Innovative Approach to Urban Flooding

Self-Organizing Channel Design

wood.

Presenters

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Project Case Study: McCoys Creek


McCOYS
CREEK
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McCoys Creek: By the Numbers

140 acre project area

2.8 miles of stream

50 acres of created floodplain & wetlands

3,800 acres of watershed

40 acres of stormwater detention

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History of McCoys Creek – 1864

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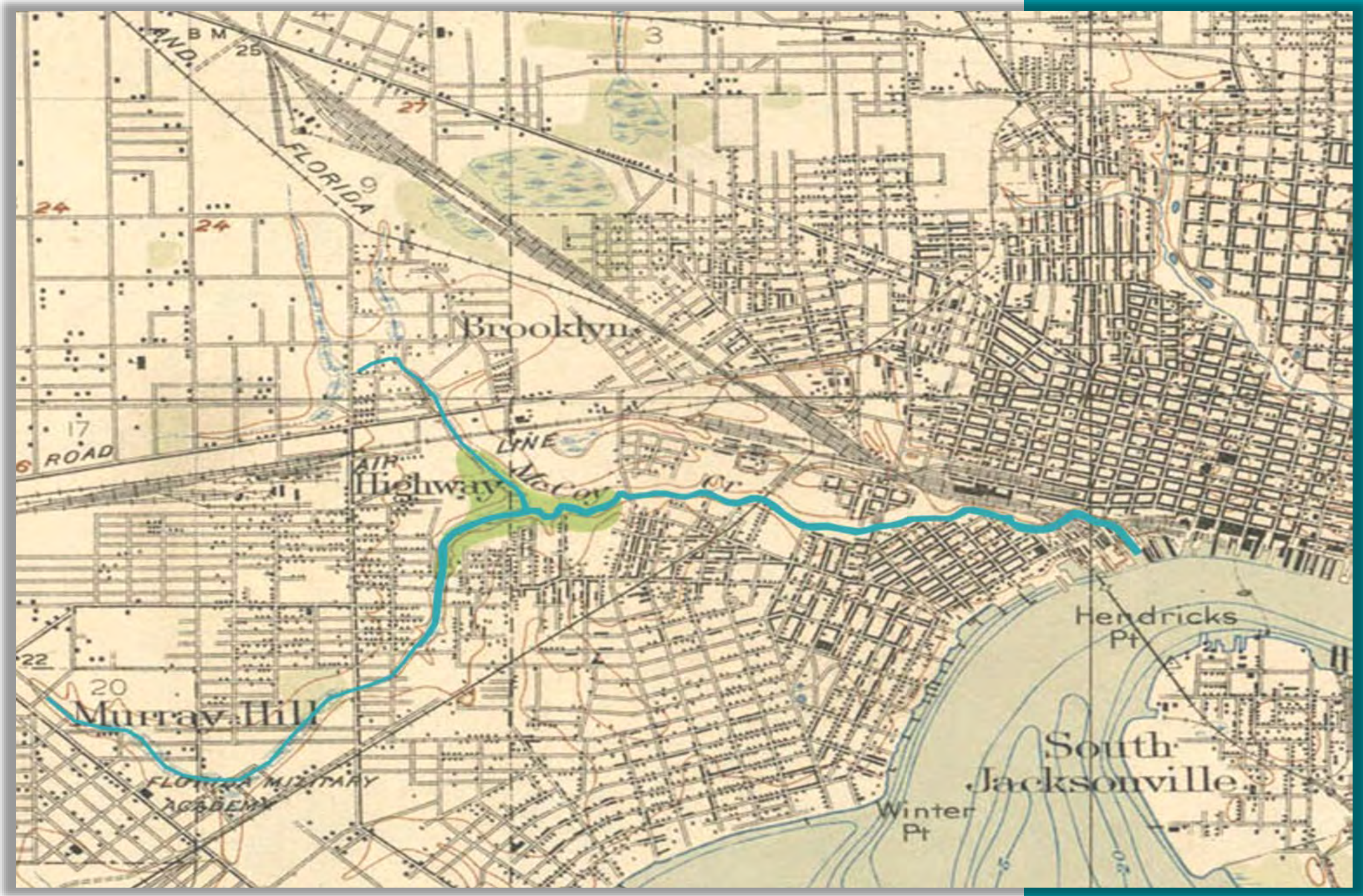
History of McCoys Creek – 1917



