



From Better Stormwater Management to Greater Sustainability

July 11, 2024 | 10:30 a.m. – 11:30 a.m. (Eastern)

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Today's Presenters



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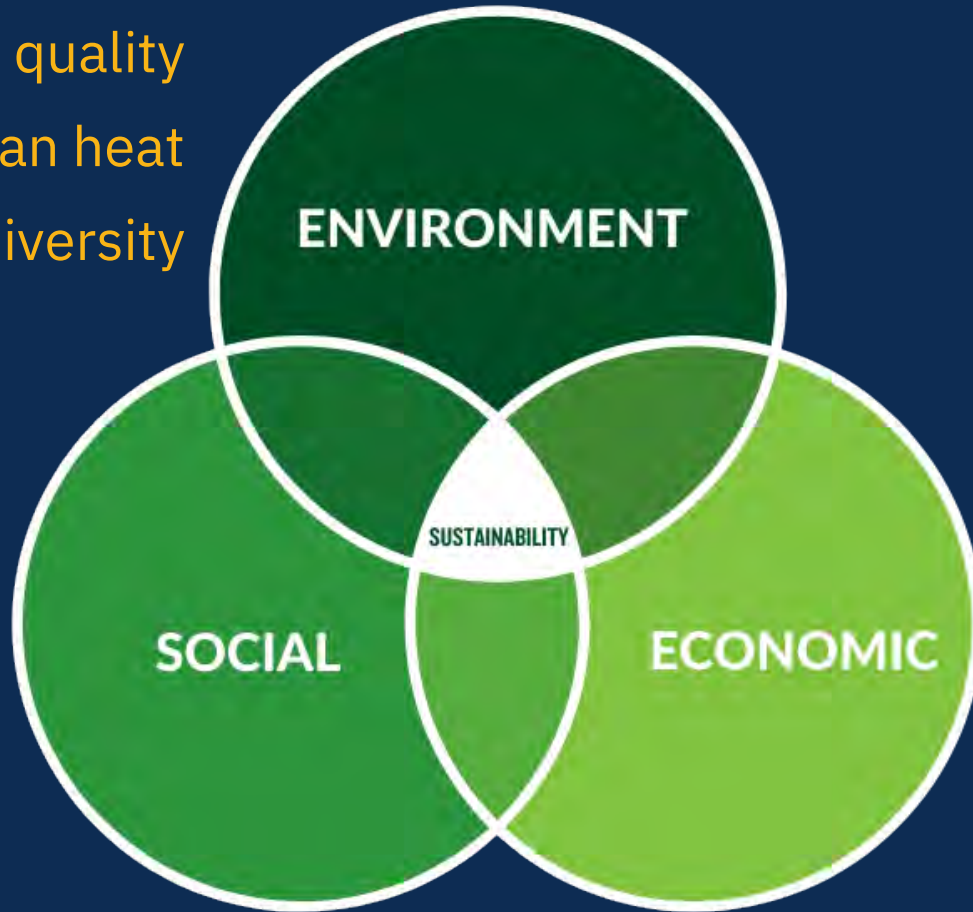
From better stormwater management to greater sustainability

Josh Rogers, City of Chattanooga

Catherine Riihimaki, 2NDNATURE



Water quality
Urban heat
Biodiversity



Local flooding
Green space
Equity

Green jobs
Better
infrastructure
Efficiencies

Factors Working Against Us



Frequent Intense
Rainfall Events



Aging & Undersized
Infrastructure



Urbanization /
Impervious Surfaces

... and funding, resources, and competing priorities

THE STAKES ARE HIGH

Arizona Limits Construction Around Phoenix as Its Water Supply Dwindles

In what could be a glimpse of the future as climate change batters the West, officials ruled there's not enough groundwater for projects already approved.

MATT SIMON

SCIENCE FEB 29, 2024 8:00 AM

US Cities Could Be Capturing Billions of Gallons of Rain a Day

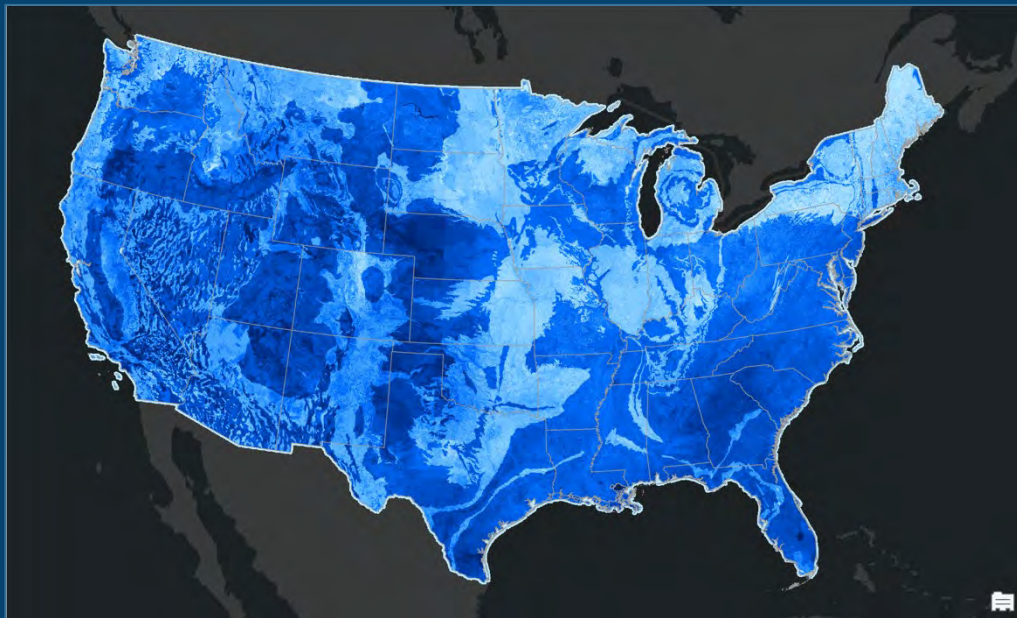
With better infrastructure and "spongy" green spaces, urban areas have made progress but should be soaking up way more free stormwater.

