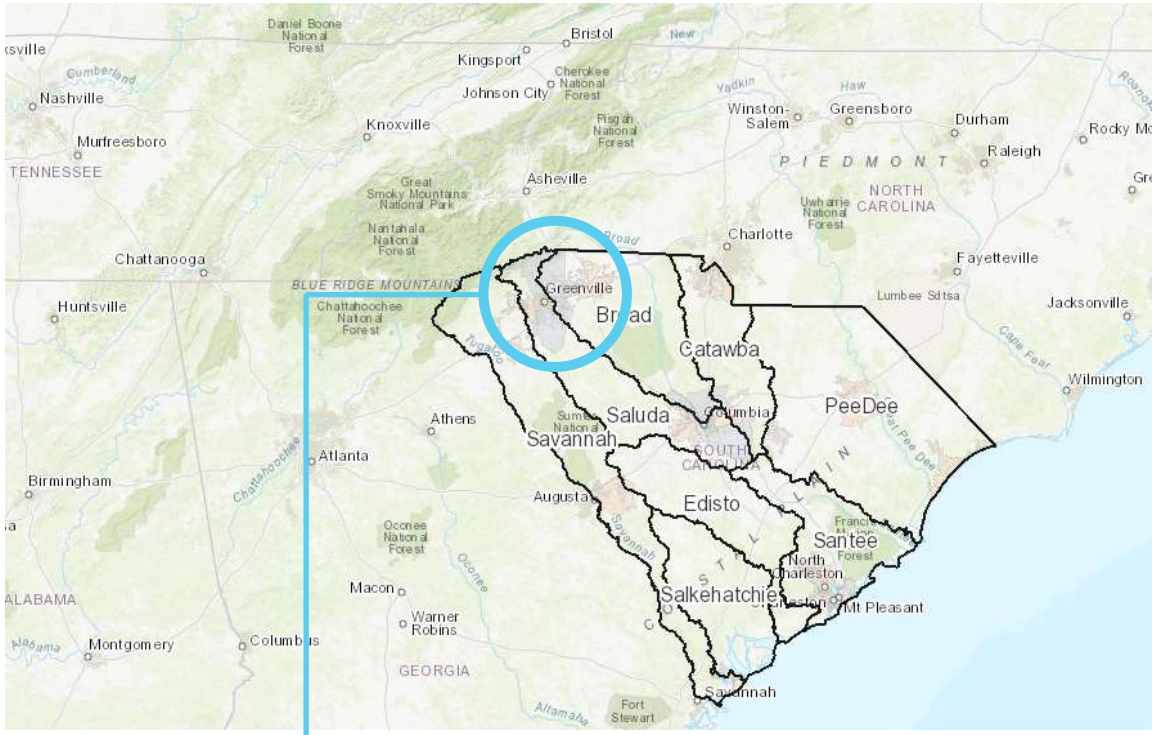
Adaptive Management in Urban Stream Restoration & Green Infrastructure

by: Jake McLean & Paul Dow

Outline

- Greenville Historic Background
- Drivers for Urban Stream and Green Infrastructure Projects in Greenville, SC
- Implemented Projects
- Stewardship and Adaptive Management



