Stream Restoration Primer

Approach and Examples in Florida

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Agenda

Introduction

Scale

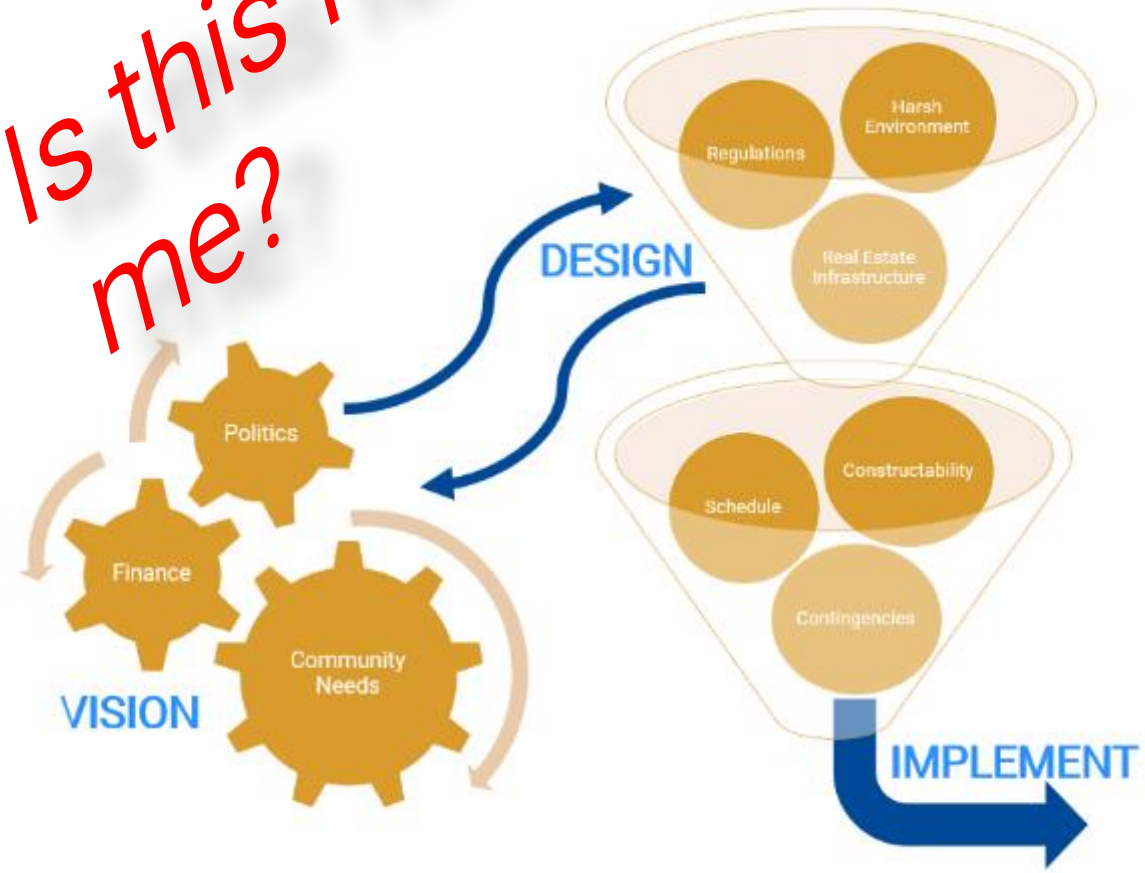
Design Intent

Your Questions

Hickey Branch Stream & Wetland Restoration at YR 20