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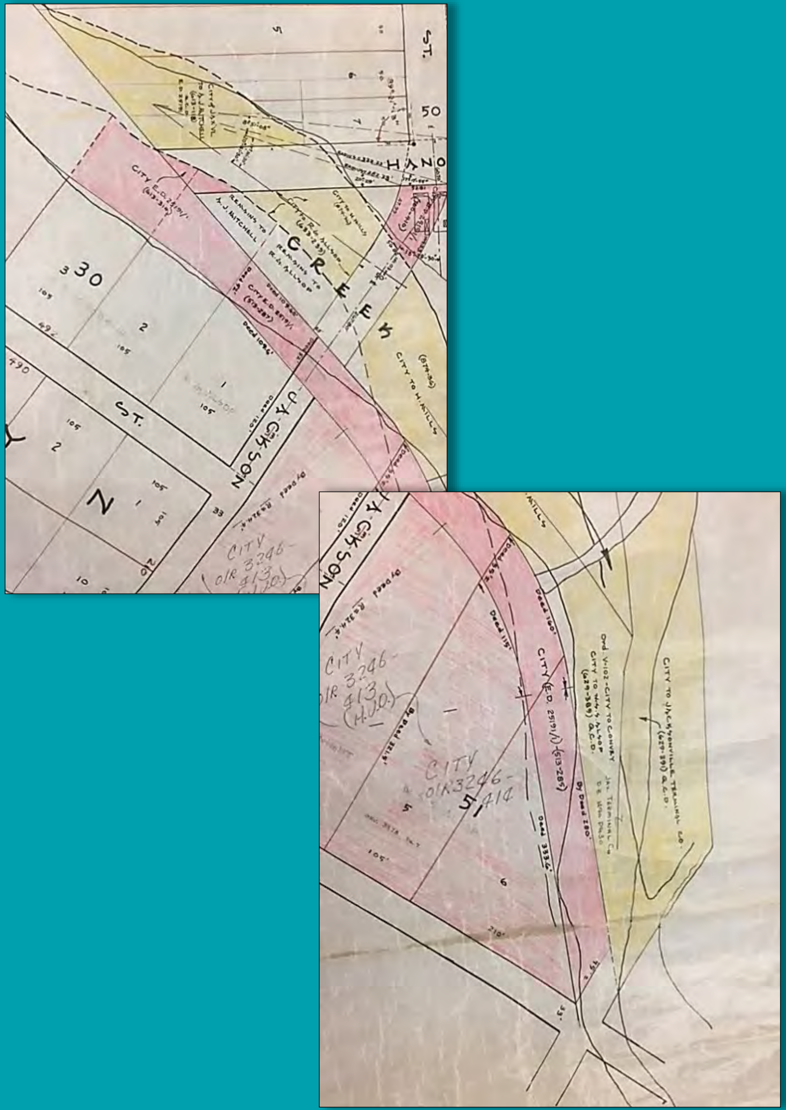
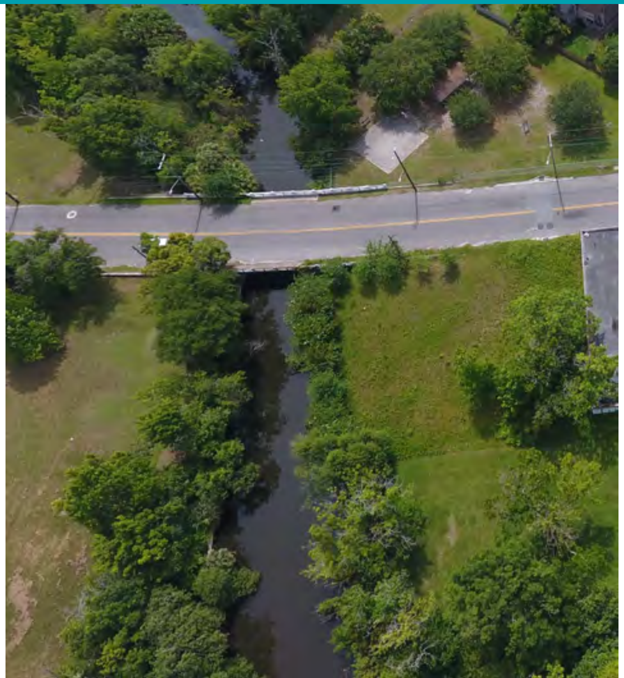
History McCoys Creek – late 1920's to 1930's



McCoys Creek - Today

- Bulkheaded in most areas
- Narrow and low bridge crossings
- Loss of habitat and water quality



McCoys Creek - Today

- Culverted and buried under Riverside Ave
- Culverted and buried under Times Union building

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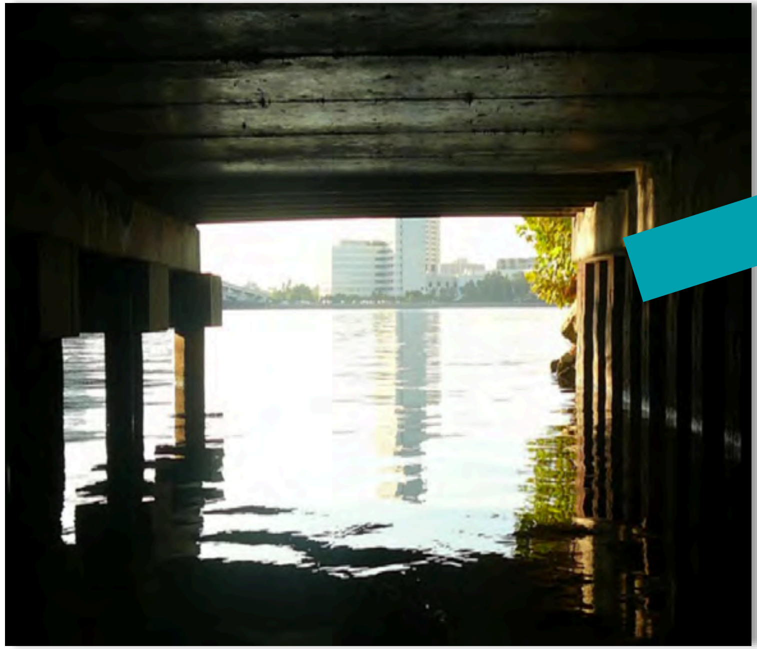


Chronic
Flooding
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Collapsed Bulkheads & Erosion

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Clogged & Narrow Stream

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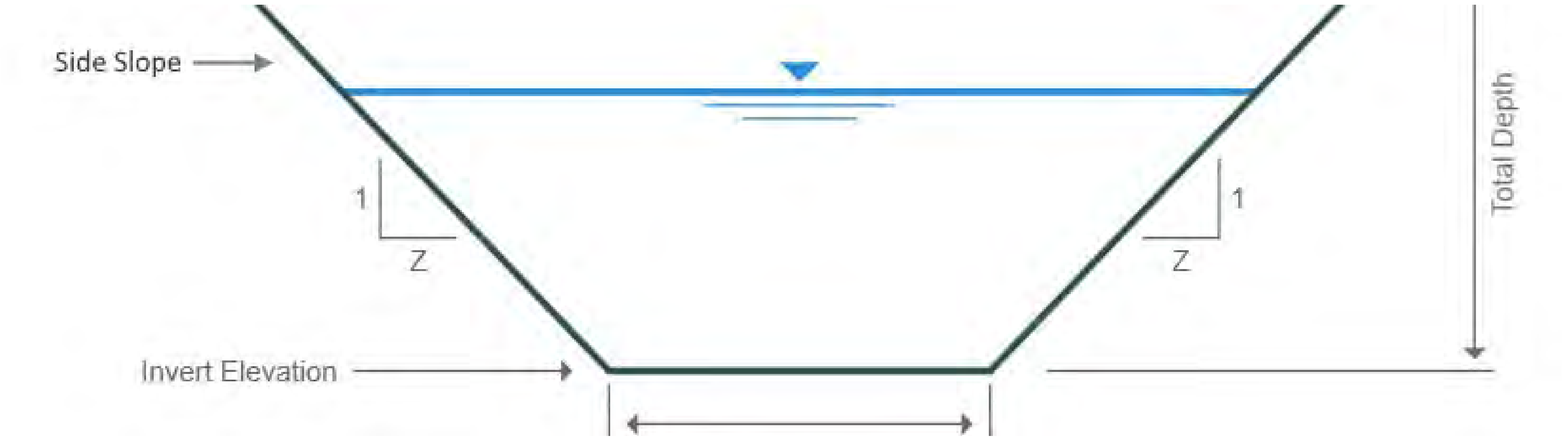
Loss of Habitat & Water Quality