Greenville, South Carolina

Population: 70,000+

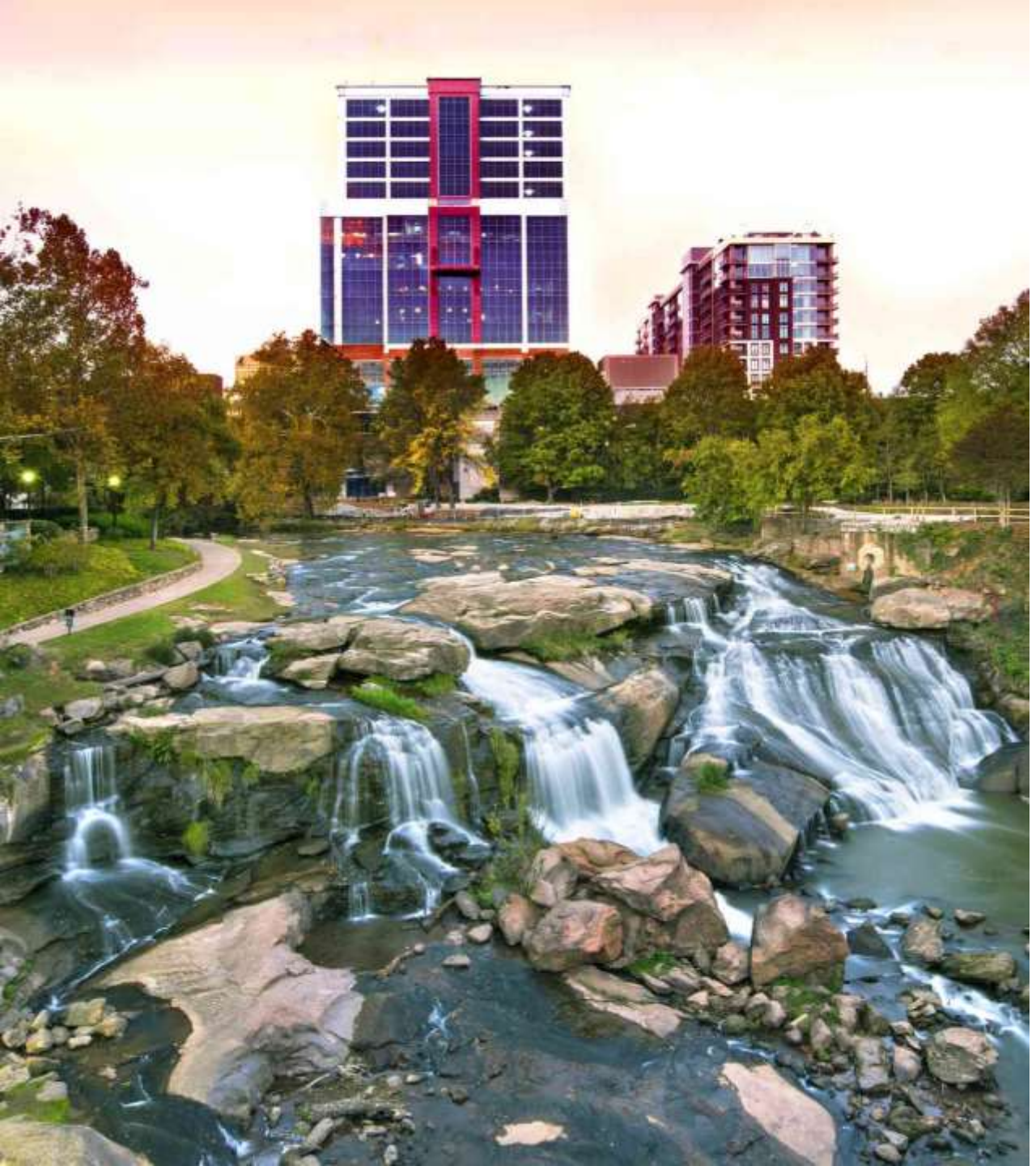
City Limits: 29 square miles

Watershed: Richland Creek --> Reedy River --> Saluda River

Concerns: Bacteria, sediment, nutrients, biological, urban pollutants








Hampton
Inn & Suites

Drivers

- Treating Waterways as Infrastructure Assets
- Water Quality and Impairment
- Stormwater and Floodplain Policies and Regulation
- Maximizing the Benefit of Recreational Corridors
- Natural Systems Approach in Urban Reaches