Photo by John Kiefer

Introduction

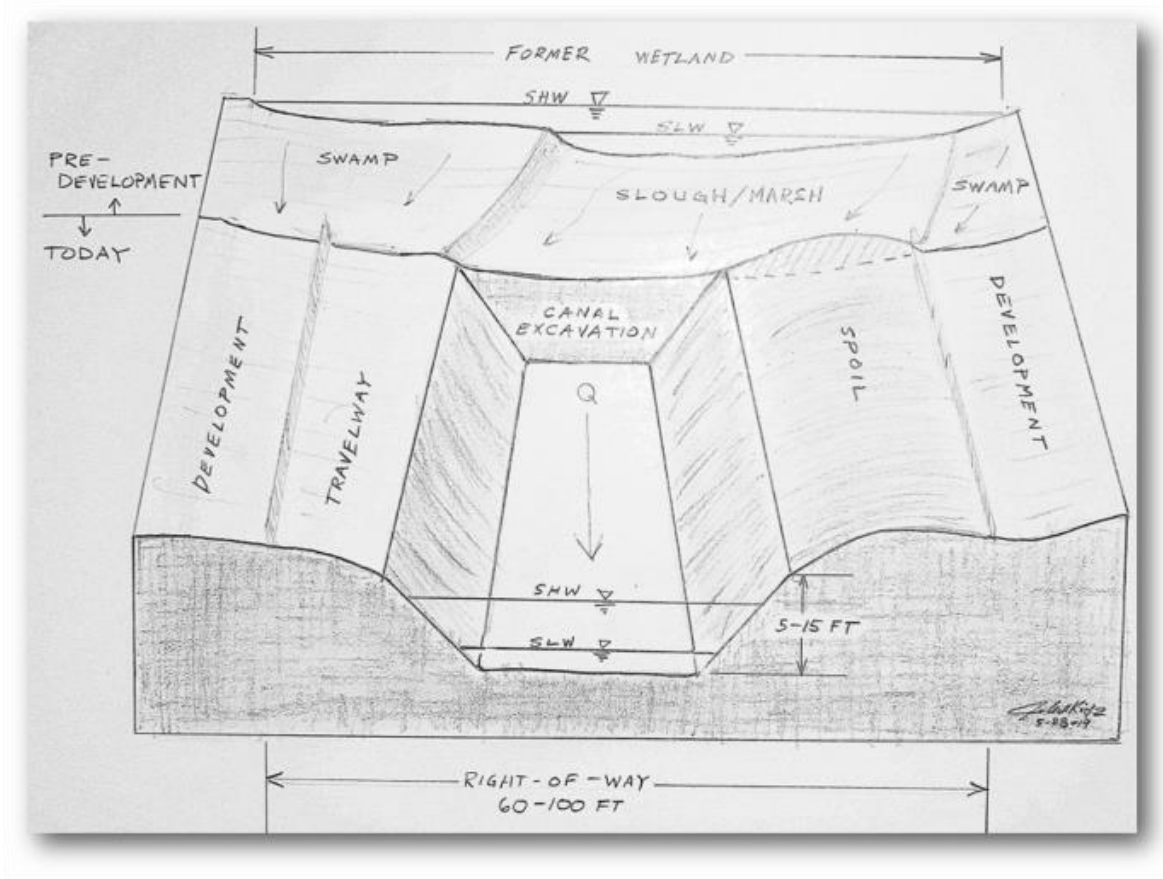
Is this for me?



McCoys Creek Phase 1 Restoration at YR 1
Photo by John Kiefer

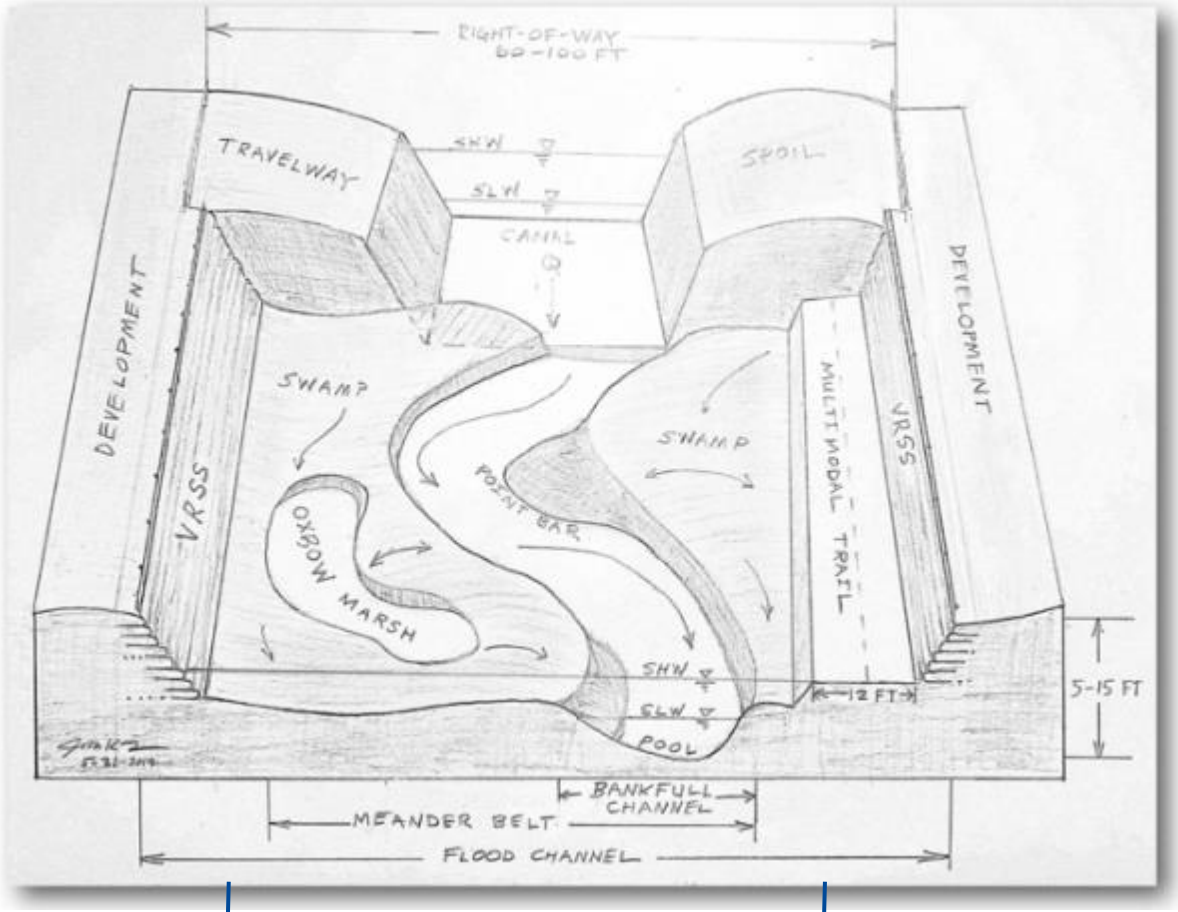
What is Urban Stream Restoration?

