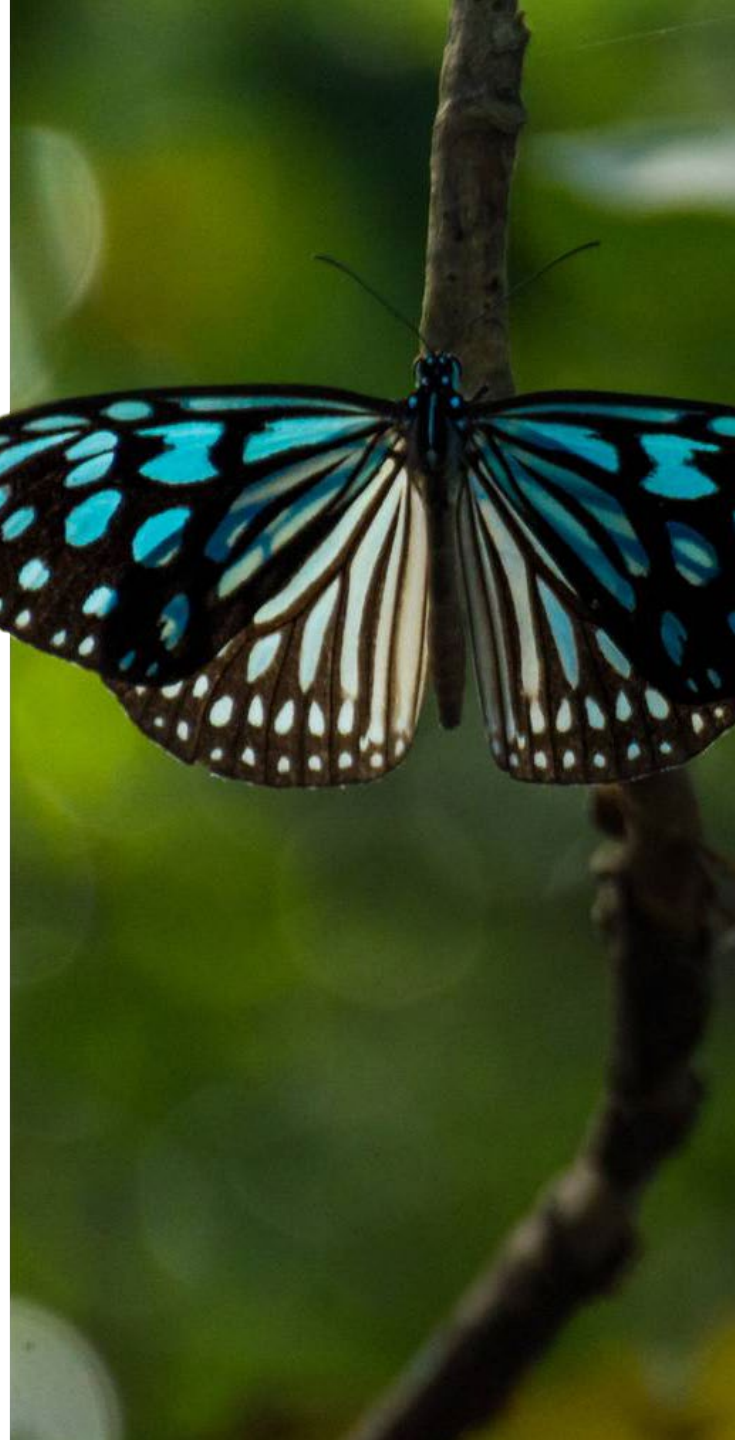
NATURE BASED SOLUTIONS –

THE NEW BUZZPHASE



presented by

Phillip Todd

March 19, 2024

FREESE AND NICHOLS

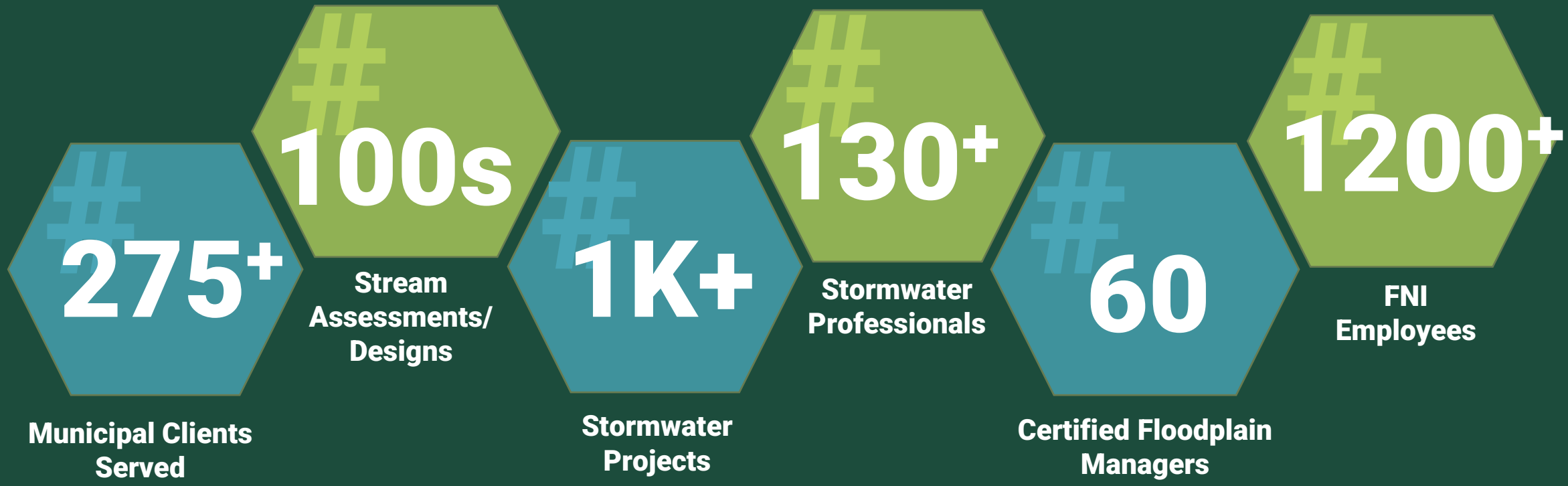
presented for

SC Association for Hazard Mitigation

FREESE AND NICHOLS

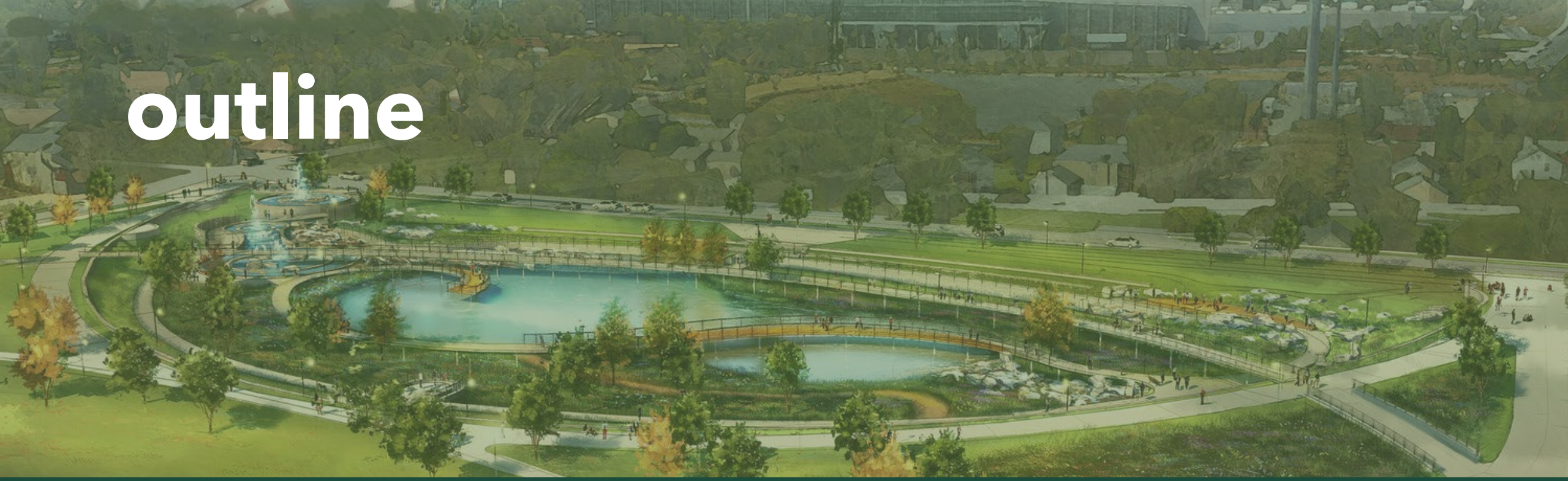
SERVING CLIENTS FOR 130 YEARS

FNI BY THE NUMBERS



purpose

Increase the **awareness** and **understanding** as to what NBS measures include, and how and why they should be considered as a **valuable component in flood mitigation projects**.



outline

01

NBS Background

02

NBS Approach

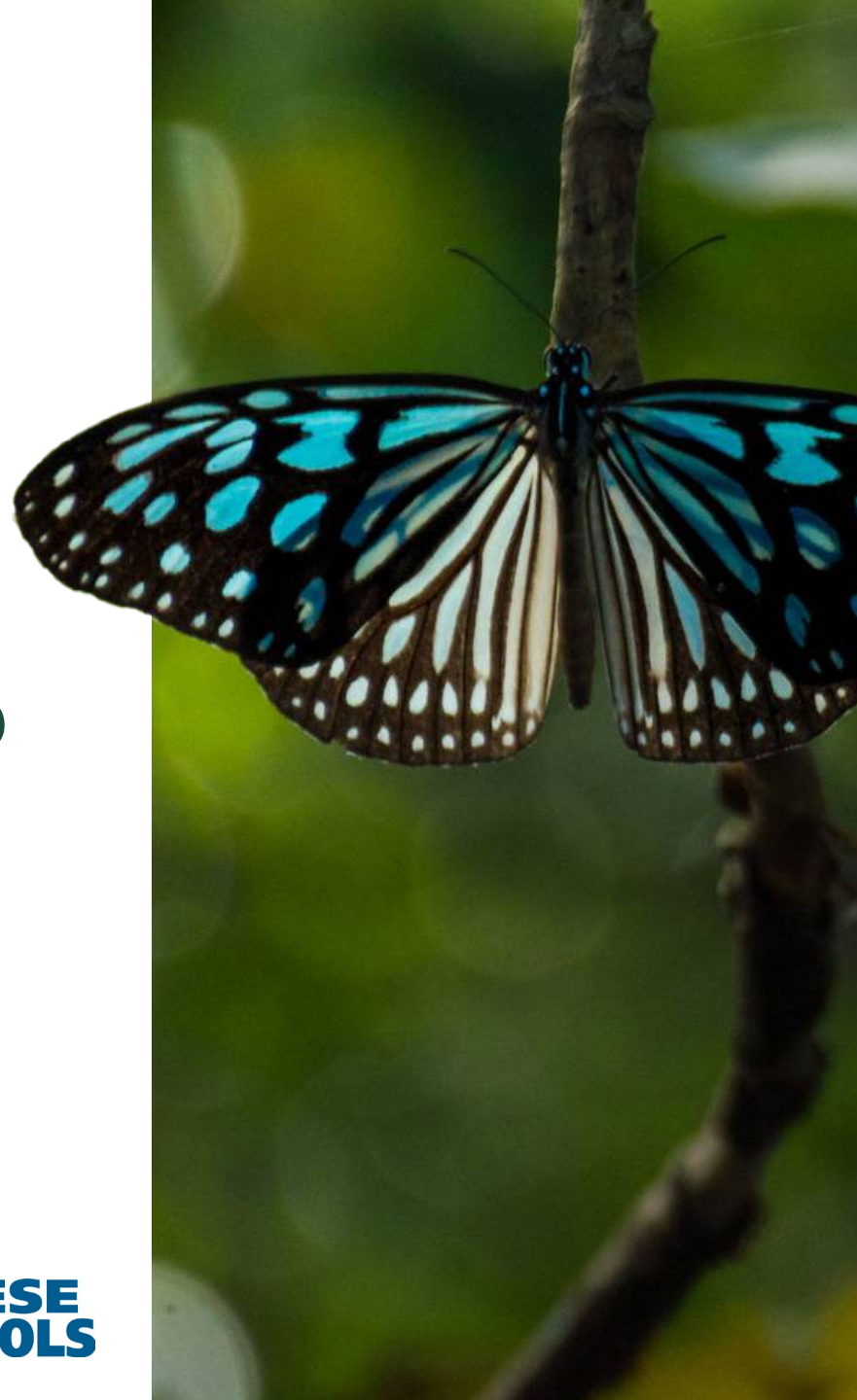
03

Key Takeaways

So, what the heck are

NATURE BASED SOLUTIONS (NBS)?

and why should we implement them?



FREESE AND NICHOLS

Background

01

1: What are NBS?

2: Why NBS?

3: Examples of NBS

City of Irving Stormwater Park by FNI: Wyche Park Overlook Rendering

defining NBS

- "**sustainable** planning, design, environmental management and engineering practices that weave **natural features** or processes into the built environment to promote adaptation and **resilience**." – FEMA

- an "umbrella concept"
  - Green Stormwater Infrastructure (GSI)
  - Low Impact Development (LID)
  - Natural & Nature Based Features
  - Stormwater BMPs

triple bottom line

Social

- Human health
- Climate resilience
- Public safety

Environmental

- Ecosystem diversity
- Watershed resiliency
- Water quality

Economical

- Property value
- Tourism
- Recreation

benefits of NBS

ecosystem services

- Air quality & reduced heat island effect
- Water quality
- Infiltration
- Habitat & biodiversity
- Mental & physical health
- Aesthetics/beauty
- Recreation
- Resource preservation
- **Flood mitigation/resilience**

how NBS work for flood mitigation

Nature Based Solutions

Traditional (Gray)	Hybrid Engineering Solutions	Natural
Hard, gray, engineered structures built to address development and flood risk reduction objectives	Combination of hard engineering solutions incorporated with natural and nature-based features to accomplish flood risk reduction objectives	Creation, protection or restoration of natural systems or processes to accomplish flood risk reduction objectives.

Adapted from the International Guidelines on Natural and Nature-Based Features for Flood Risk Management