Stream Asset Management

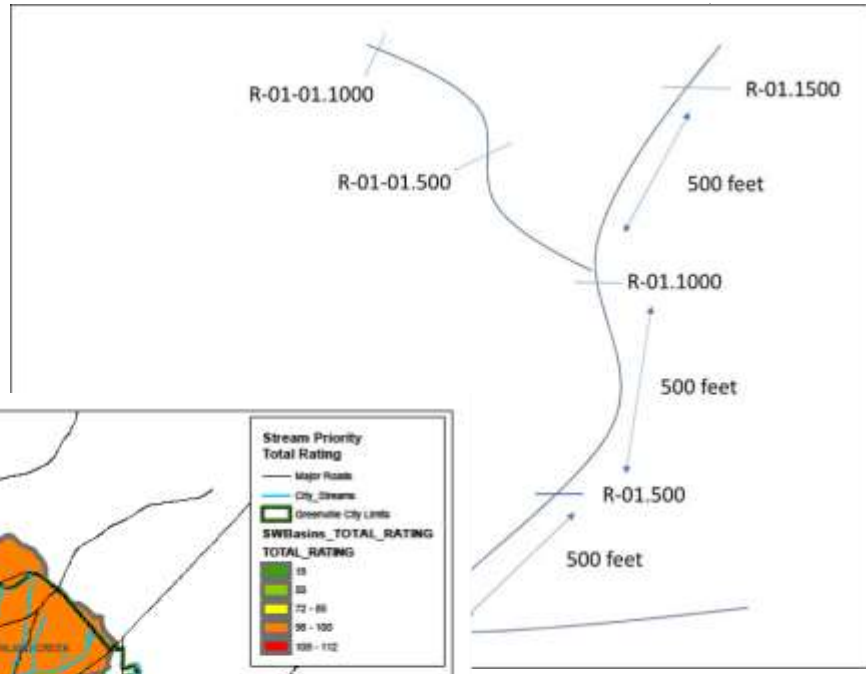
Prioritize Criticality of Basins

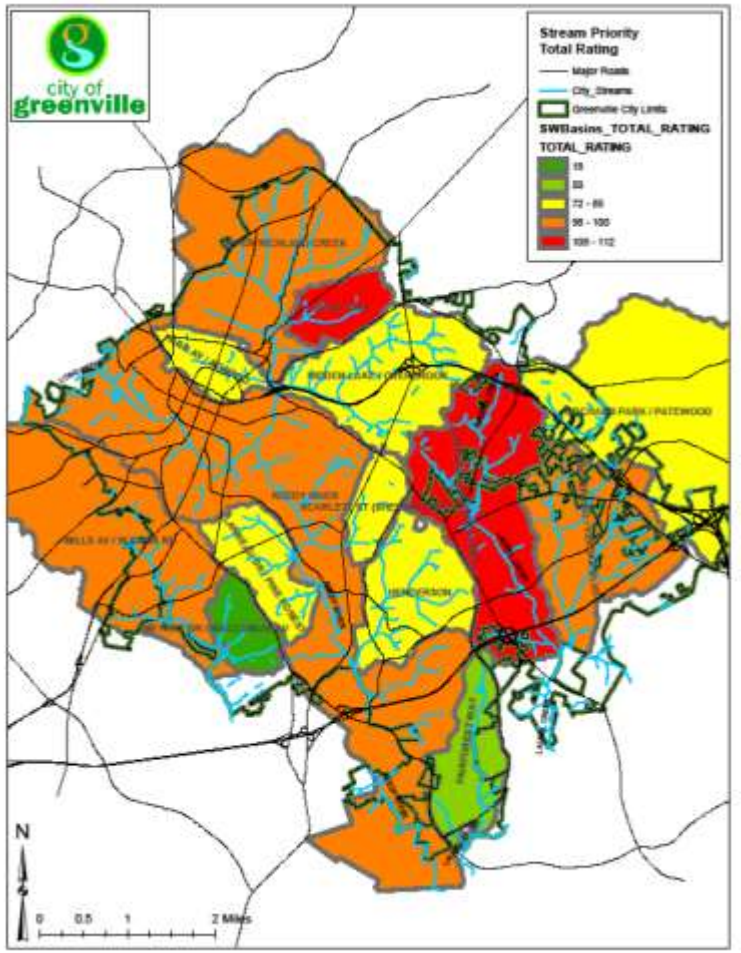
- LOF: Impervious %, # of Outfalls
- COF: Parks, Streets, Utilities

Field Surveys

- Survey123
- BEHI
- MS4
  - Dry Weather Screenings
  - Outfall Inspections
  - Utility Crossing Condition