**The Daily Weather Update from FOX Weather:
Las Vegas, Phoenix under threat of flash
flooding on Tuesday**

Moving from science to action

Derived from 2NDNATURE's open science efforts and using the best available public data

WATER SUPPLY



WATER QUALITY



POLLUTANT LOADS (TSS)



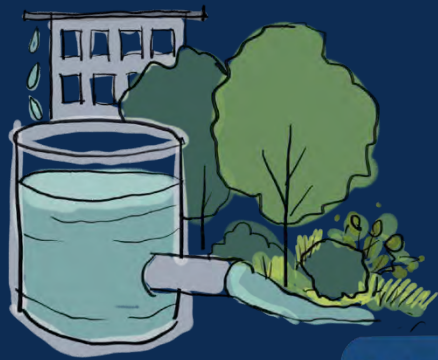
RUNOFF



URBAN HEAT



FLOOD REDUCTION



ENVIRONMENTAL
JUSTICE

WATER
SECURITY

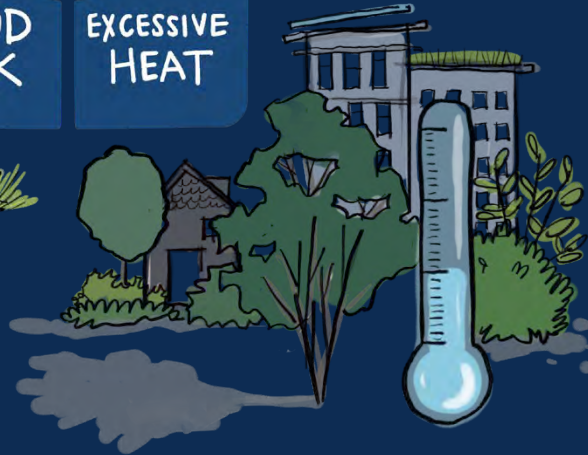
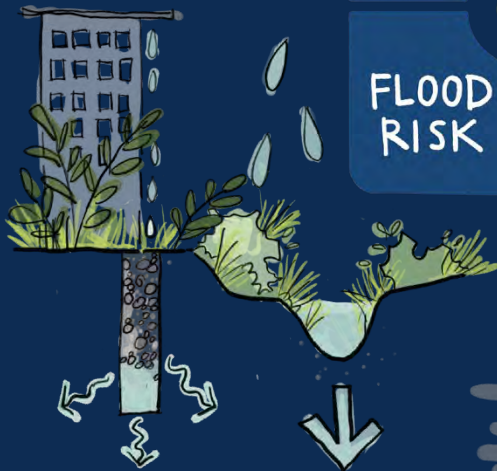
WATER
QUALITY