typical gray infrastructure

Los Angeles, CA

Irving, TX

natural restoration approach

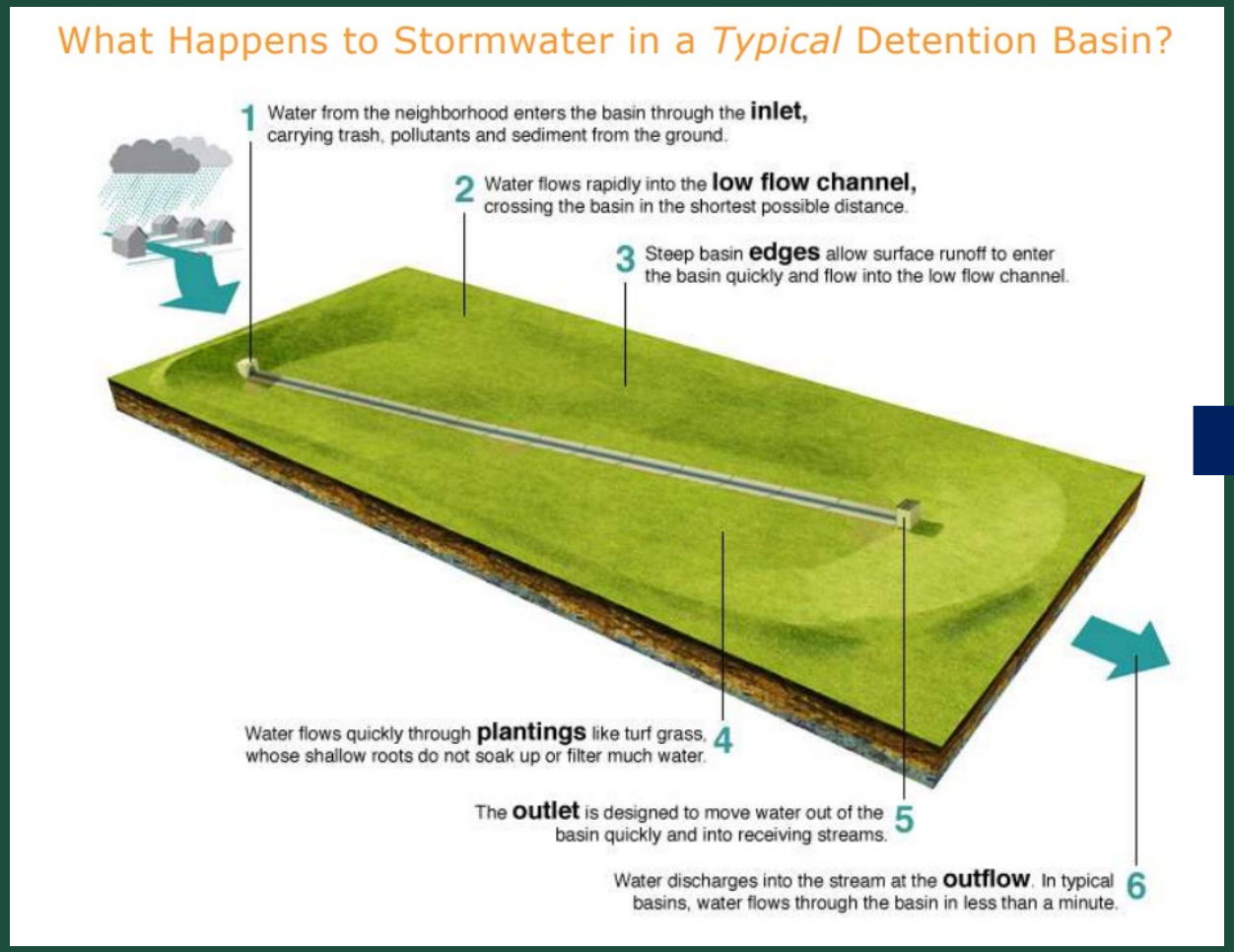
Glade Creek Roanoke County, VA

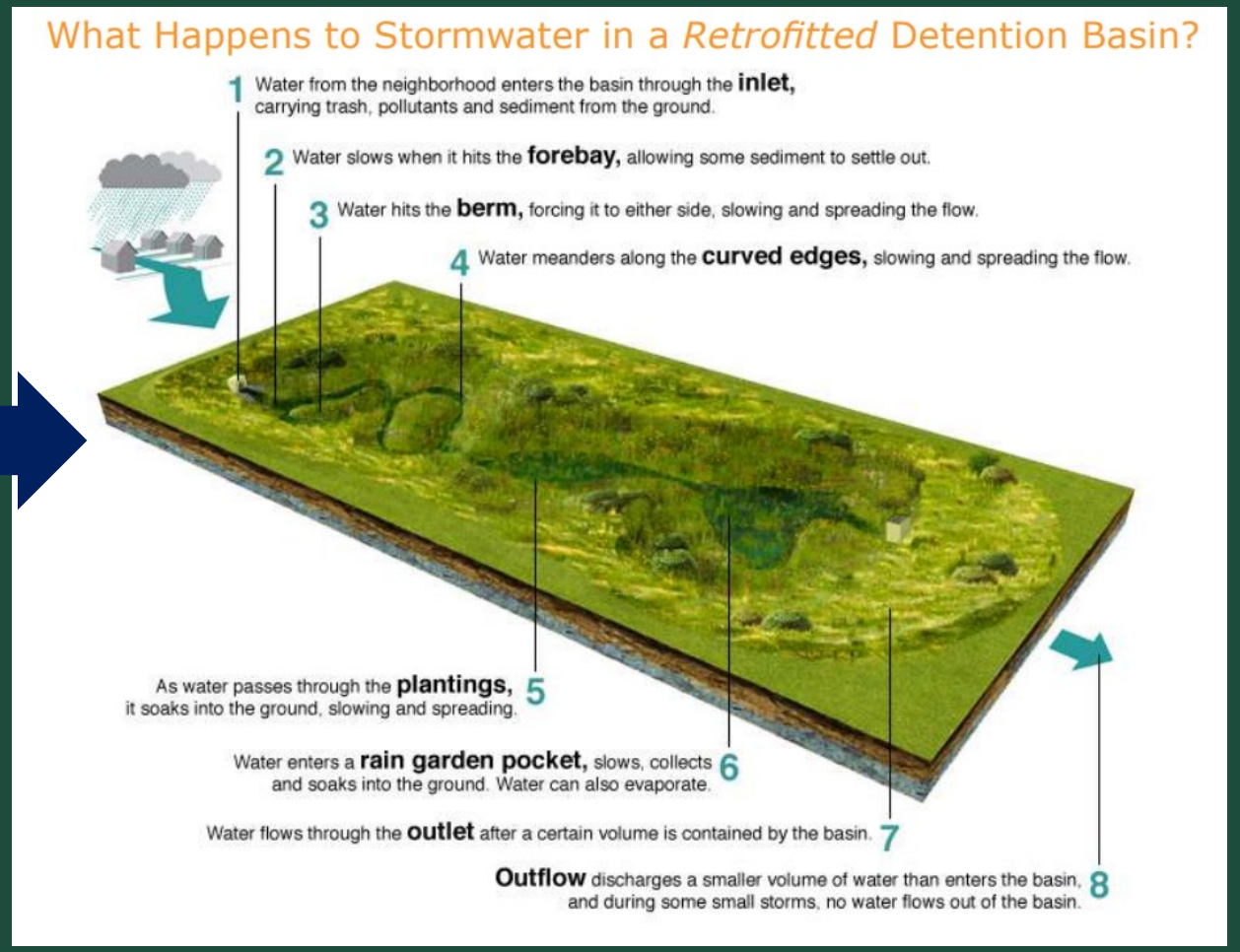
- **Air quality** *& reduced heat island effect*
- **Water quality**
- **Infiltration**
- **Habitat & biodiversity**
- **Mental & physical health**
- **Aesthetics/beauty**
- **Recreation**
- **Resource preservation**
- **Flood mitigation/resilience**