McCoys Creek Flood Mitigation Alternatives Considered

Conveyance improvements – widening creek, regrading side slopes



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McCoys Creek Restoration Expanded Vision

Improve water quality

Establish habitat for fish and wildlife

Clean up existing contamination

Provide educational and recreational opportunities

GROUNDWORK Jacksonville
CHANGING PLACES CHANGING LIVES

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McCoys Creek Approach: Self-Organizing Channel Design

Channelized Stream → **Natural Channel Design**

McCoys Creek – Present Day

Maron Run – Year 10

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Self-Organizing Channel Design:

How do we know what to do and where to place it?

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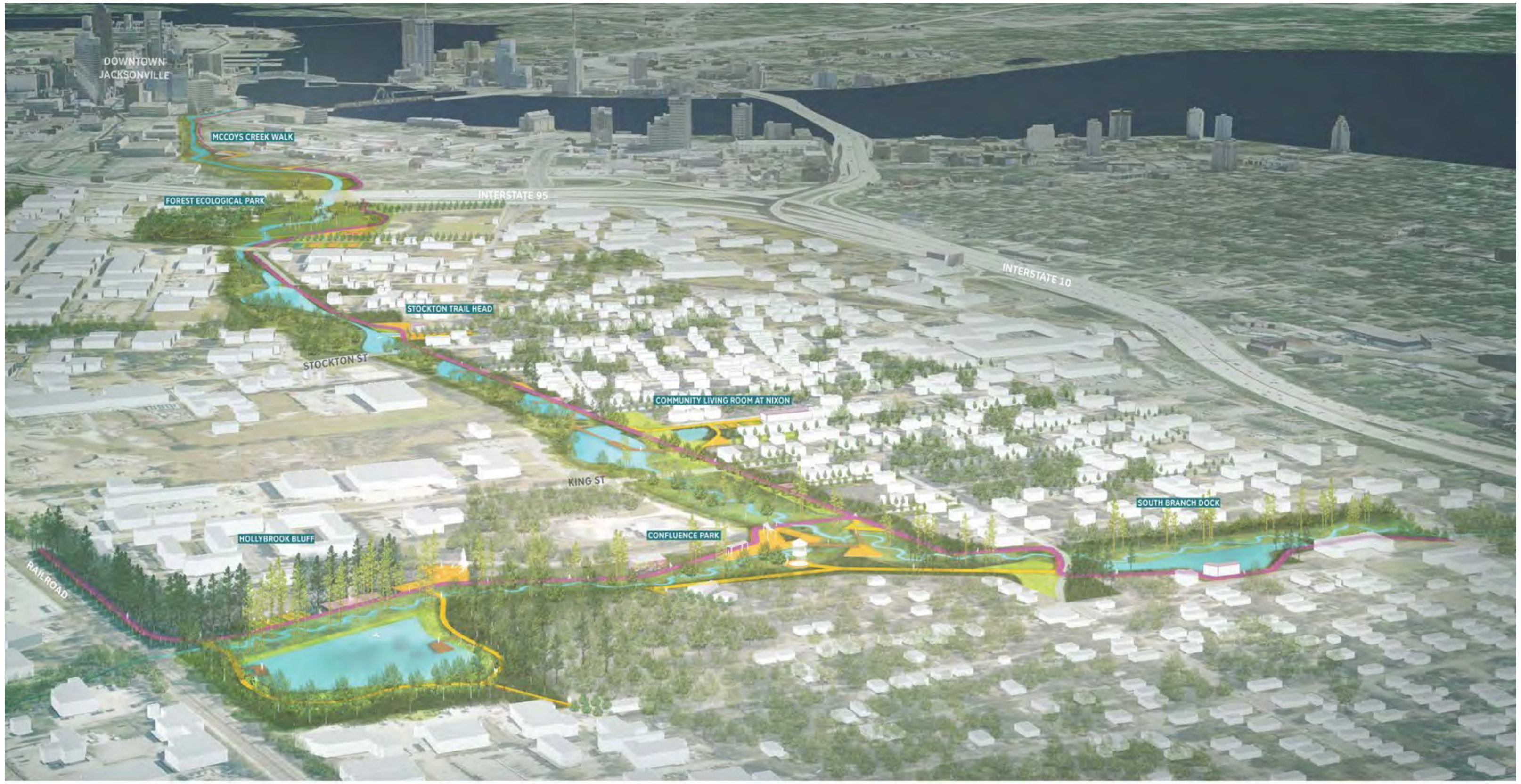
Five Fundamental Design Steps



1) Geologic controls or legacy effects

2) Alluvial stream types along environmental gradients

3) Novel urban conditions

4) Cohesive and resilient design

5) Quality of life

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1) River inlet morphology (geologic control)

First step is to determine the primary controls on channel and floodplain morphology and biology

Florida streams often alternate between geologic, alluvial, and biogeomorphic control

All of the tributaries to the lower St Johns have inlets drowned by the river:

- **McCoys inlet was obliterated, relocated, and buried**
- **So, how wide, deep, and long should we make it?**