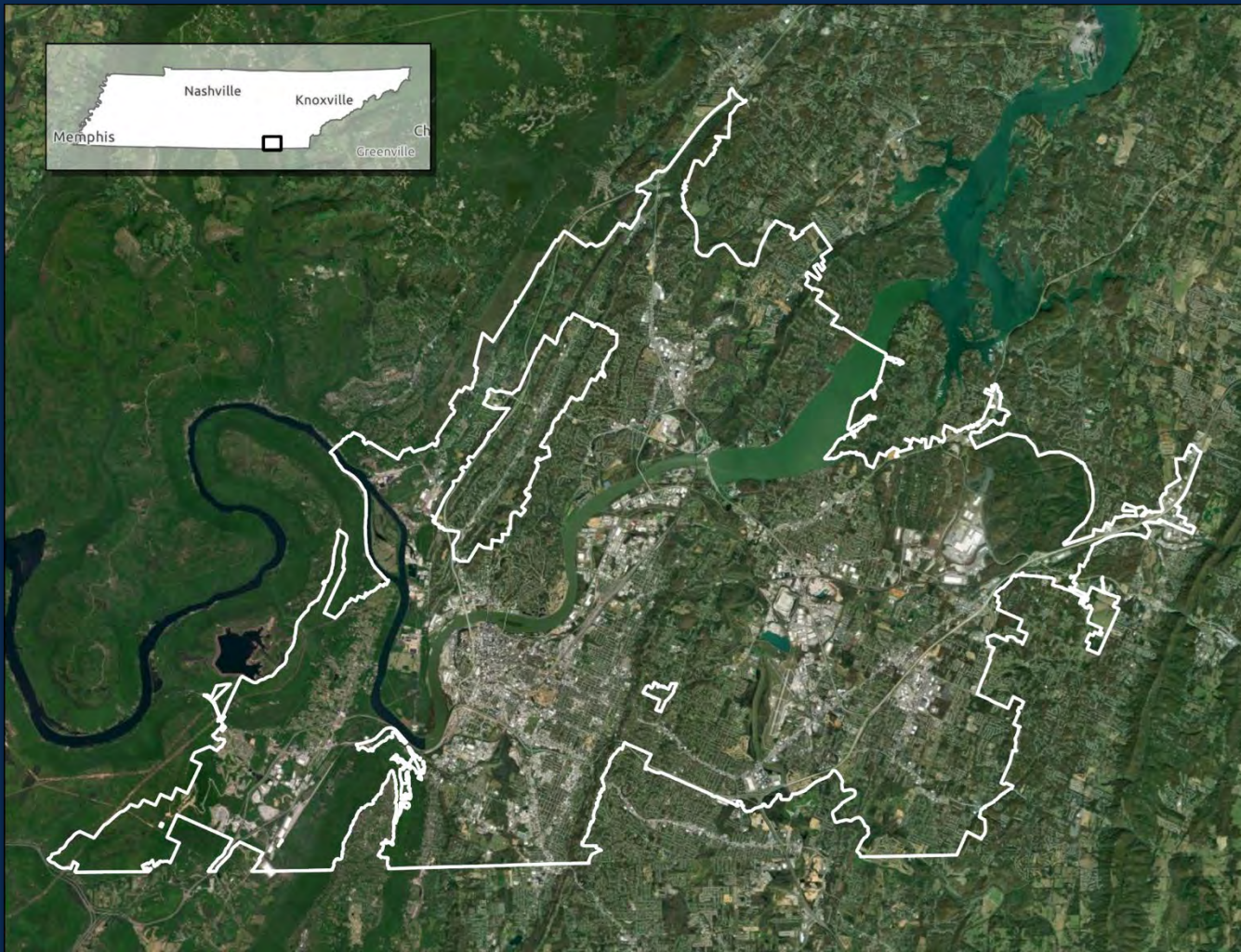
ENERGY
DEMAND

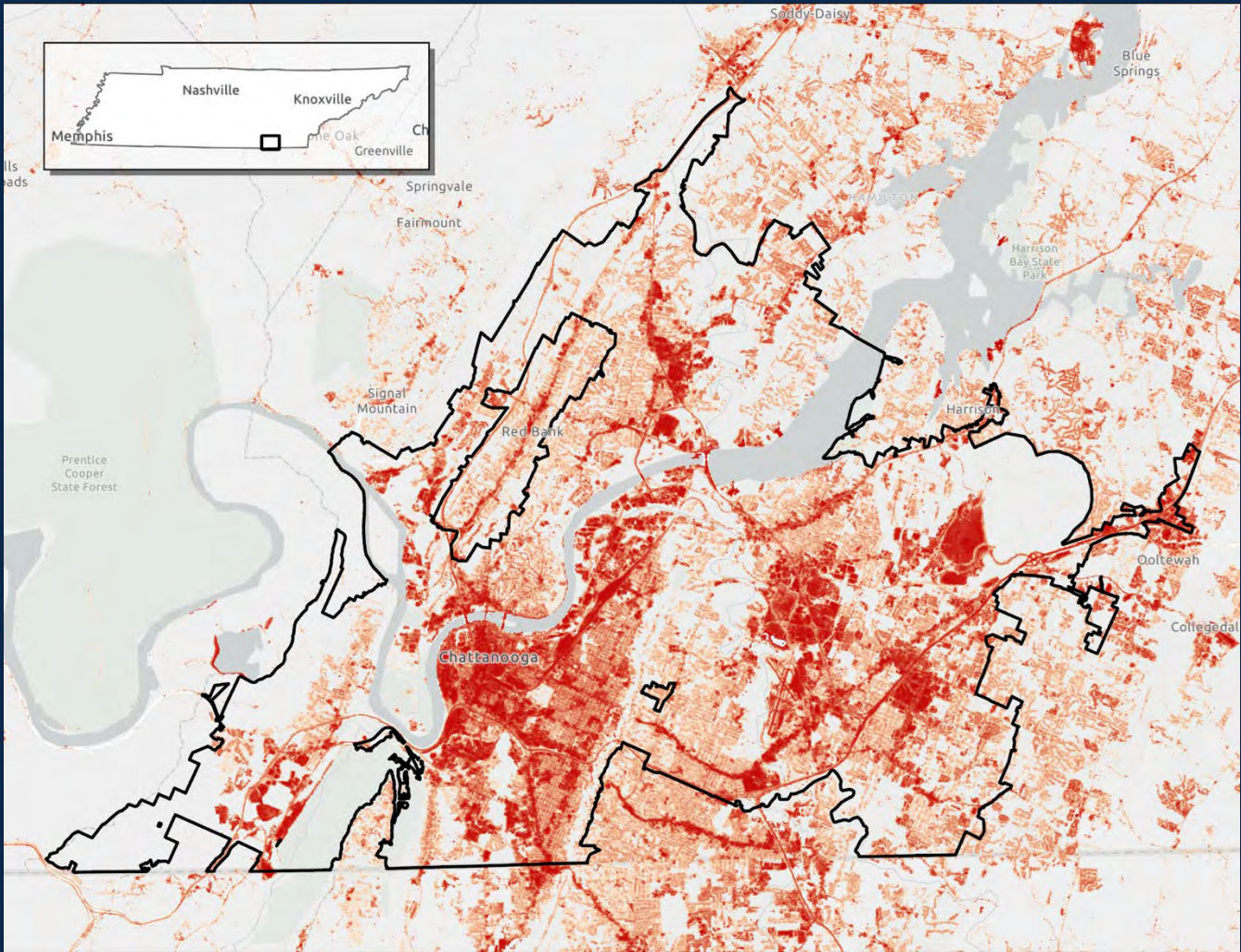


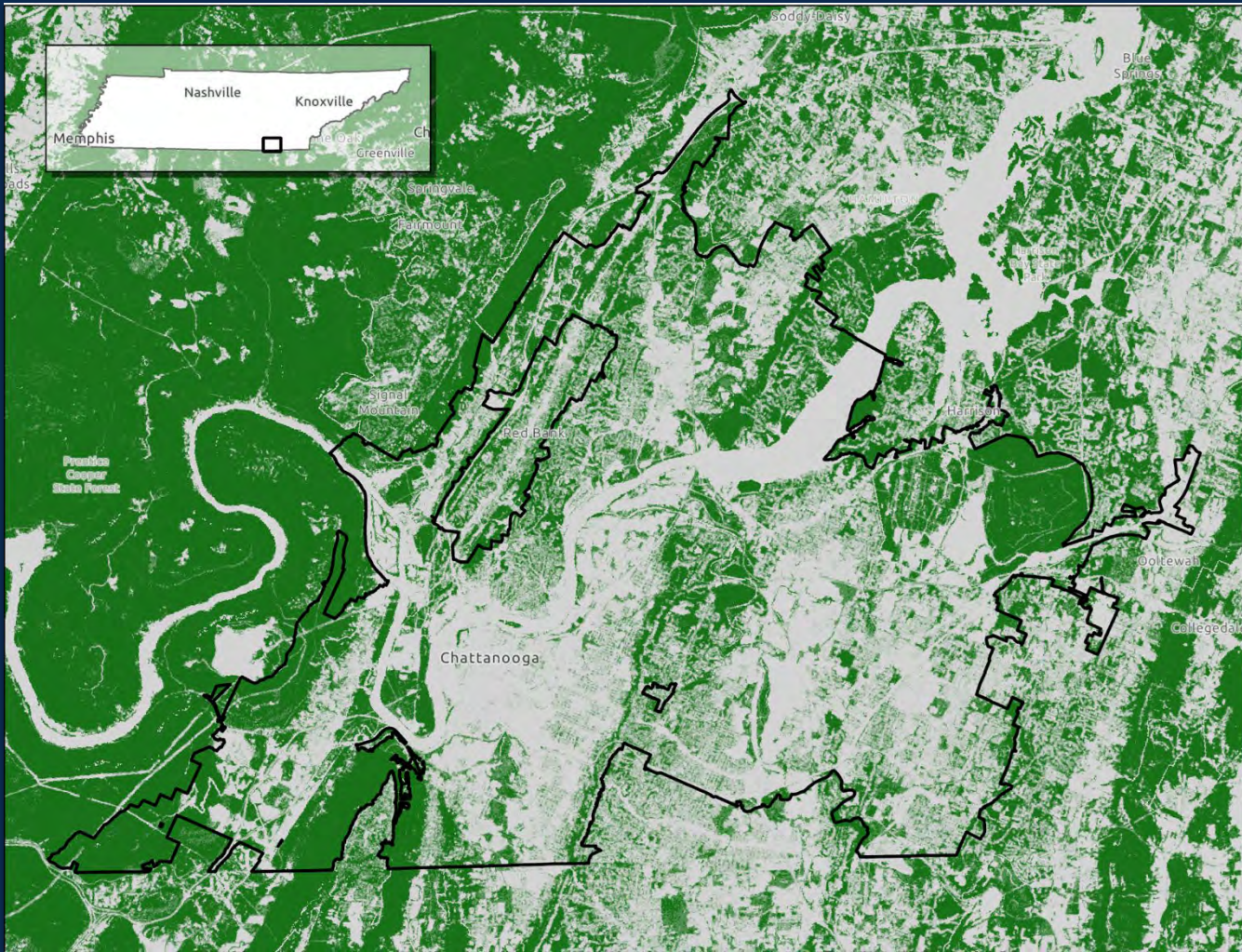
FLOOD
RISK

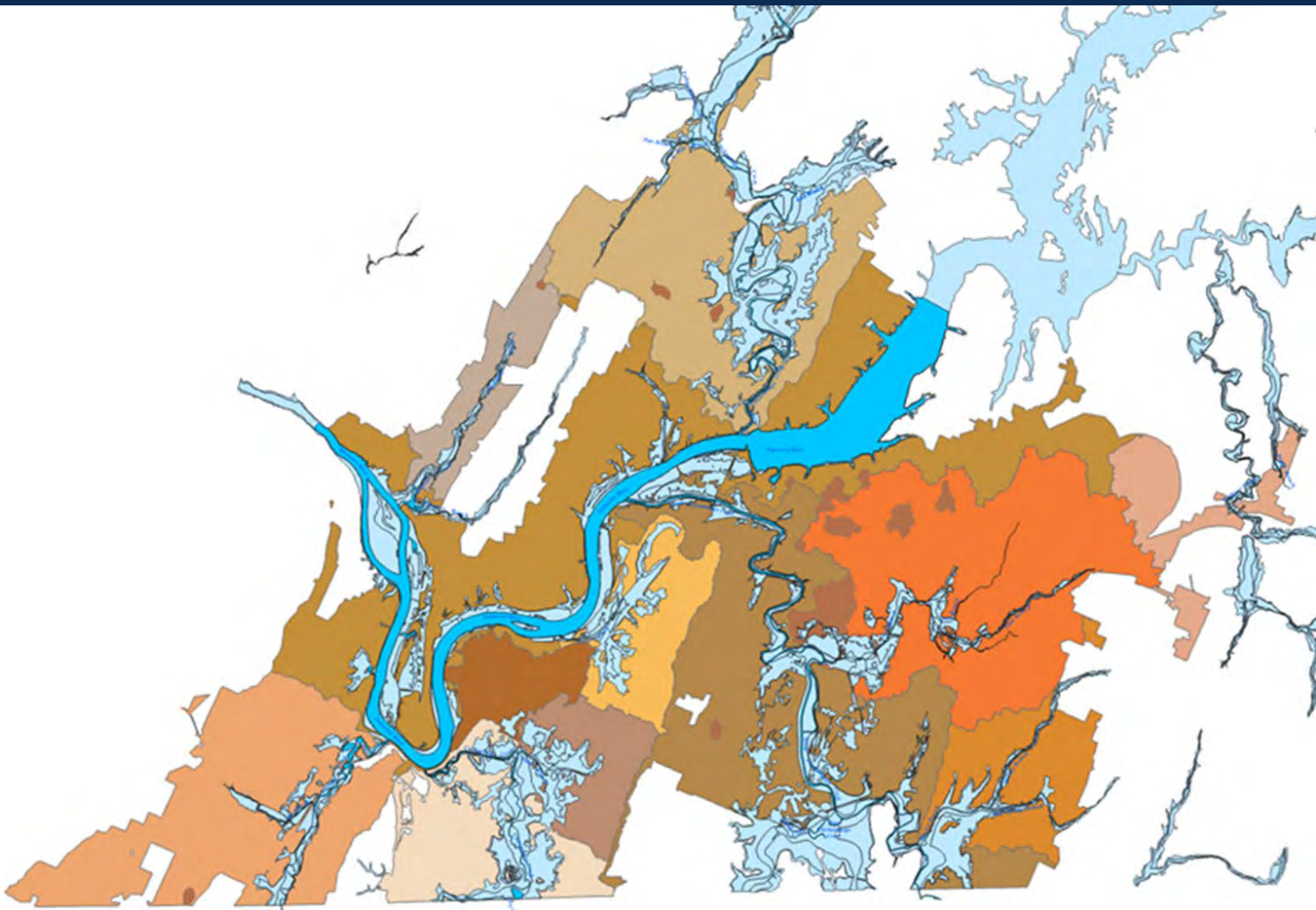
EXCESSIVE
HEAT











ONE

CHATTA

NOOGA

Regional Resiliency Report: 2020-2022

Extreme weather events, climate phenomena, and environmental issues are presenting challenges that impact the City of Chattanooga's infrastructure and assets while also placing burdens on the most vulnerable populations. Over the past few years, the Chattanooga area has experienced record rainfall and flooding, excessive heat and wildfires, and the impacts of tornadoes and a global pandemic. In recognition of the impacts that previous climate-related events have had on the region and on the City's municipal operations, and in recognition of future climate changes, pandemic and community challenges, the City of Chattanooga embarked on the development of the City of Chattanooga Regional Resilience Report.

One Chattanooga Vision: Green Economy

As our world adjusts to the reality of a changing climate, Chattanooga has made early investments to position itself as a leading resilient and innovative city ready to compete in the emerging green economy. Our buildings, transportation, and businesses are powered by renewable energy.