Developed Entrenchment



Resists ambient forces

Natural Channel Design



Self-adjusts to ambient forces

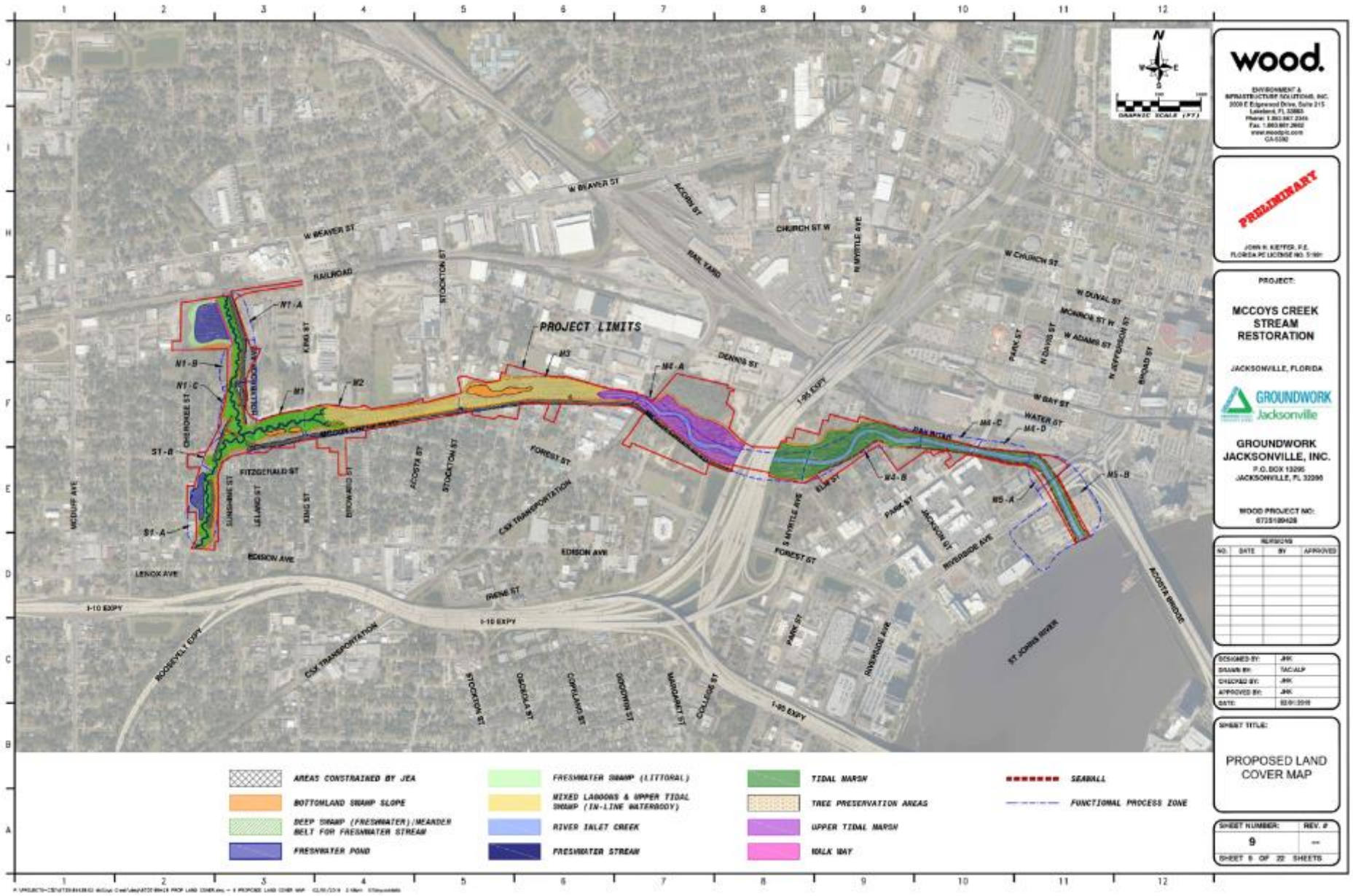
Environmental Gradients:

Flow Source

Drainage Area

Valley Slope

Tide



Total Economic Impact of 2018 Red Tide Now Estimated at $2.7B

Published on: 05/20/2025
Science Area(s): Harmful Algal Bloom Detection and Forecasting, Stressor Impacts and Mitigation
Region(s) of Study: Florida, U.S. States and Territories
Primary Contact(s): quay.dortch@noaa.gov

From October 2017 to January 2019, a large and prolonged red tide bloom, commonly known as the "2018 red tide," caused respiratory distress and displaced recreational activities, heavily impacting the tourism sector along Florida's Gulf coast. An NCCOS-funded study found that this red tide event — unprecedented in duration, intensity, and impact — caused $2.7 billion in losses, an order of magnitude larger than previous estimates of $318 million.

Red tide off Florida's southwest coast during the 2017–2019 bloom.
Credit: Mote Marine Laboratory's Manatee Research Program.

Red tides in the Gulf are caused by *Karenia brevis*, which produces toxins that are harmful to human health. Most people experience red tide toxins as minor respiratory irritation — coughing, sneezing, teary eyes, and an itchy throat. However, people with chronic lung problems, like asthma and chronic obstructive pulmonary disease, can have more severe reactions when they breathe in air-borne red tide toxins, which could lead to hospitalization. Red tides can also kill fish and marine mammals and make shellfish dangerous to eat.