hybrid engineering solutions

Salem Creek
Winston Salem, NC

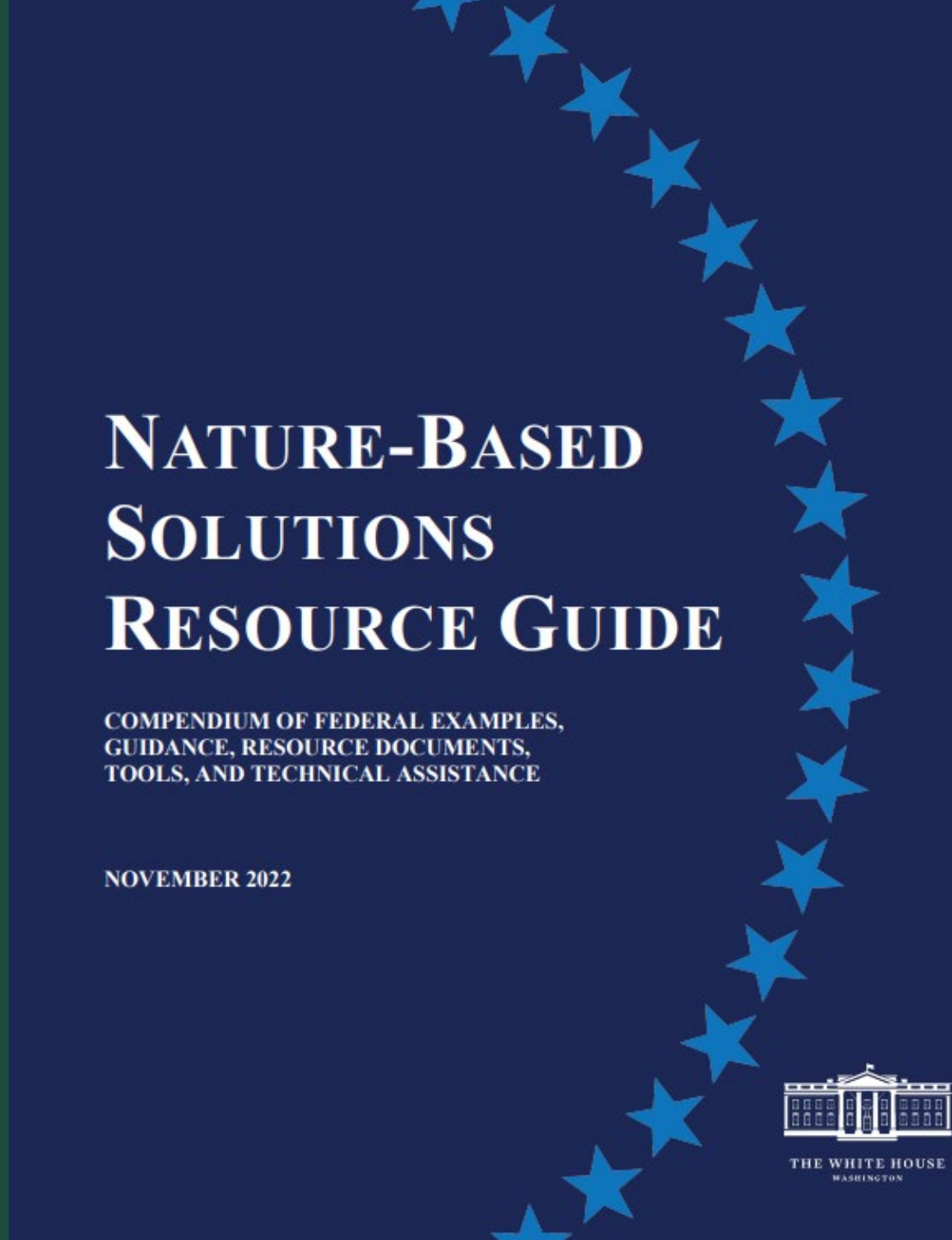
example: detention basin retrofit/ hydrid

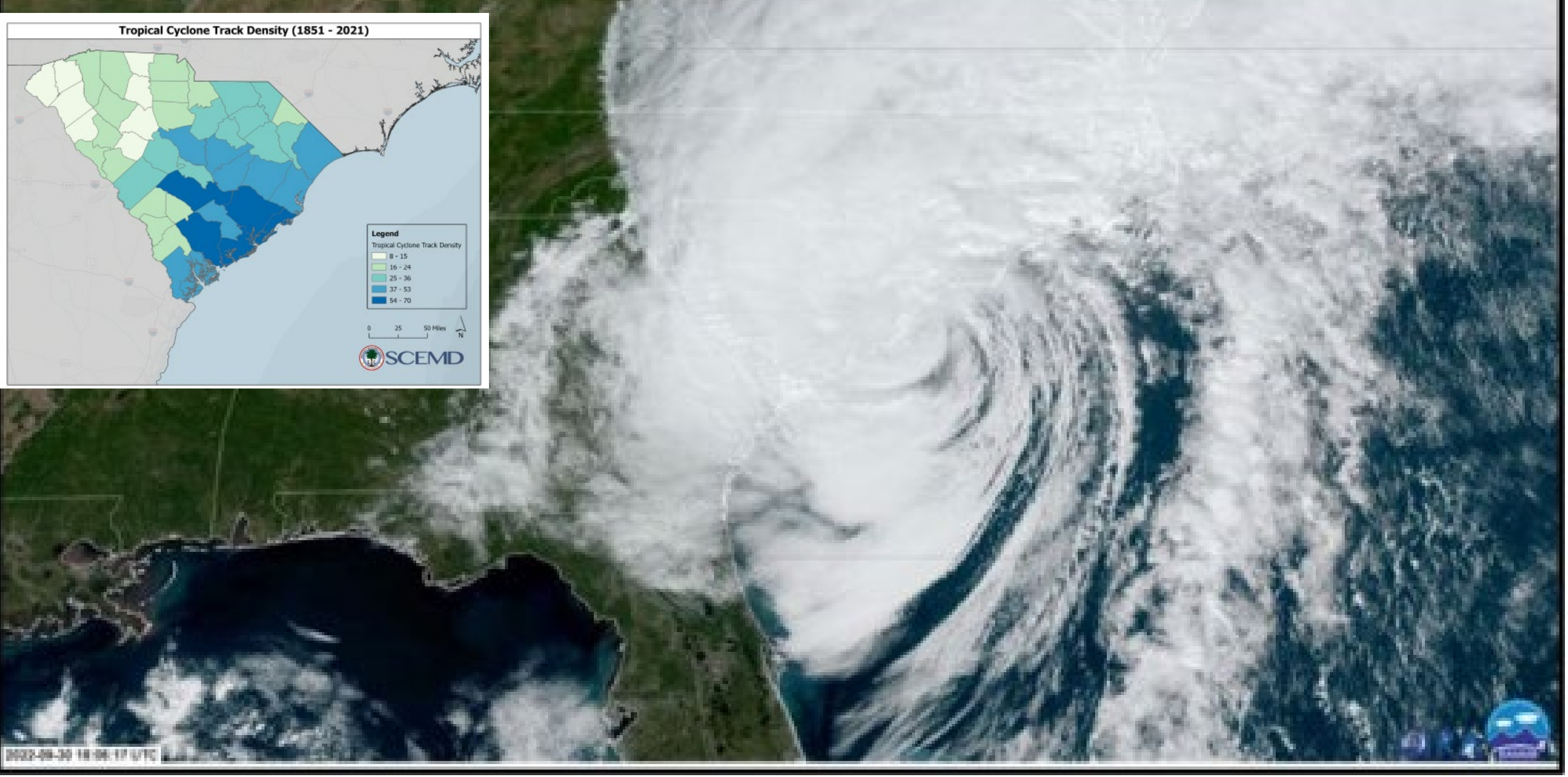




why NBS?