Our sewer and waste management systems are optimized for sustainability. Our city attracts entrepreneurs and companies that develop the technology, materials, and ideas that make our nation more resilient and sustainable. **Every Chattanooga benefits from these investments and our city stands as a model for our region.**

One Chattanooga Goal: Infrastructure

City Priority: Improve Local Infrastructure

1. Ensure timely, equitable, and responsive repairs to potholes and road failure
2. Develop a strategic capital plan that includes long-term maintenance
3. Modernize and invest in our public transit system
4. Design Chattanooga for sustainable and inclusive growth
5. Expand and connect our local parks, trails, and greenways system
- 6. Invest in sustainable and resilient infrastructure**

Climate Focus

1. Climate Vulnerability and Adaptation Report - Oct 2022
 - a. Purpose: improve understanding about local climate change impacts and vulnerabilities and present adaptation responses that can help reduce community vulnerability and/or increase resilience in the areas of Housing, Transportation, and Natural Resources
2. Climate Action Plan - Mar 2023 update (last CAP in 2009)
 - a. Reduce disparities among vulnerable communities
 - b. Net zero-carbon and zero-waste community
 - c. Build a more sustainable city
 - d. Preserve and improve natural resources integrity
 - e. Be a leader in the green economy

Chattanooga's Stay-On-Volume Market

Option for meeting runoff reduction standards

- SOV Market (2014-15)
 - Credit coupons earned for installing SOV over the requirement
 - Up to max 2.1" storm
- Can be used/sold on an open market
 - 50% of a site's SOV requirement can be met with credits w/o demonstrating hardship
 - Value set by market

Public Private Partnership



- Overall goal of the City is to increase confidence and predictability of stormwater capture and reuse as a form of runoff reduction that the City can promote in their stormwater manual.
 - Section 5.3.9 of the City's Rainwater Management Guide states "Captured rainwater can be used for landscape irrigation, fire needs, toilet flushing, or other greywater uses." However... Due to issues of seasonality and demand, the City has not allowed the capture-reuse option of SOV



Public Private Partnership



- Overall goal of the Developer is to lessen potable water usage and obtain credit coupons by providing SOV to areas that were constructed prior to runoff reduction regulations (i.e., retrofit).

Area Name		Total Potential SOV		
		2.1"		Gallons
Lake Silva	Lake Silva	12223	24,848	185,863
	Magnolia Vale*	12625		
Lower Lakes	River Gorge Drive	130,236	144,185	1,078,504
	Ridges			
	Knoll			
	Wildrose Lane*	13,949		
	Hawks Nest*			
	Ridges Basin		Credits Earned	
Total Project Credits			169,033	