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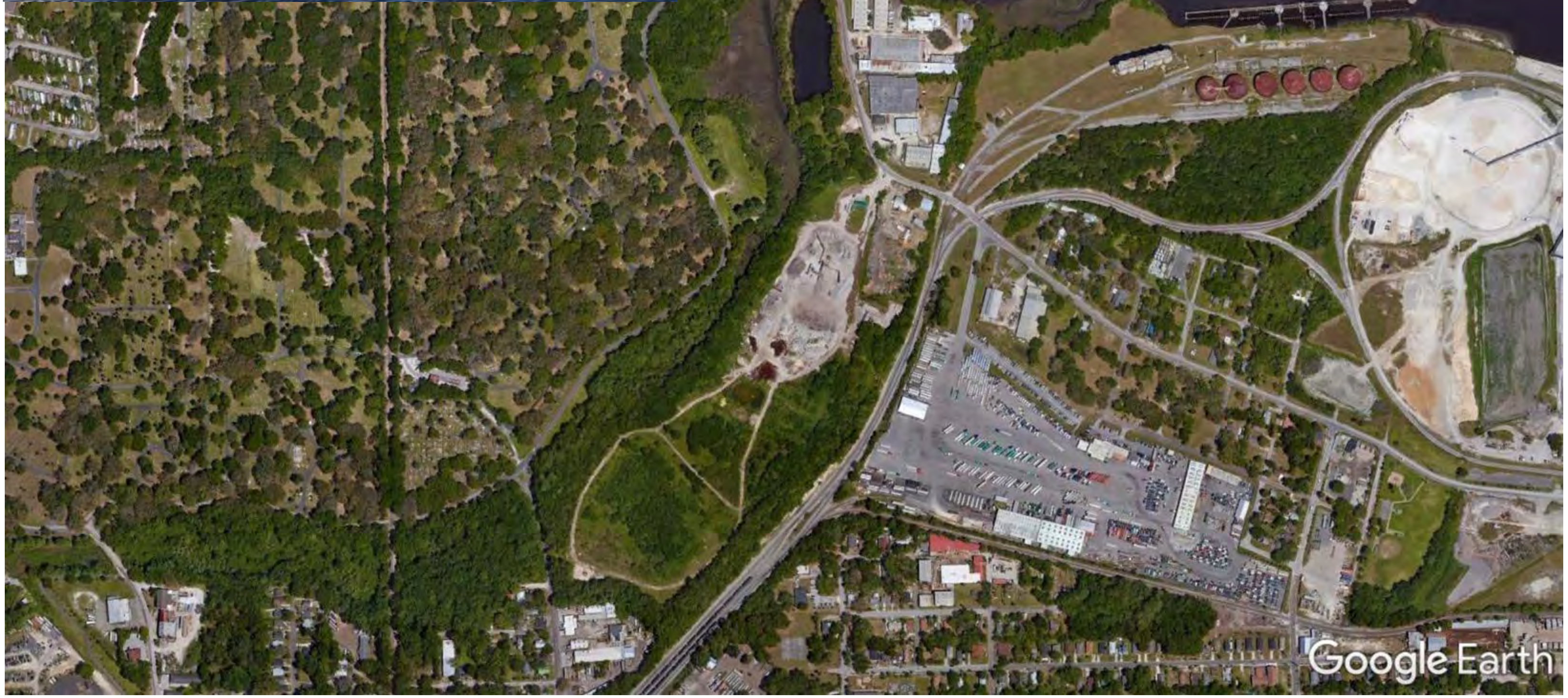
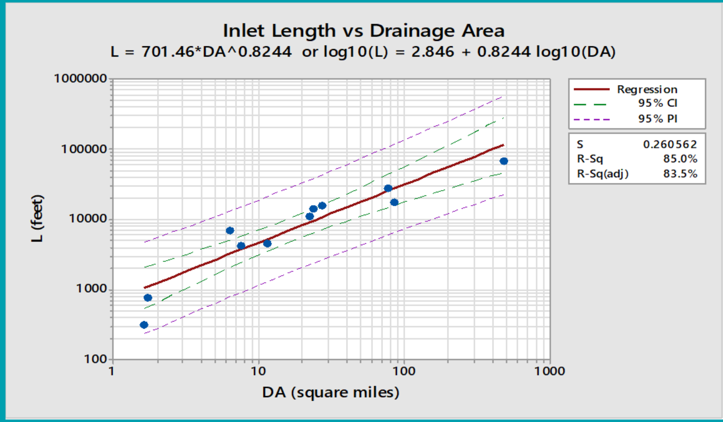
1) River inlet morphology (geologic control)



Place-for-time-replacement study

Regional regression data



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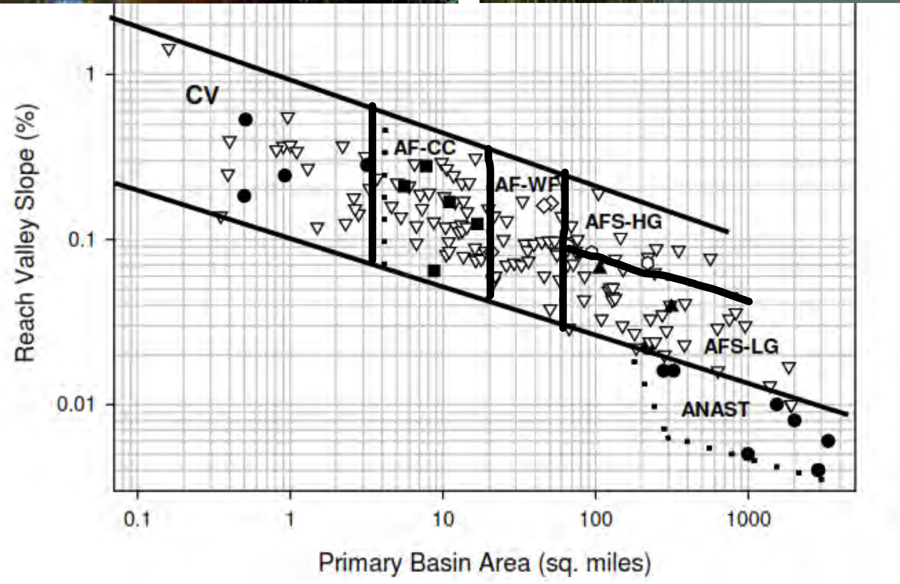
2) Stream type and position along environmental gradients


Photo Credit: PBS Learning Media



Florida stream type depends on:

- Runoff/groundwater flow
- Stream power
- Sediment load
- Salinity and tide

5 natural stream types occurred along the McCoys valley pre-development

All 5 can be mimicked (with adjustments for urban effects and climate change)

Here's why knowing this matters... mistakes were made in the 1920's.