- SC has had its fair share of federally declared natural disasters
- Widespread loss and conversion of natural areas to other land uses, including to impervious surfaces
- Population centers are outgrowing stormwater drainage systems
- Costs of gray solutions & aging infrastructure are very high
- Increasing emphasis on NBS from federal agencies (grantors and regulators)
- Climate change and population pressure are exacerbating these challenges (and costs)



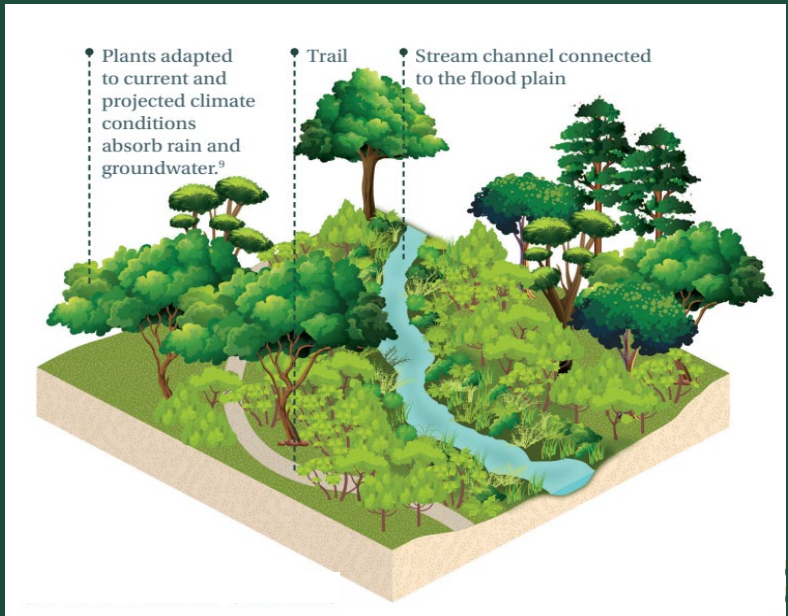


Visible Satellite Image of Hurricane Ian Landfall Near Georgetown, 2:05 p.m. EDT, September 30, 2022

types of NBS

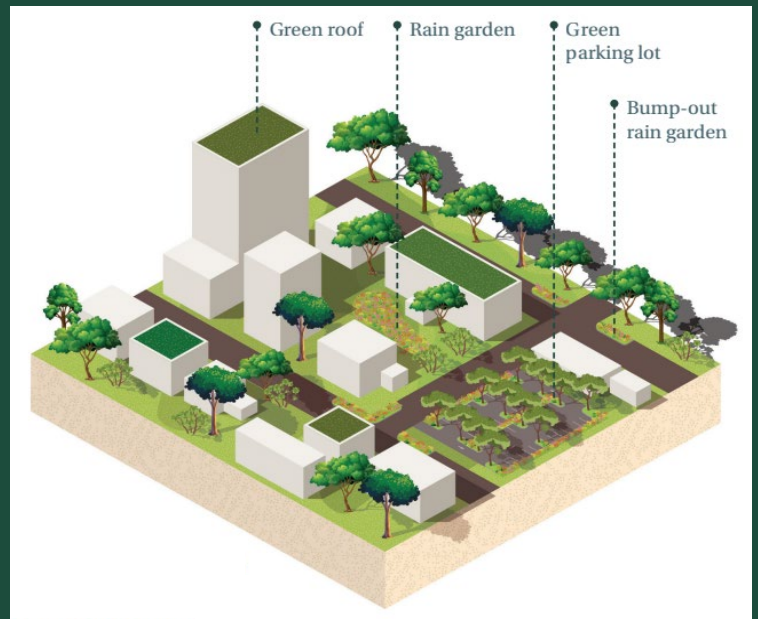
as defined by FEMA

Watershed Scale



- Build interconnected systems of natural areas and open space
- Require long-term planning and coordination
- Examples:
  - Land Conservation
  - Wetlands
  - Natural Channel Design

Urban Scale



- Manage rain where it falls to reduce stormwater runoff
- Often built into a site or neighborhood without extra space
- Examples:
  - Stormwater Parks
  - Vegetated Swales
  - Stream Restoration