Manmade Irrigation Pond

Stormwater Retention Ponds

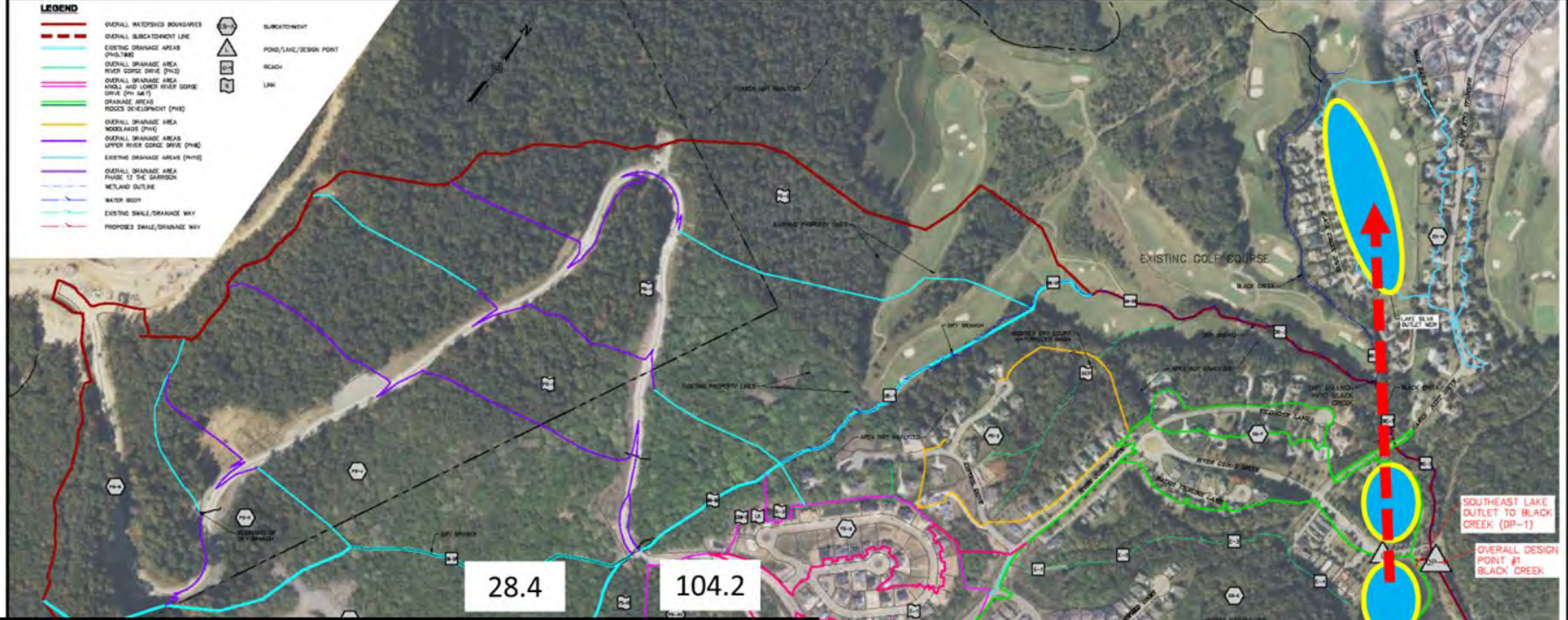
Max storm event

Sub catchment with credits earned on earlier project

LEGEND

- OVERALL WATERSHED BOUNDARIES
- OVERALL SUBCATCHMENT LINE
- EXISTING DRAINAGE AREAS (DP1-18)
- OVERALL DRAINAGE AREA (DP1-18)
- RIVER GORGE DRIVE (DP-1)
- OVERALL DRAINAGE AREA (KNOLL AND LOWER RIVER GORGE DRIVE (DP-1A))
- DRAINAGE AREAS RIDGES DEVELOPMENT (DP18)
- OVERALL DRAINAGE AREA (WILDBROSE DRIVE)
- OVERALL DRAINAGE AREAS (UPPER RIVER GORGE DRIVE (DP18))
- EXISTING DRAINAGE AREAS (DP18)
- OVERALL DRAINAGE AREA (PHASE 2 TO THE GARRISON)
- WETLAND OUTLINE
- WATER BODY
- EXISTING SMALL DRAINAGE WAY
- PROPOSED SMALL DRAINAGE WAY

- SUBCATCHMENT
- POND/LAKE/DESIGN POINT
- REACH
- LINE



Area Name		Subcatchment Designation	Impervious Area		Drainage Area	
			Acres	Acres	Acres	Acres
Lake Silva	Lake Silva	N1	1.7		11.5	
	Magnolia Vale*	N2	1.8		3.6	
Lower Lakes	River Gorge Drive	F1	17.6	23.0	73.3	84.8
	Ridges	E1-4,6,7				
	Knoll	S				
	Ridges Basin	E5	5.4		11.5	
	Wildrose Lane*	F2	1.9			4.3
	Hawks Nest*	F3				

Green Grants

Non-Residential Reimbursement Grant



- Objectives:
 - To increase water quality of Chattanooga's local waterways by focusing efforts on existing sites that currently have no water quality control measures
 - To foster community stewardship and enthusiasm for green infrastructure
 - To spark interest of property owners to invest in green infrastructure retrofits
- Provides \$200,000 a year for partial funding of green infrastructure on private properties



NOTRE DAME HIGH SCHOOL INFILTRATION TRENCH

WHAT IT DOES

- 1) COLLECTS AND ABSORBS STORMWATER RUNOFF FROM SURROUNDING PAVEMENTS, BUILDINGS, AND LAWN AREAS
- 2) RECHARGES GROUNDWATER BY INFILTRATION
- 3) FILTERS AND REMOVES POLLUTANTS CARRIED BY STORMWATER RUNOFF SEDIMENT THROUGH AMENDED SOIL AND GRAVEL.