Red tide blooms have major impacts on tourism-reliant communities

Carpenter Creek, Pensacola 2021

Mill Creek, Manatee County 2018

Upper Hickey Branch at YR 25, photo John Kiefer

Photo: Nate Brennan, Mote Marine. Phillippi Creek

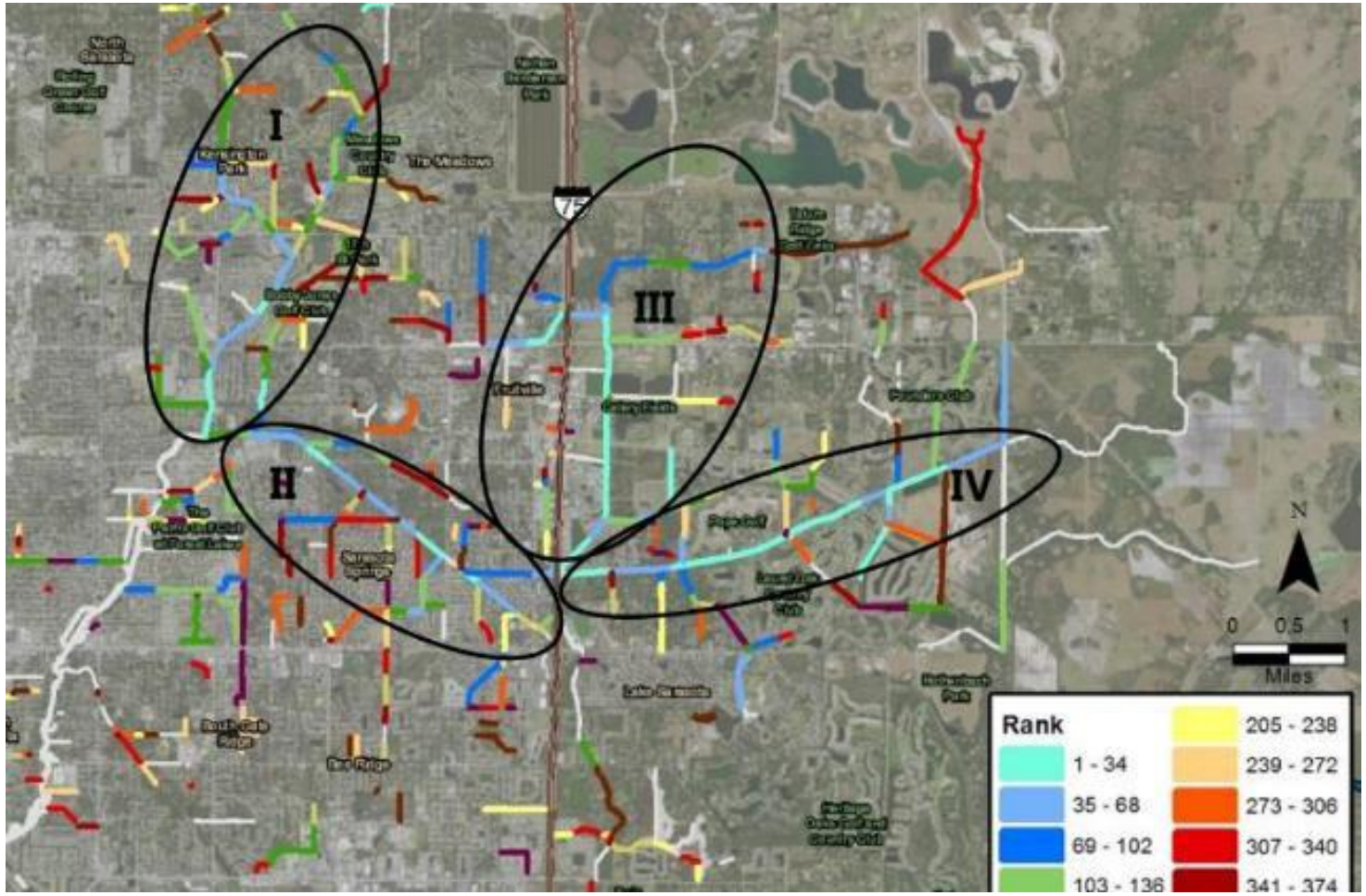
Doe Branch Restoration at YR 8, photo John Kiefer

Photo: Groundwork Jacksonville.

Rendering: SCAPE Studio

Scale

Match Scale of Solution to that of the Problem



Phillippi Creek Watershed Channel Improvement Study 2013

Nutrient Load Reduction Scenario

TMDL requires 6,500 lb TN reduction
Several sub-basins each producing about 10,000 lb

17% TN removal from 1-mile of restoration

Single sub-basin 10,000 lb influent load

- 6 miles in series needed to remove 6,700 lb (67% removal)

Separate reaches, each with influent loads of 10,000 lb

- 4 miles dispersed basins remove 6,800 lb (17% removal)