2) Stream type and position along environmental gradients

Stream power, sediment transport continuity and self-organization

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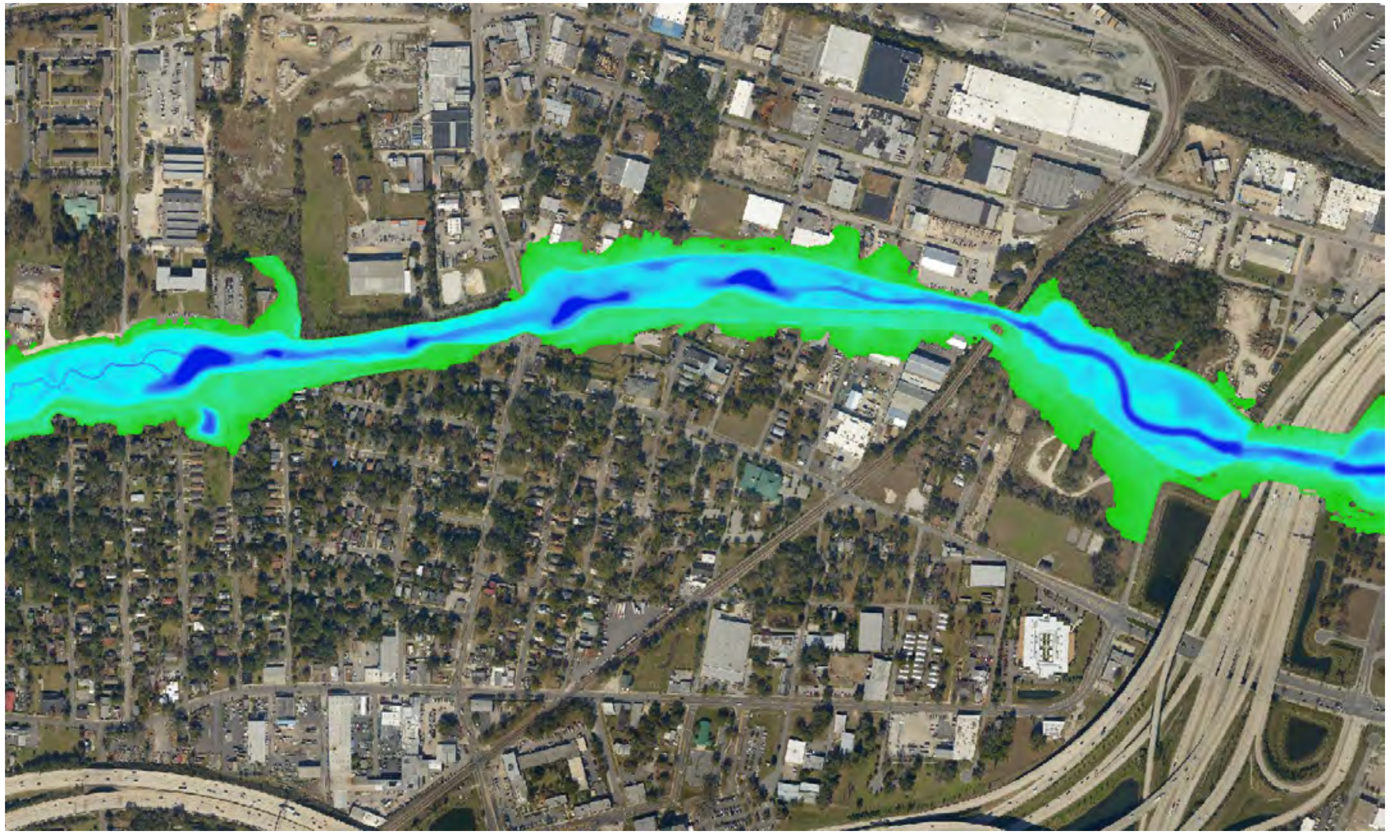
3) Scope and range of novel conditions



Mean Annual Flood Depths

Urban Stream Syndrome:

- Flood conditions akin to those of a river almost 10x larger
- Polluted water & soils
- Bridge & culvert bottlenecks
- Sea level rise and tidal range increase
- Utility and development conflicts

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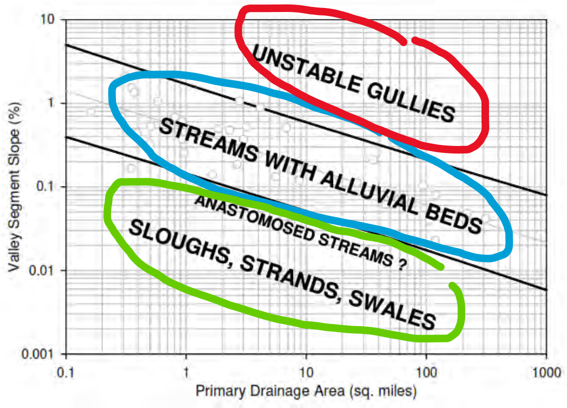
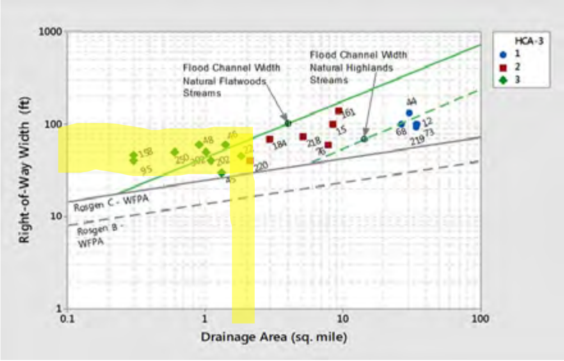
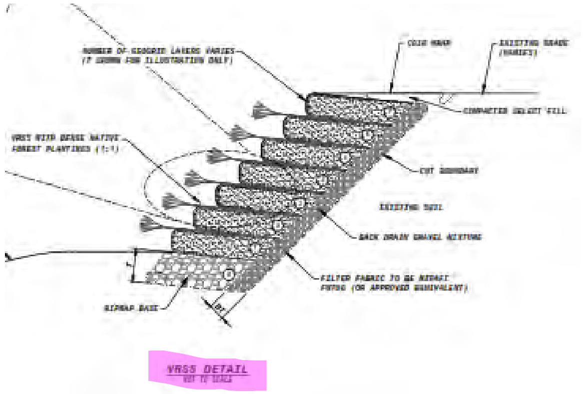
3) Scope and range of novel conditions