Scoring and CIP Planning





Addressing Water Quality Impairments

- **Development Requirements**
  - LID & GI ,Buffers, Stormwater Treatment
- **Illicit Discharge**
- **Sanitary Sewer Rehab**
- **Stream Asset Management**
- **303(d) streams and urban runoff and erosion**
  - Richland Creek Watershed Management Plan

Stormwater and Floodplain Policies & Regulation

- **Establishment of Policies** (LOS, EOS, Asset Management)
- **Floodplain Modeling**
  - Updated Flood Maps
  - LOS Analysis
  - Gap Analysis
- **Asset Inventory and Condition Assessment**

- **Community Rating System** (CRS)
- **Land Management Ordinance**

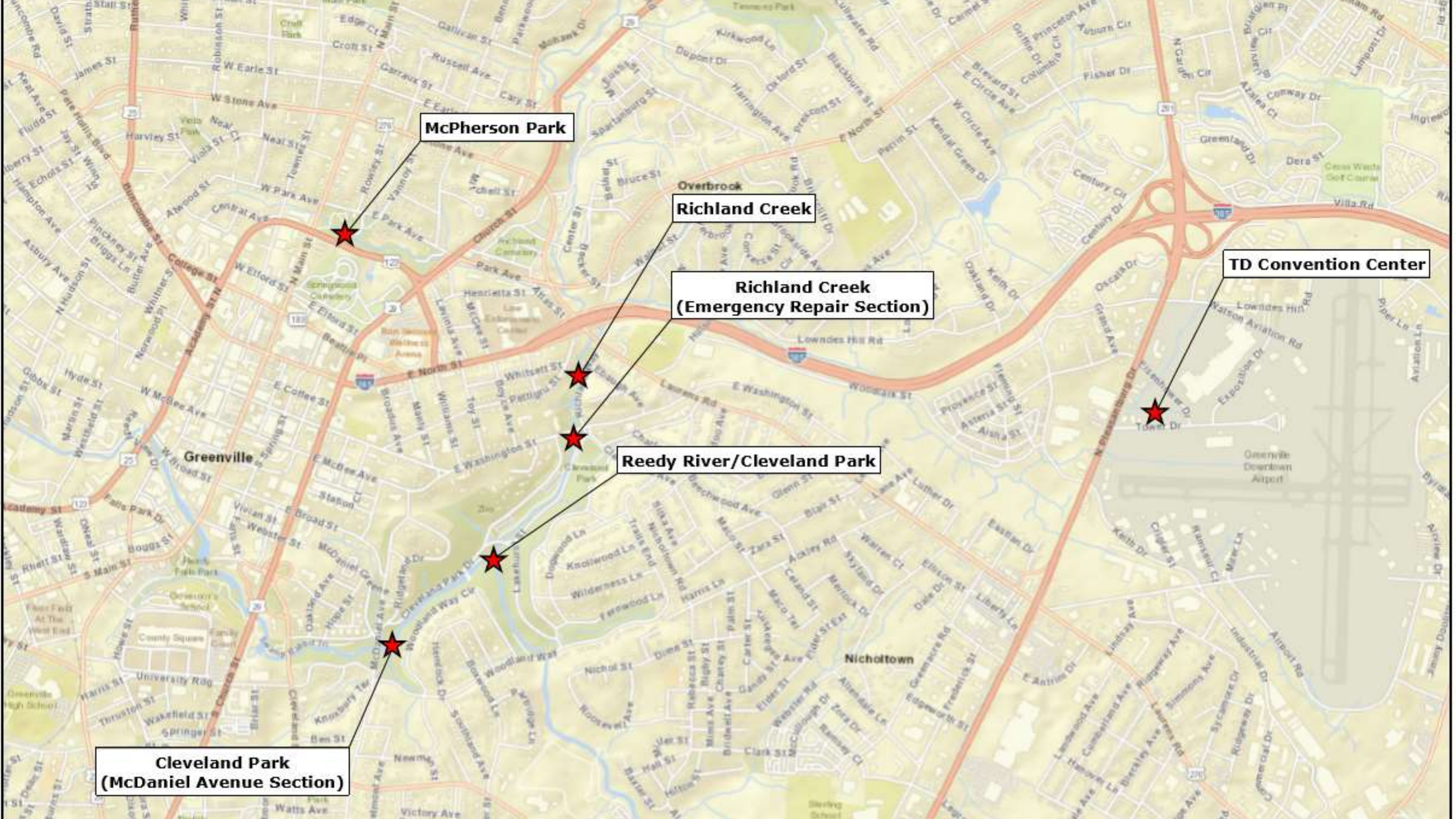
Recreational Corridors

Education and Awareness

"Healthy root systems are key to stable streambanks, so we need everyone's help in this final stage. Please stay off the matting!"

Preserve and Protect Tree Canopy

- 2 tree giveaway events
- Have given away 400+ trees to community for free
- Community messaging and education on the importance of trees and replacing the tree canopy
- Tree planting workshop at public Work Session of City Council