Nutrients are a load we wish to diminish

Dispersed features target the sources

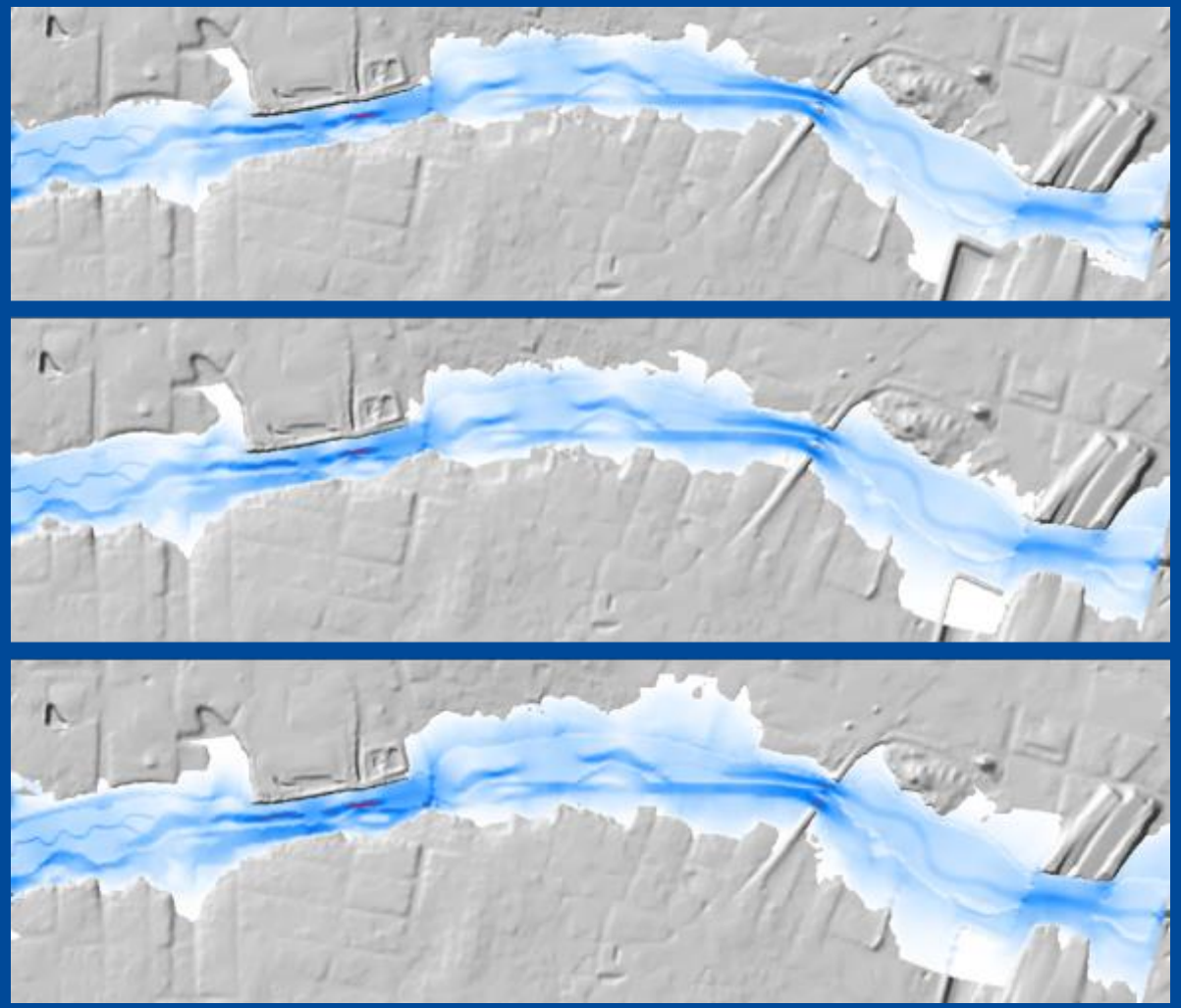
McCoys Branches Stormwater Quality Permit Area

Flood Reduction Rules of Thumb

- Less than 2 miles unlikely to generate flood benefits
- More than 20% of the drainage network typically required
- Culvert crossings can mask flood reduction potential
- Watershed modeling is typically required

Water is flow, we wish to grant space for effective passage

Consolidated flow features usually work best



McCoys Phase 1 HEC-RAS 2D Output

Sediment Management

- Distributed treatments target erosion
- Consolidated treatments assure sediment passage
- As little as ½ mile can make a difference
- Some basins require more
    - Carpenter Creek at 40x natural load requires ~2 miles of restoration

Sediment is a load and a flow

Consolidate drainage features for sediment transport continuity (flow)

Dispersed treatments target source control (load)

Continuity up to 5x natural load

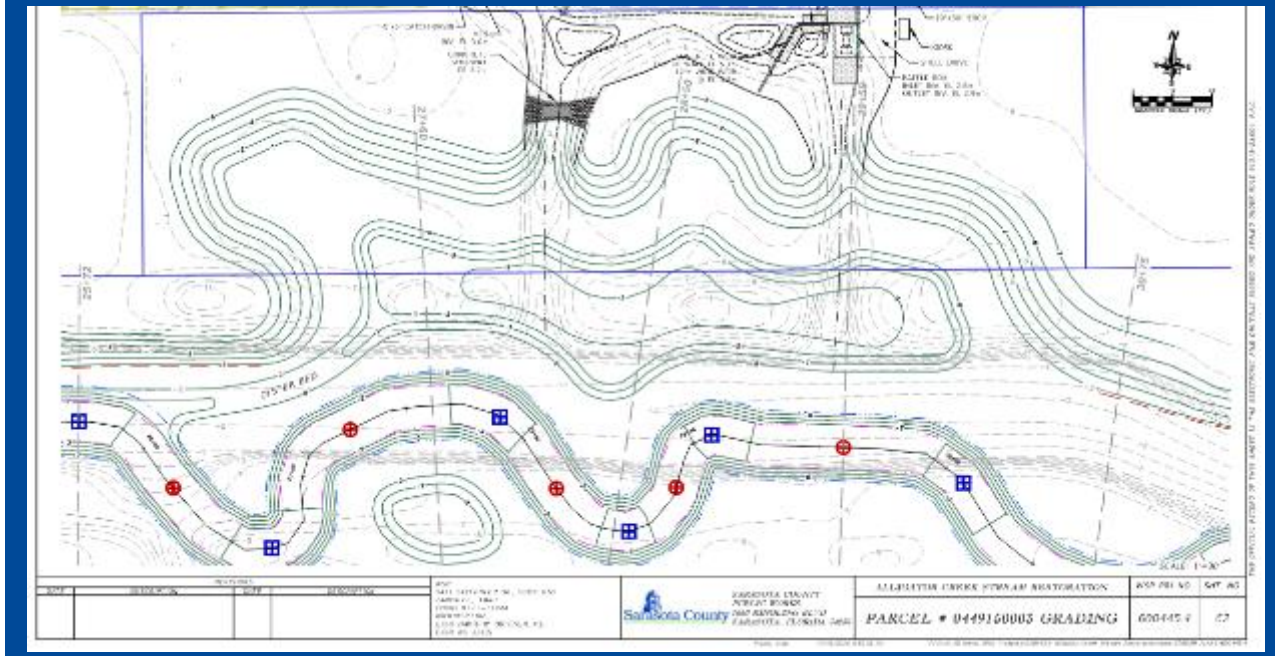
Stream restoration as sediment trap – Edwards Bottomlands, Starke FL at YR 6