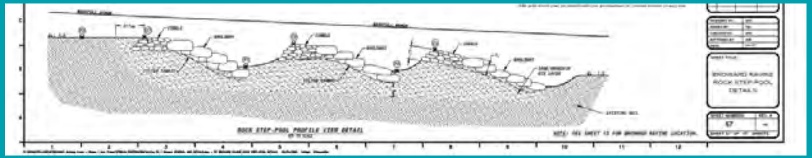




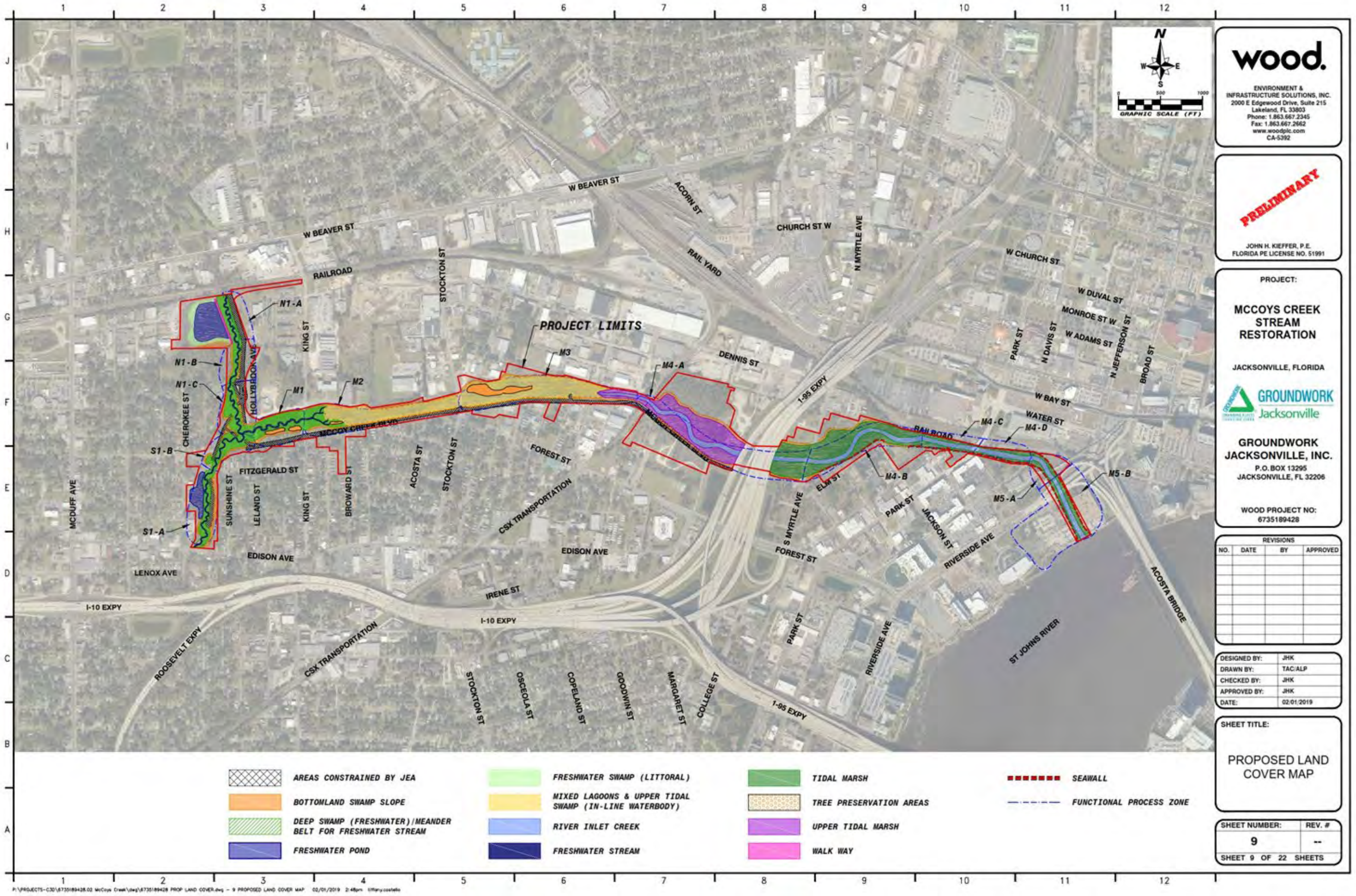


Florida climate & physiography, urban hydromodification, and rising tide.

No single off-the-shelf natural channel design short-course training or book fully prepares a team to design for these...



4) Develop a cohesive and resilient design



6 Functional Process Zones:

- 5 FPZs have natural analogues
- 1 is a novel ecosystem at a critical position for multiple project objectives

