&M AgriLife Extension | Dallas Environmental Quality & Sustainability | City of Dallas | The Trust for Public Land

KJ

Modeling GSI in Dallas for Flood Control



https://www.nature.org/content/dam/tnc/nature/en/documents/GSIanalysisREVFINAL.pdf

Upcoming Tasks

- Final determination of potential *E. coli* sources (analysis only, modeling for this item is covered under the QAPP for the characterization project)
- Chapter 4 will be released to the Steering Committee once QAPP is approved (minor additions need QAPP approval before it is complete)
- Finalization of source determination methodology
- Determine load reduction necessary to meet water quality standards (will start once new QAPP is approved)

Upcoming Meeting Goals

- Next meeting- May 15th, 10-11 am
- More draft chapters of WPP will be completed and ready for stakeholder review, pending QAPP approval
- Update progress on modeling, pending QAPP approval

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Questions, Discussion

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