Fisheries Enhancements

- Fish passage
- Habitat hotspots (spawning, rearing, feeding areas)
- Landscape ecology
- ½ mile restorations can benefit freshwater species
- Estuarine species require larger scale

Fish are a flow we wish to facilitate and loads we wish to increase

Target life history gaps



YOY snook rearing area design – Alligator Creek, Sarasota County (with Mote Marine)

Recreation and Quality of Life

- Pocket park needs about ½ mile
- Greenway trails and blueways need at least 2 miles

Recreation is a balanced load and flow item

Tailor to community service area needs and ecosystem capacity

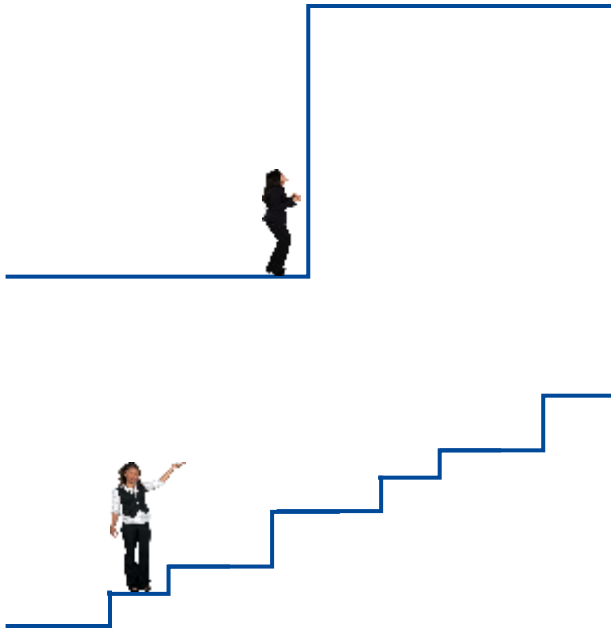
McCoys Creek Greenway – SCAPE Studio

Match Scale of Solution to that of the Problem

Problem	Minimum	Sweetspot Length	Position	Alignment
Nutrient Load	1-mile	Depends on reduction target	D/S of source hotspots	Dispersed
Flooding	2-mile	>20% of network	At flow bottlenecks, U/S of sufficient baselevel	Contiguous
Erosion Control	½ mile	Highly network specific	At sources	Dispersed
Sedimentation	½ mile	>2 miles	At troublespots or D/S of amplified loads	Contiguous
Fisheries	½ mile freshwater; 1 mile estuarine	>2 miles	Areas accessible to the species of care	Contiguous
Recreation	½ mile	>2 miles	Where the community wants it	Contiguous
OVERALL	1 mile	2 to 3 miles	Where the community needs it	Contiguous & Dispersed Mix

Design Intent

Cultivate an approachable design culture



"Challenges are not barriers to a compelling solution."

"Trust is earned with your ears."

"Be flexible in approach, inflexible with the facts."

"Build momentum, then time your advances wisely."

"Share your joy!"