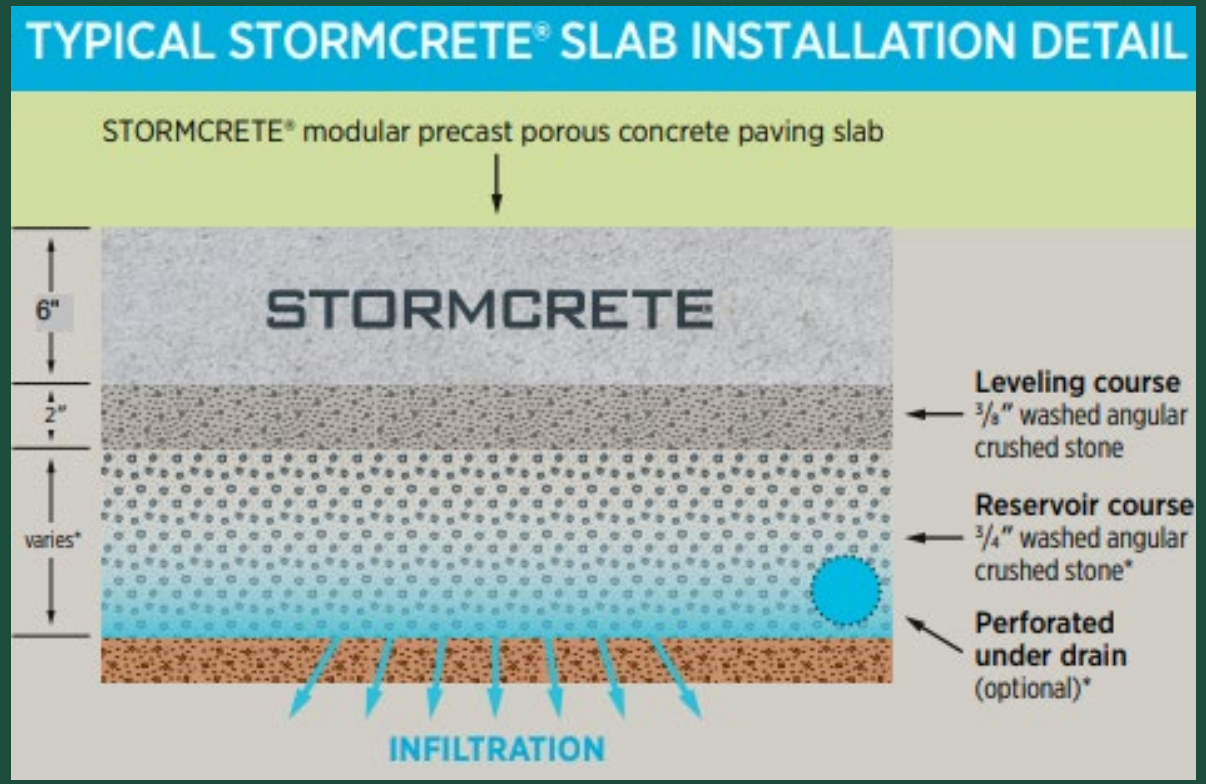
examples of NBS

Permeable Paving

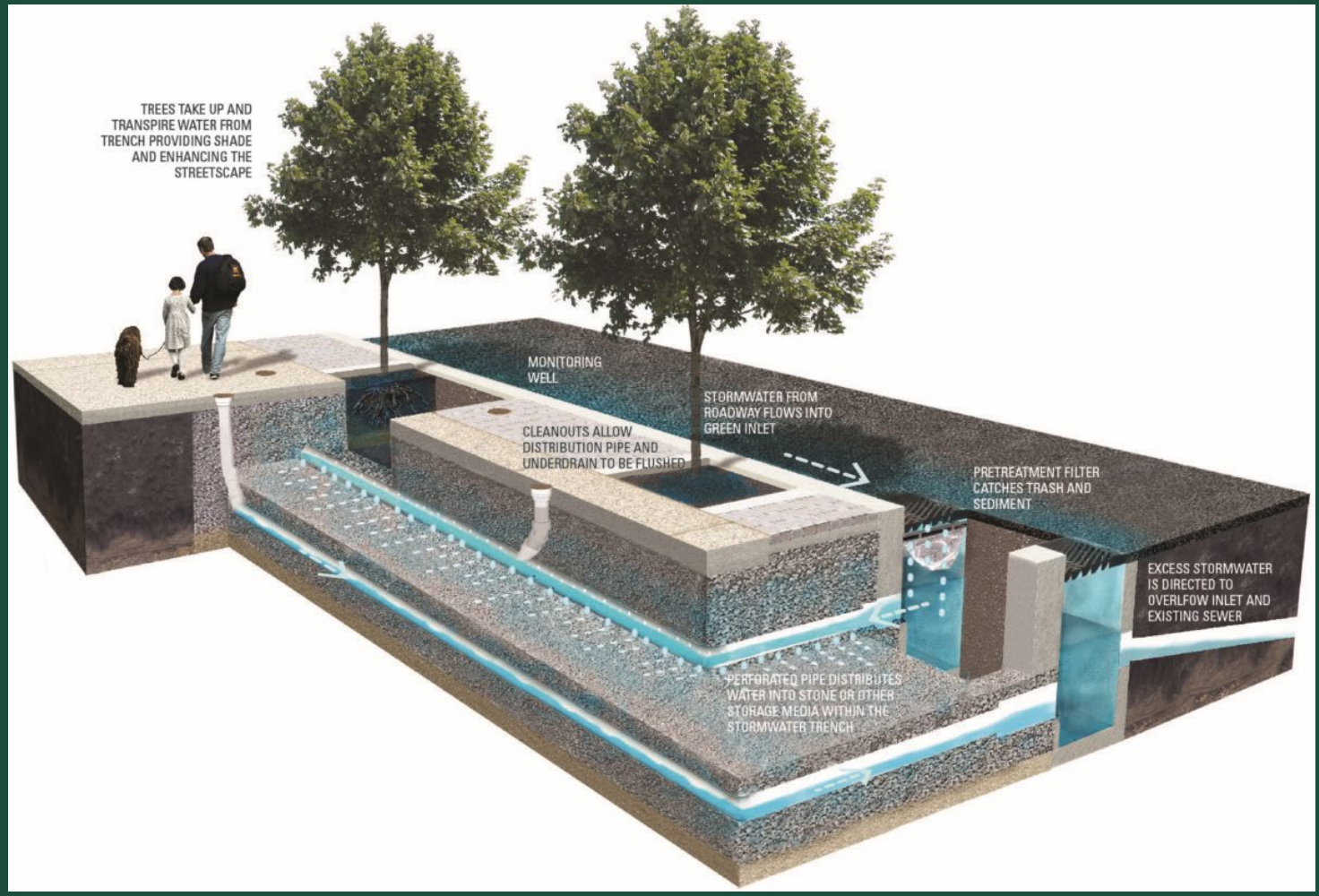
Stormwater Trees & Tree Trenches

Rain Gardens

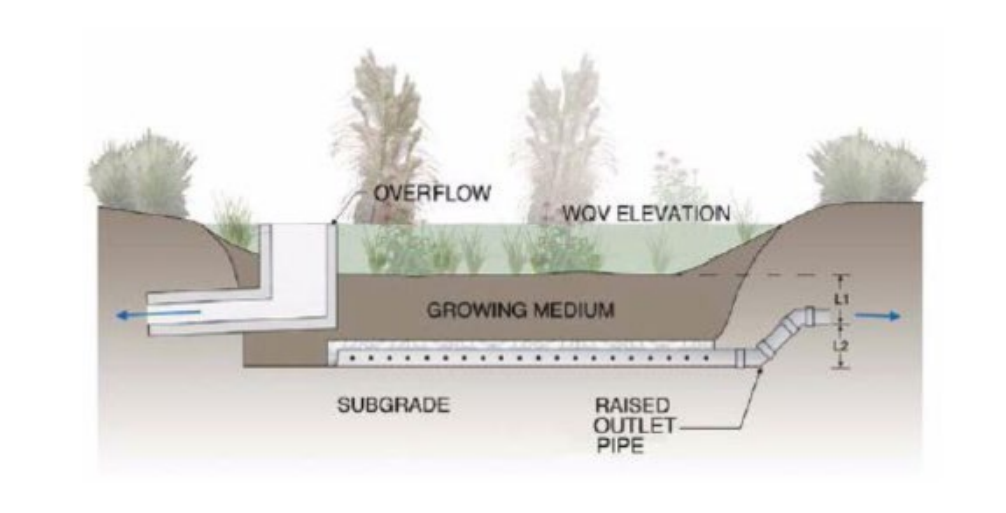
permeable paving

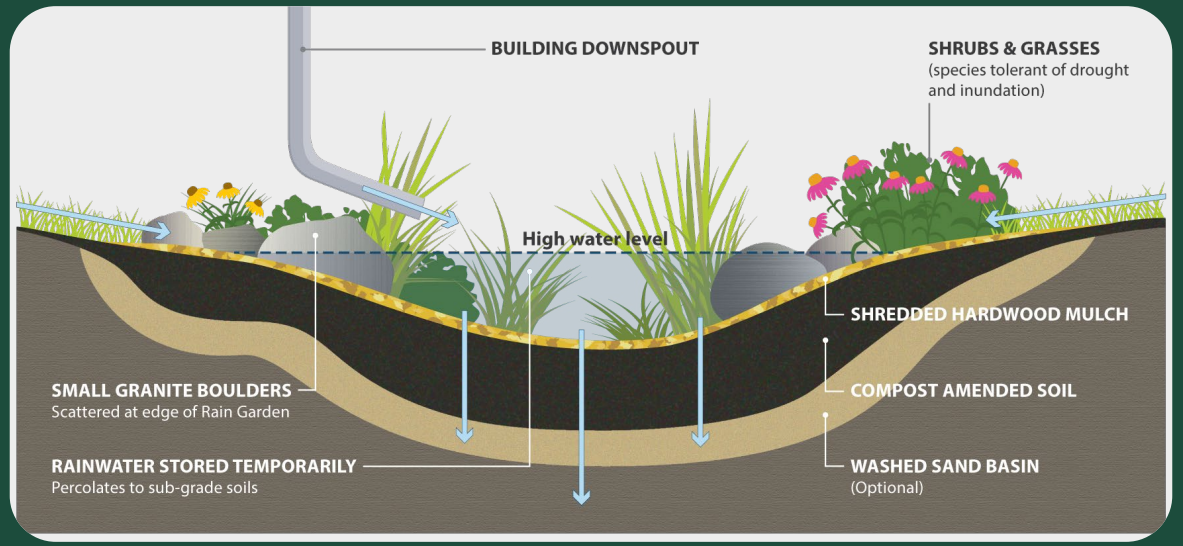


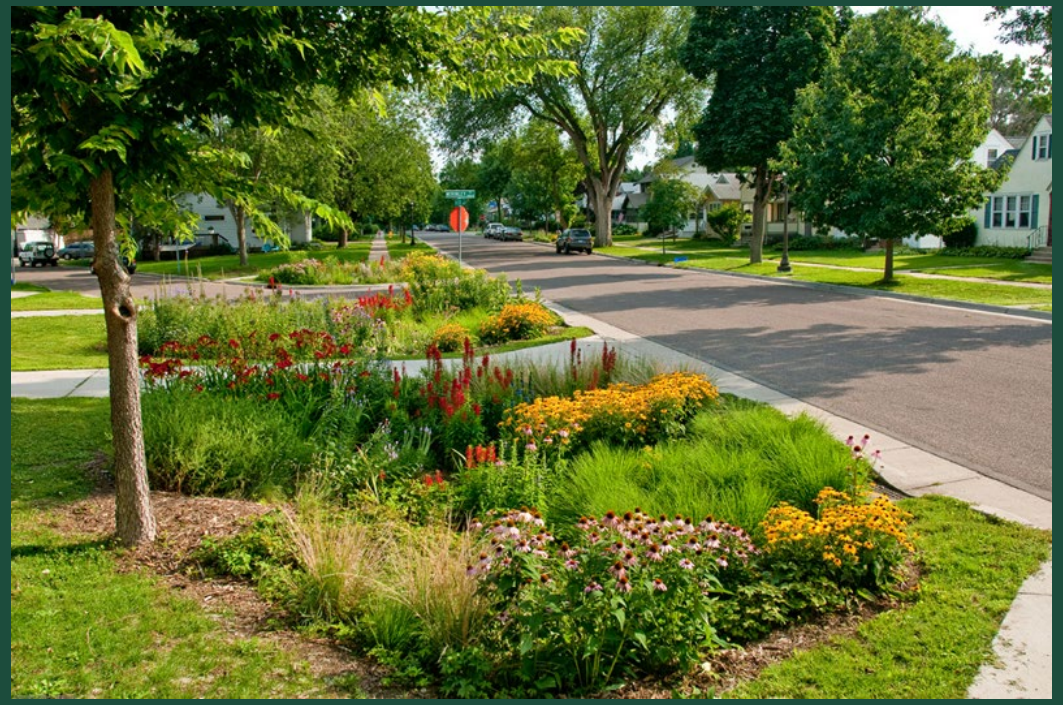
stormwater trees & tree trenches



rain gardens







challenges & barriers

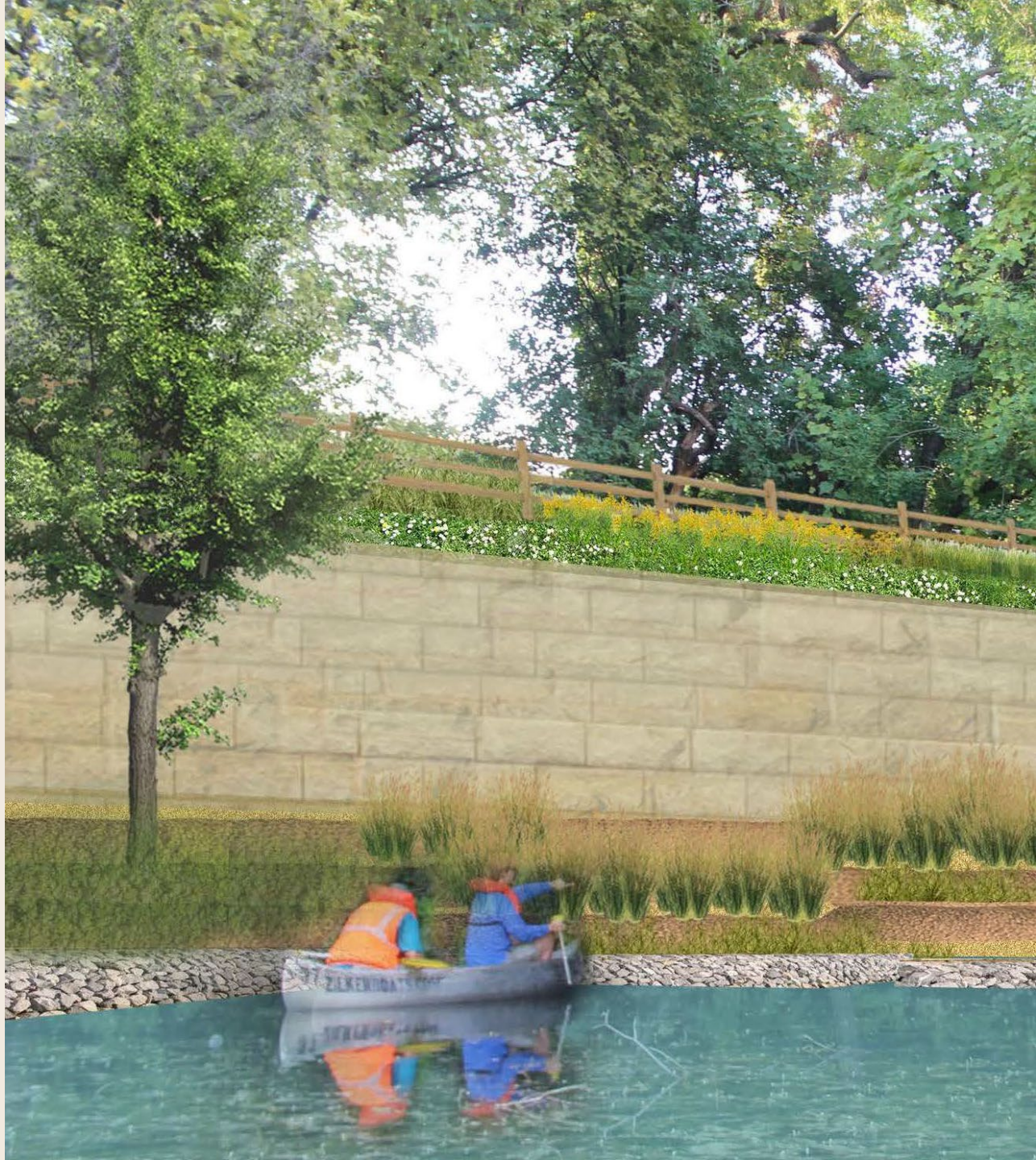
common challenges & barriers

- **Perceived cost & maintenance** requirements and responsibility
- Lack of **familiarity and experience** with NBS
- Need for consistent and accepted methods and metrics for **quantifying benefits**
- Lack of capacity and **funding** to implement projects
- Lack of a **comprehensive approach** to project management & design
- Lack of, or conflicting, **ordinances, policies, incentives**