Three Florida Streams for McCoys Creek – Example Projects

Runoff Dominated Headwater Creek with Colluvial Floodplain

Runoff Dominated Mid-Order Creek with Alluvial Floodplain

Low-Power Cypress Strand

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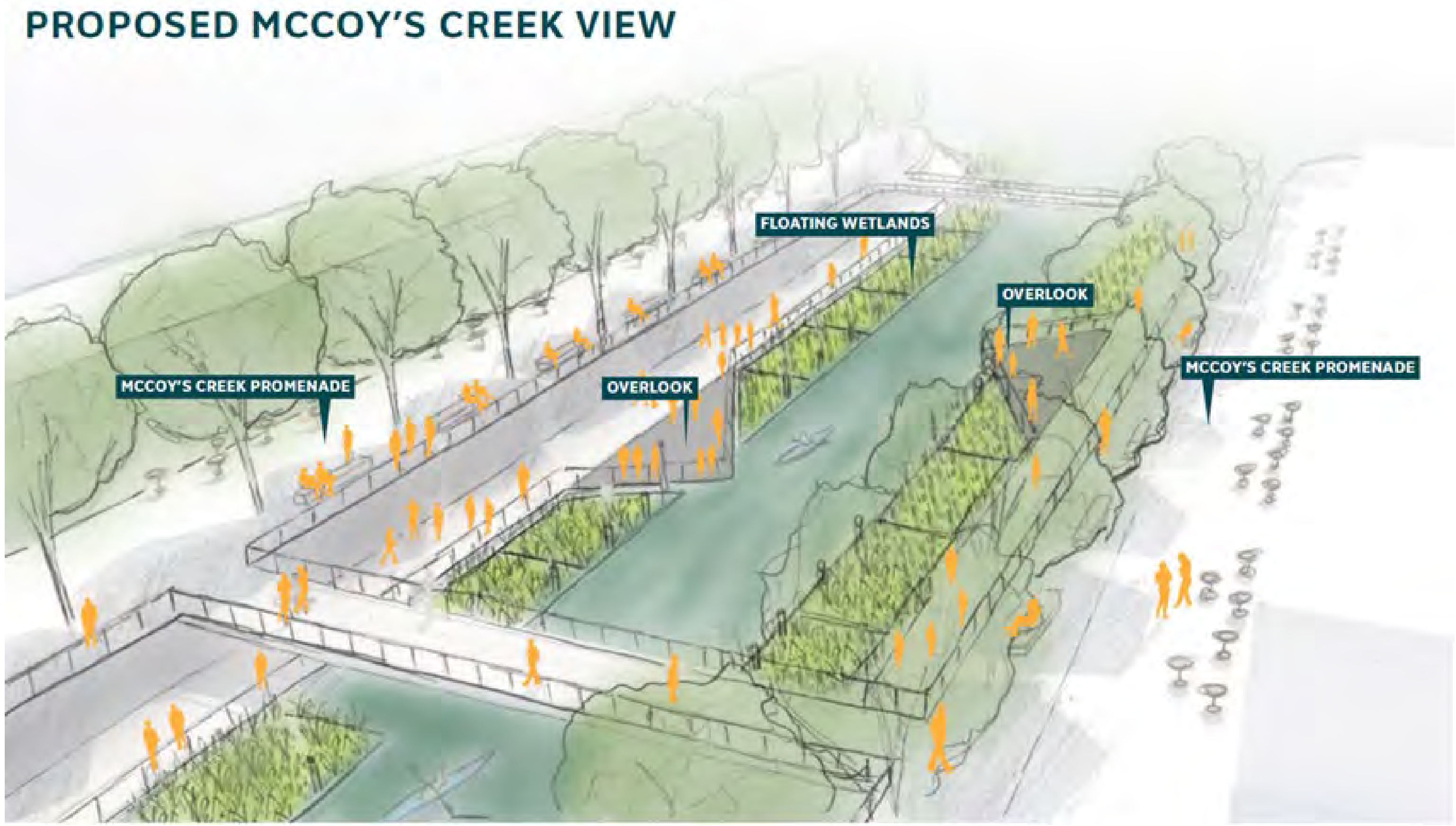
4) Develop a cohesive and resilient design



Daylighting the creek through high intensity development and the need for a novel ecosystem:

- **Provides continuity of flood discharge**
- **Provides continuity of sediment transport**
- **Provides fish passage and refuge between the river to the creek**
- **Boat passage (kayaks)**
- **Greenway trail and overlooks**

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5) Create value for the community

Photo credit: Nate Brennan/Mote Marine Laboratory

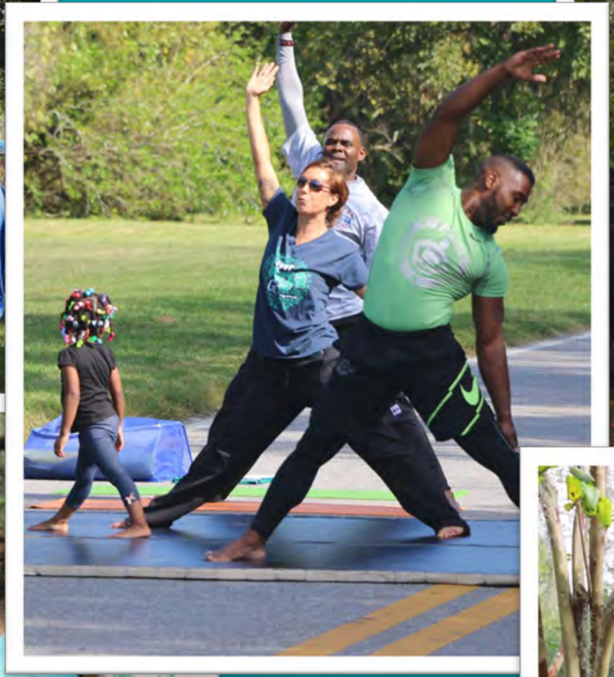
Fishing, kayaking, bird watching... designing toward a useful and beautiful urban ecology

Stormwater Management as an Amenity for the Community

McCoys Creek Visioning Plan

SCAPE wood.