Each project should write the story your community wants to read

McCoys Creek Task Force – Groundwork Jacksonville

Myakka State Park Dam Removal – photo by Miri Hardy

Biophysical Integrity in Design

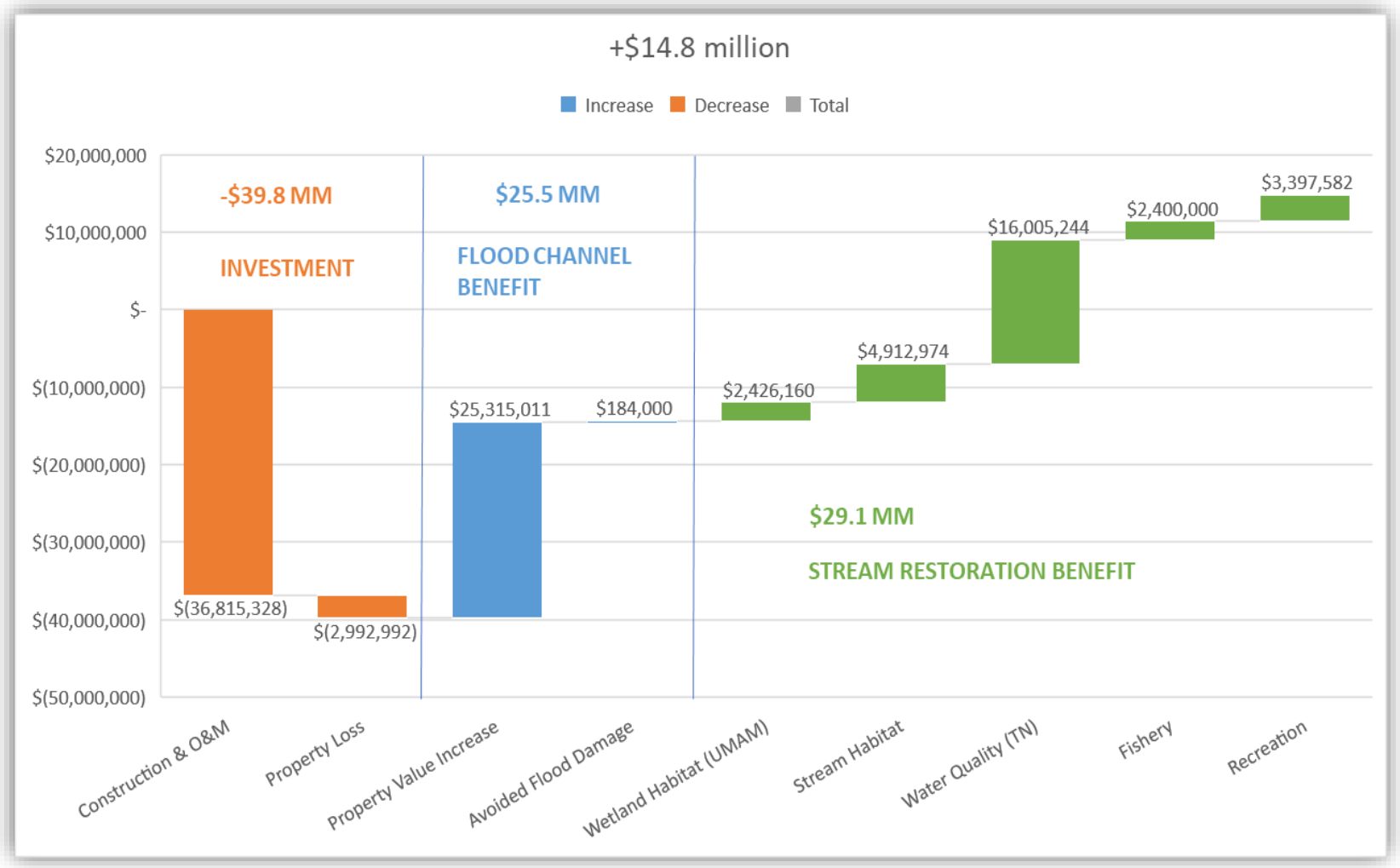
- Natural channel design has its place
- Stream type varies along the drainage network
- Pattern and dimension must fit watershed and valley conditions
- Modeling is required for urban bottomlands

- Natural channel design can be more resilient to >100-YR storms than hardened systems
  - Minimum of 4-bends between hardened segments
  - >40% of a total alignment as stream restoration

Edwards Bottomlands 2018 (YR 0) – Google Earth

Co-Benefits that Launch the Mission

McCoys Creek Phase 1 – Flood Control via Urban Core Stream Restoration



Using Fish to Catch Money

Project	Grantor
Stallion Hammock/ Boyette Park	FDEP
G.T. Bray Park	EPA
McCoys Creek	Look here
McCoys Branches	NOAA, COJ
Edwards BL (in Starke)	FFWCC. FDOT
Alligator (in Sarasota County)	NOAA

McCoys Funding Sources

$150MM+

Your Questions