NBS Approach

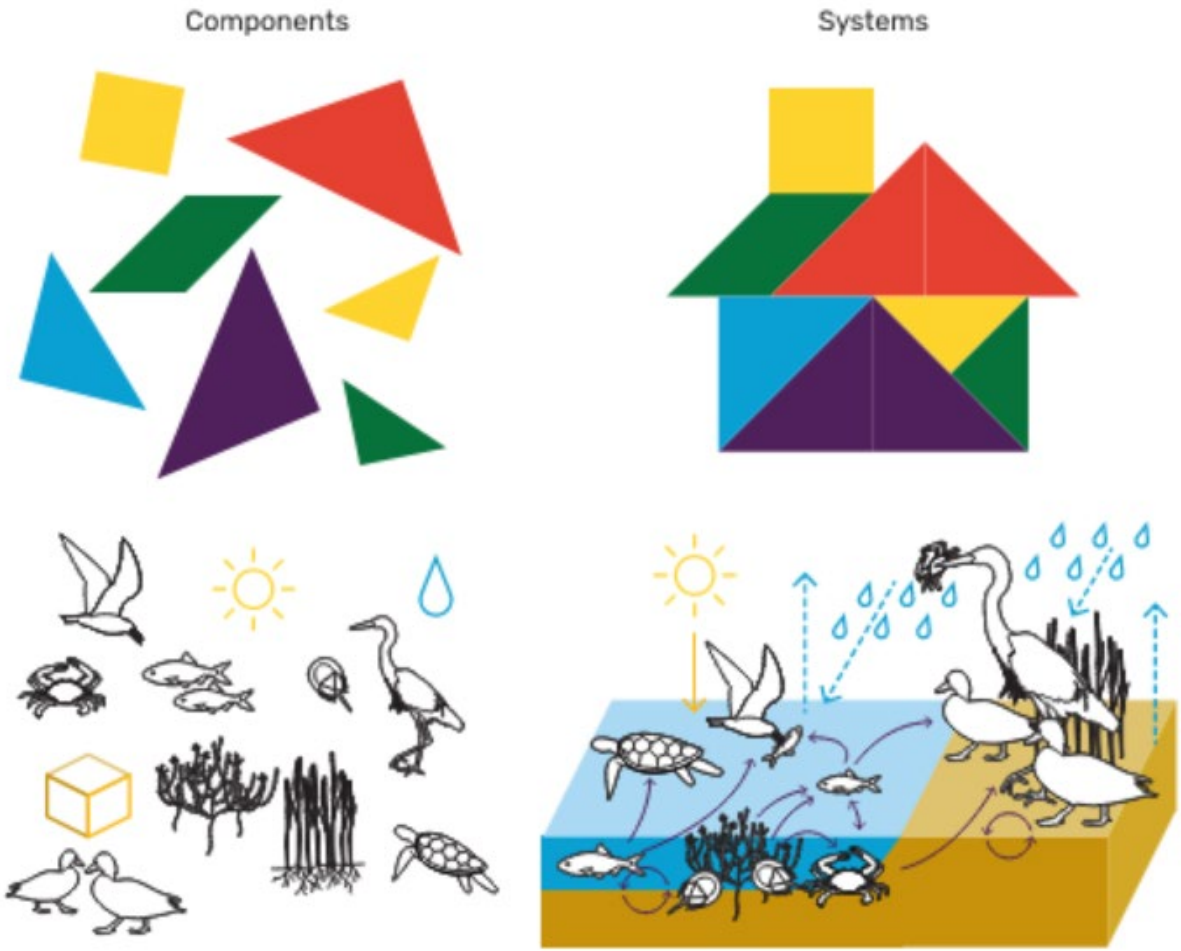
02

1: Systems Thinking
2: Framework



systems thinking

- Considers **physical, biological, and social processes** and their interactions when evaluating flood risk reduction solutions
- Promotes **sustainable, long-term thinking** essential to near and long-term effectiveness
- Enhances value across systems resulting in higher potential for cost efficiency to **leverage funding**



Source: Top graphics adapted from a tangram puzzle; bottom graphics adapted from ecological system graphics from the following website: http://ian.umces.edu/media-library

key principals:
engagement & inclusivity

- Short & long-term successes depend on **inclusive + transparent communication**
- **Community engagement** & ownership
- Consider **equity** implications
  - Build adaptive capacity of socially vulnerable & marginalized communities
  - Meaningful outreach & education

Figures adapted from Community Engagement for Nature-Based Solutions (Sefton et alt. 2023), University of Sheffield

Stage 1: Prepare

- Why are you engaging?
- What are you offering

Stage 2: Build Relationships

- Who are the community?
- Which key individuals could you ask for help?

Stage 3: Engage

- Introduce yourself to the community.
- Use a range of tools to ask people what they want.

Stage 4: Listen and Respond

- Feedback: explain how what you have heard have influenced the process.
- Evaluate: is the process working?

Stage 5: Celebrate

- Celebrate what you have achieved together.
- Think about the project's legacy, including maintenance.

framework elements

Opportunity Assessment should be conducted to understand all systems involved and to identify opportunities to enhance social and environmental benefits in areas of flood risk. This is a cross-disciplinary process.

Conceptualize is the scoping phase, where viable solutions are identified, and preliminary costs and benefits are assessed.

Life-cycle plan is the iterative process to evaluate the solutions identified in the Conceptual phase to determine the one that optimizes benefits and satisfies stakeholders. Detail costs-benefit analysis is typically used to guide decisions. Long term O&M is considered.

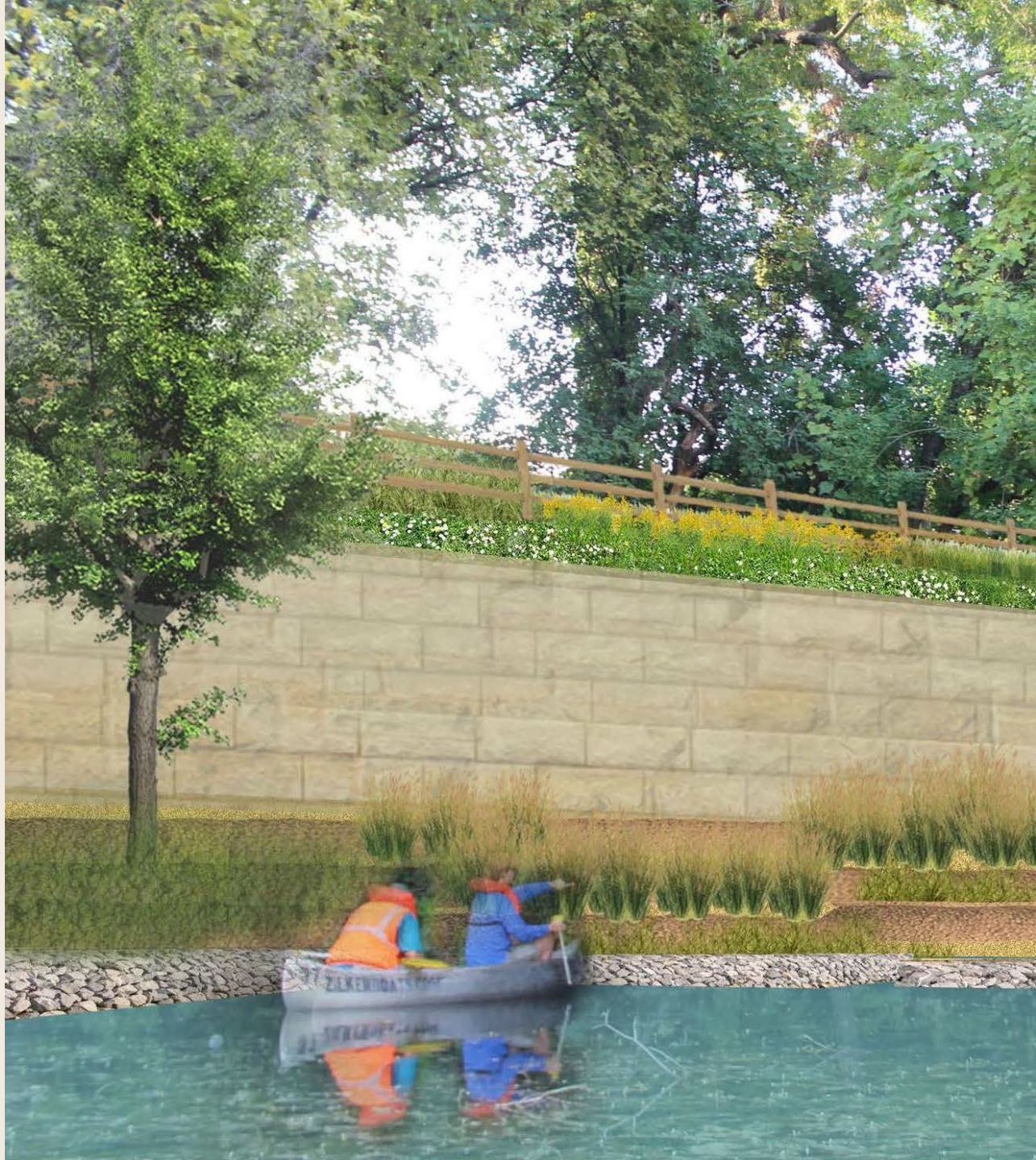
Implement is the design and construction phase. Adaptive management principles should be used in the design process.

Apply adaptive management principles to monitoring and maintaining NBS. Learn and adapt process, as needed to future projects.

Engaging to build community - Integrating solutions across disciplines and engaging with stakeholders throughout the process maximizes benefits, builds community, creates equity and generates lasting partnerships.

Key Takeaways

03



the importance of NBS

why should you care?

WQ & Quantity

- Flooding
- Water supply
- Cost savings

Air Quality

- Ground-level ozone
- Particulate pollution & smog
- Health effects

Communities

- Green jobs
- Recreational space
- Property values

Climate Resiliency

- Different threats to infrastructure WQ, and human health

Habitat & Wildlife

- Habitat improvement
- Habitat connectivity

thank you!

Feel free to reach out to either of us if you have any questions, comments, or feedback.

Phillip Todd
phillip.todd@freese.com
919-971-5641 - direct