McCoys Creek: Concept for Community Asset



Images from Creek Fest 2018 hosted by
Groundwork Jacksonville

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Integrated Design

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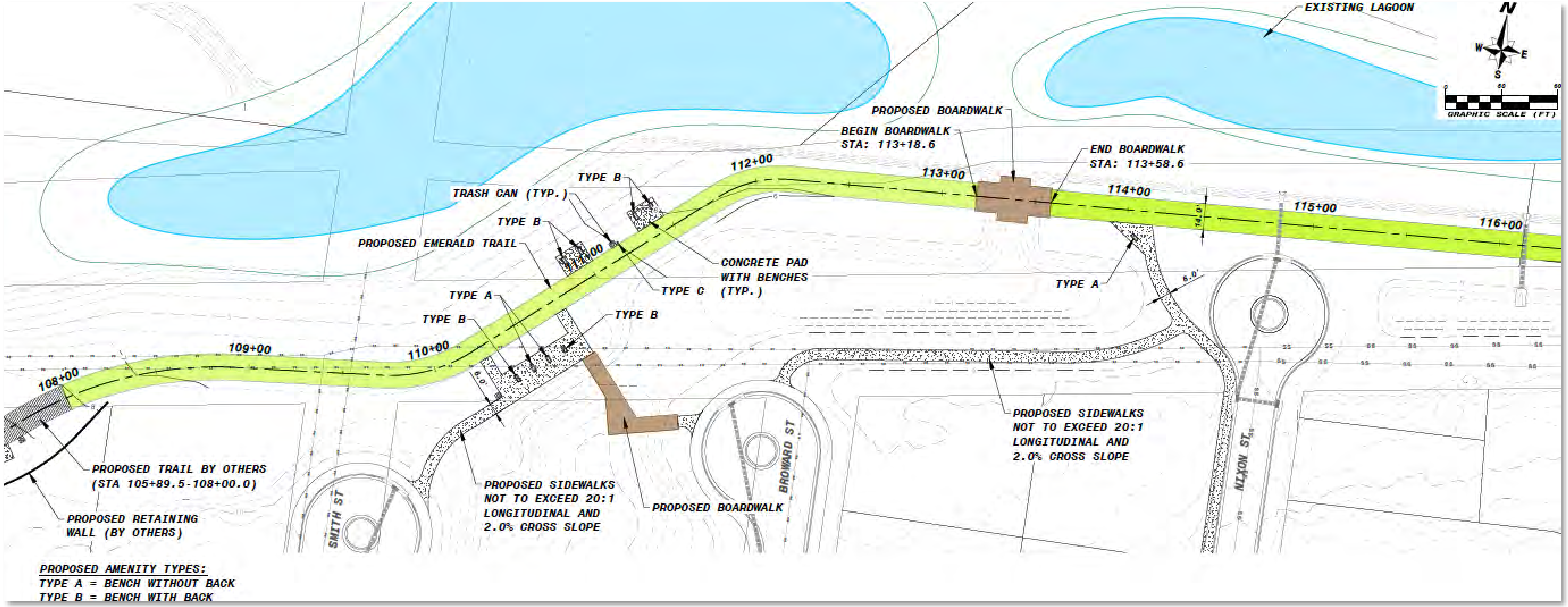
Integrated Design



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OBSERVATION PLATFORM
GREAT BLUE HERON
Ardea herodias
RED-EARED SLIDER TURTLE
rachemys scripta elegans
ACTIVITY LAWN
EDUCATIONAL SIGNAGE
SCAPE
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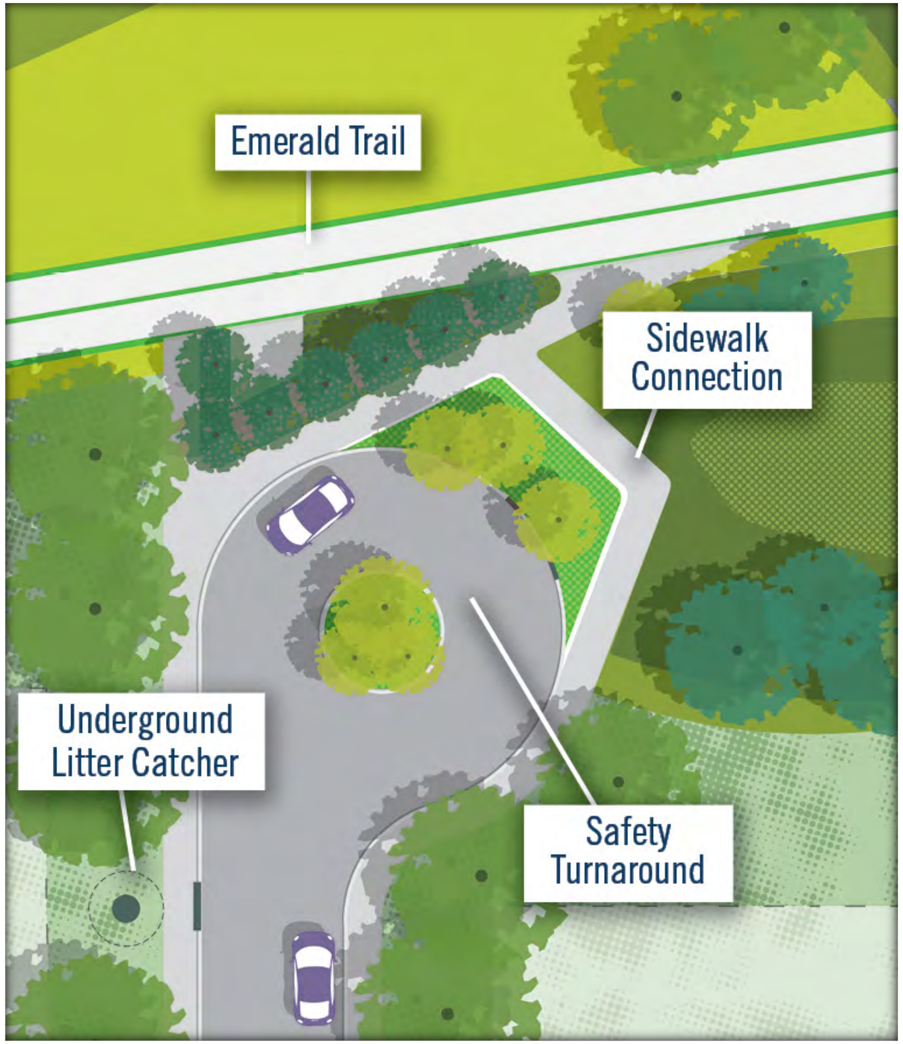
Raise & Replace Bridges

New design inspired by historic railings

Existing bridge

Proposed design

Stormwater Management Features



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Community Access to Creek Amenities

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Community Access to Creek Amenities

Part of Emerald Trail Network

- Connects McCoys Creek to an urban trail system with a paved bike/ped path
- 30-miles of trails, greenways and parks
- Encircles urban core in downtown Jacksonville
- Links 14 historic neighborhoods, 16 schools and 21 parks

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Community Access to Creek Amenities

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