BENEFITS

- SLOWS & REDUCES RUNOFF
- FILTERS & CLEANS STORMWATER RUNOFF
- COOLS STORMWATER
- RECHARGES GROUNDWATER

DIAGRAM OF INFILTRATION TRENCH
HEAD & TAIL BY THE UNIVERSITY OF TENNESSEE, BARRINGTON, ILLINOIS AND BARRINGTON, ILLINOIS

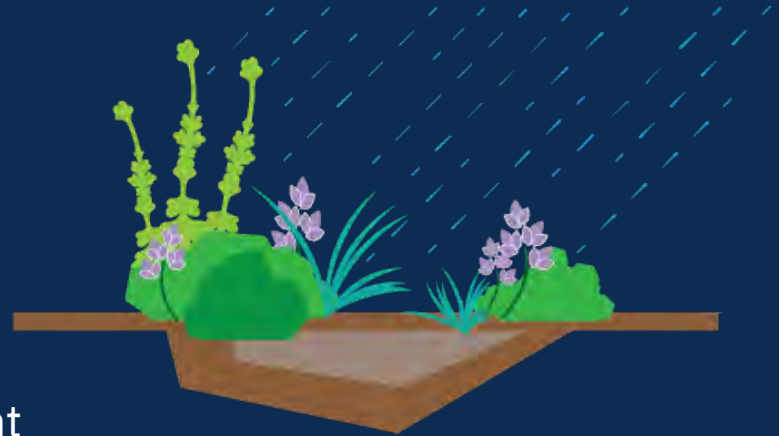
RESOURCE Rain GREEN Credits GREEN GRANT FUNDED BY CITY OF CHATTAHOOCHEE, DESIGN AND INSTALLATION BY CHANG DESIGN GROUP



RainSmart

Residential Programming

- Residential recognition & incentive program
 - “Creek-Friendly” Yards
 - Rain Gardens
 - Rain Barrels
 - Native Plantings
- Helps address NPDES permit parameters
 - Reduce Runoff (3.2.5.2.1)
 - Watershed Protection (3.2.5.9)
 - Public Education & Outreach/Involvement






RainSmart
yards

RainSmart Yards is a program that awards homeowners and businesses for conscientious, creek-friendly landscaping practices and reduces stormwater runoff




RainSmart

RainSmart

Residential Programming



- Rain Gardens: up to \$1000/property
 - Residential scale stormwater infiltration practice
 - 72 hour max stormwater retention
 - Recharging groundwater aquifers
 - Support for pollinators/birds/wildlife
- Rain Barrels: up to \$500/property
 - Reimbursement \$50/barrel (up to 10)
 - Annual Rain Barrel Distribution Day
 - 2 barrels subsidized (\$39-\$49/barrel)

RainSmart

Residential Programming



- SupportScapes (up to \$500/property)
 - 75% of reimbursable costs
 - Native plants, soil, mulch
 - Replacing turf, invasive species, bare soil, and/or addressing erosion or stormwater issues
 - Support for pollinators/birds/wildlife
- Possibilities for expanding the program through both EPA soil remediations and Habitat for Humanity homes

Free Tree ReLeaf Program

Residential Programming



“Mature trees provide cooling shade that can help lower your energy bills. Plus, trees help protect the environment by providing food and natural habitats for local wildlife, and reducing soil erosion, which decreases the volume of stormwater runoff.”

<https://epb.com/free-tree-releaf/>

Increased Shade

Tree canopies can lower temperatures by 10°



Lower Energy Use

Rooftop shade can reduce air conditioning costs

Reduced Soil Erosion

Trees capture rainwater & reduce runoff

Promotes Wildlife

Native trees provide food & natural habitats

Restores Local Canopy

Planting trees replaces canopy lost to storms & development

Improved Air Quality

Trees provide oxygen & remove carbon dioxide

Climate Action Plan

*“**Sustainability is at the core of our brand**, driving our economic growth, improving public health, and increasing residents’ quality of life. But long-standing disparities still exist across our community, with the potential to be further exacerbated by the impacts of a changing climate and aging infrastructure. And while we must continue to grow and attract the workforce of the future, we must also be vigilant to preserve the natural resources we treasure. **That’s why it’s critical to chart a path forward that will ensure a sustainable future for all of us, as we work together to build ONE Chattanooga.**”*

ONE

CHATTA

NOOGA

Stormwater Program Headaches

Jeopardizing NPDES compliance and affecting staff morale

"We're constantly backtracking to correct errors due to manual data handling."

"We are getting hammered in the press for local flooding due to runoff."

"Getting teams to work together is like herding cats because our information is scattered."

"Preparing the annual report takes months and it stresses me out."

"It's hard to be proactive because we're always playing catch up."

"Tracking our resources manually makes it tough to be efficient."

"I'm an environmentalist, not a paper pusher."

"We don't know if our GI investments are making an appreciable difference, and we can't quantify the benefits."

"We desperately need to extend the life of our existing stormwater assets."

Some of what we hear every day

"We are going through the motions, but regulators are still issuing violation notices."

"WE ARE STILL USING CLIPBOARDS AND SPREADSHEETS 🙄"

"The City's GIS team wants to help, but they are already swamped supporting others."

"The City's asset management software doesn't do what we need."

Does any of these sound familiar?



We developed

2iFORM

to provide stormwater managers with a platform to improve every aspect of their MS4 program



**Watershed
Planning**

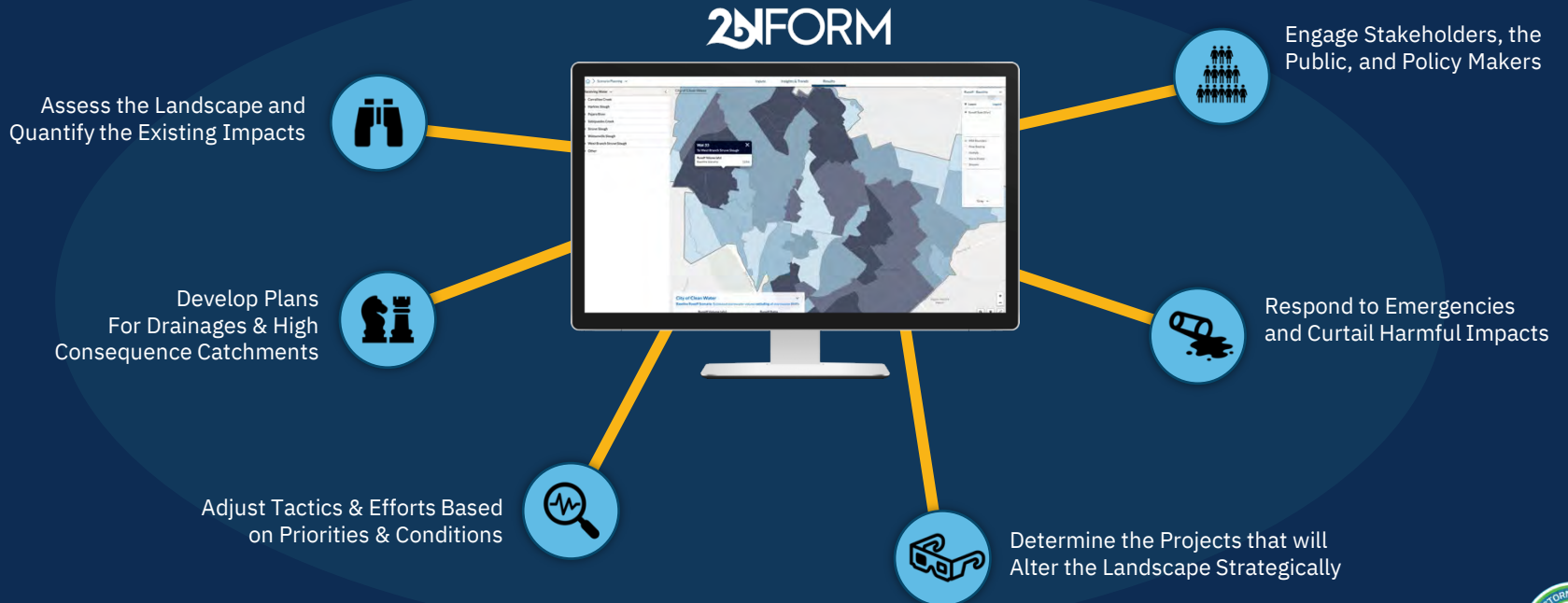
Equity

Helping turn runoff into a resource

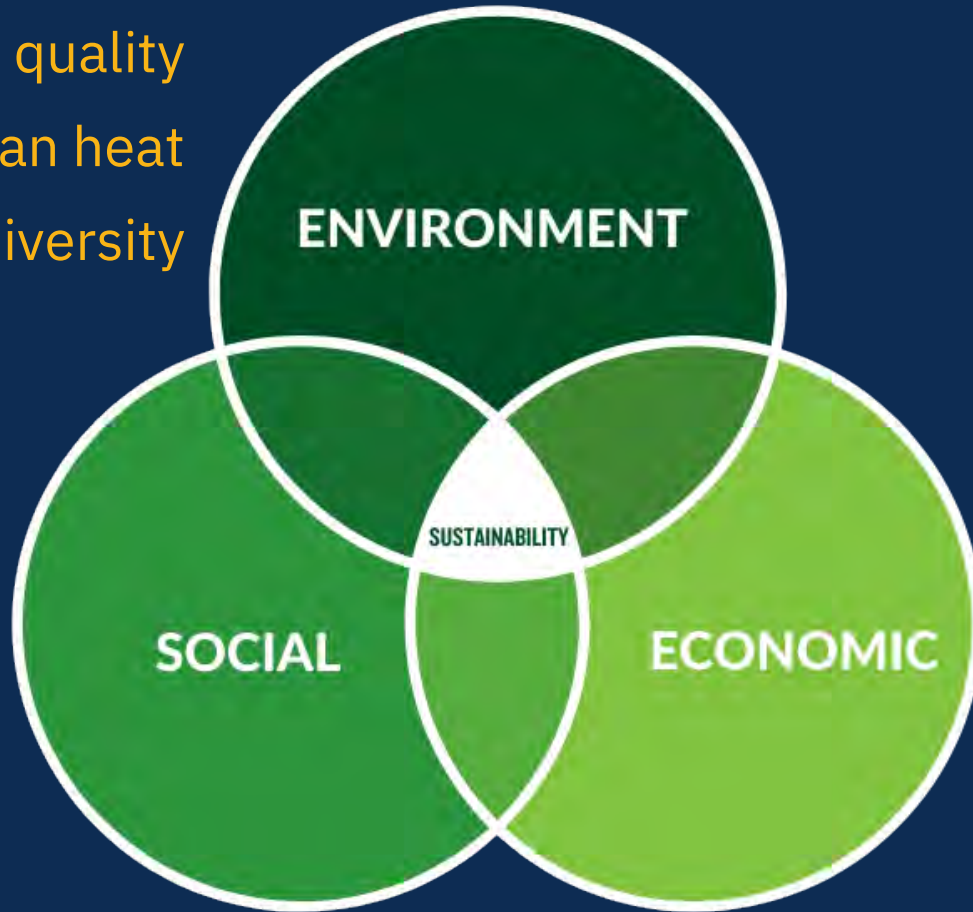
Resiliency

2NFORM: Stormwater Management System

2NFORM is a GIS-based stormwater management software designed to help you meet the requirements of your MS4 permit, reduce local flooding, plan green infrastructure projects, and boost water resiliency.



Water quality
Urban heat
Biodiversity



Local flooding
Green space
Equity

Green jobs
Better infrastructure
Efficiencies

Stormwater is a Team Sport

Requiring coordination, collaboration, and shared knowledge