McPherson Park
Richland Creek
Richland Creek
(Emergency Repair Section)
TD Convention Center
Reedy River/Cleveland Park
Cleveland Park
(McDaniel Avenue Section)
Greenville
Overbrook
Nicholtown

Project Activities

- Emergency repair - utility crossing
- Compensatory storage (FEMA)
- EPA 319 water quality improvements

Project Stewardship & Adaptive Management Planning

Stewardship

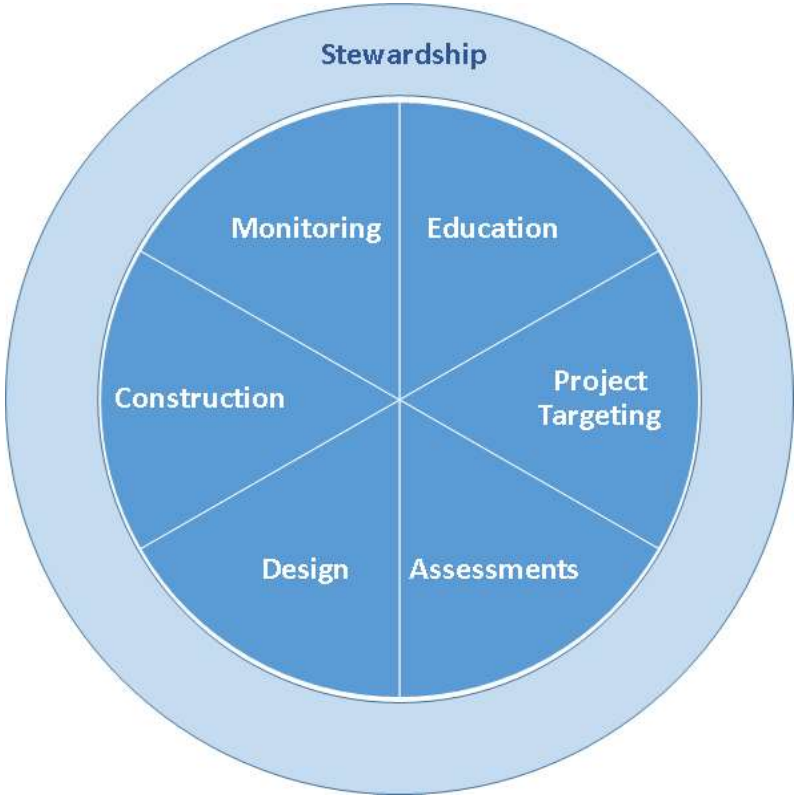
- OVERARCHING – Starts early, guides construction, continues
- HOLISTIC - Involves many disciplines and activities and integrates ecology with society
- Critical to project success(ion)
- Pays off to invest early in project

Adaptive Management Planning

- Identifies project components and challenges
- Creates framework for addressing challenges to achieve long-term goals
- Guides project activities throughout life of project

Requires a Vision and Data to Support Action

Aesthetic and Functional Goals



Field Maps Mobile App

Field Data Collection/Editing

AGOL Web Map Application

Activities & Considerations

Evaluate Challenges and Opportunities:

Invasives

Poor soils

Adjacent influences (land use, vegetation, hydrology, wildlife)

Identify Post-construction issues:

Overland flow and floodplain scour

Bank or bed instability

Vegetation issues

Encroachment (on easement or vegetation)

BMP maintenance

Considerations:

Management goals

Aesthetics, visible and physical access to streams

Ownership, use/access

Budgetary constraints

Education

Supporting Adaptive Management

Budgeting for activity

Assessment

Repairs

Maintenance

Information sharing

Maps & plans

Landowner information

Proactive efforts

Collect soil samples

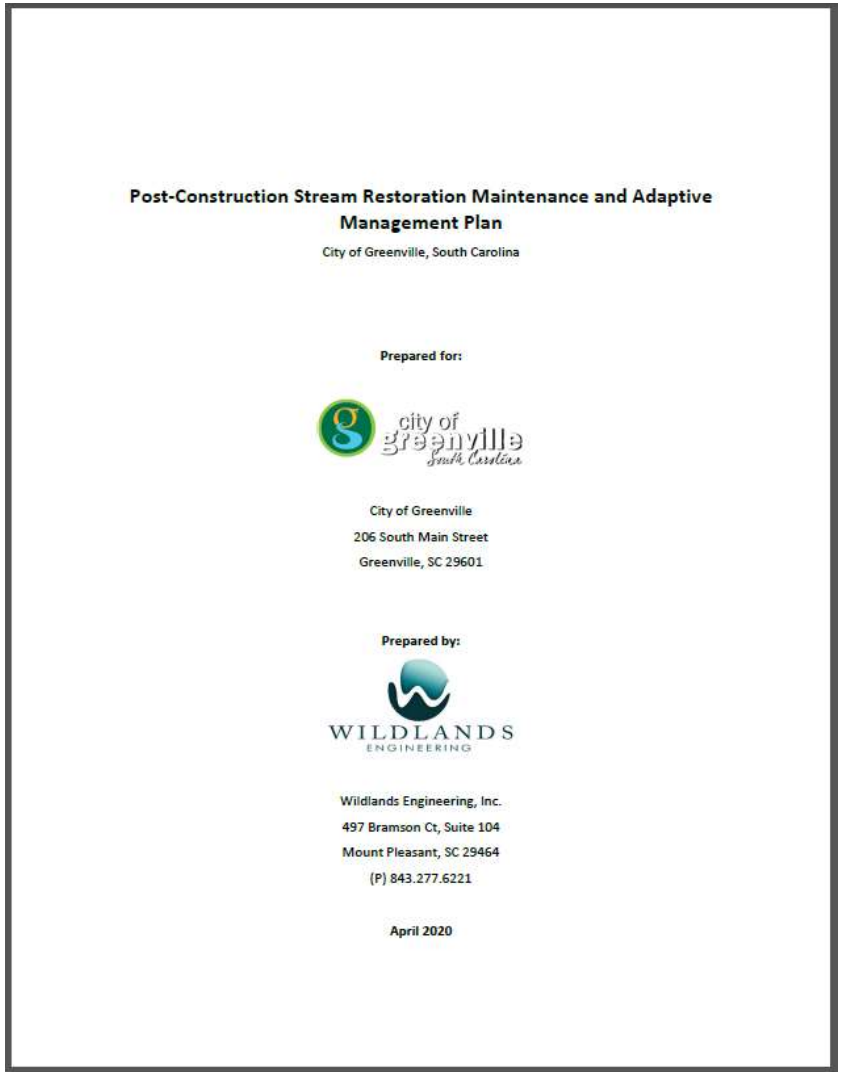
Conduct kick-off, design-phase site walks, talk to stakeholders and caretakers of project (City staff)

Create schedule and status and plan update milestones

Greenville Post-Construction Adaptive Management

Document Components

- **Background**
- **Evaluation Criteria**
  - Stream
  - Floodplain/Upland
  - BMP
  - Plantings
  - Mowing Areas
  - Invasive Species
- **Post-Construction Assessment**
- **Maintenance Recommendations**



Post-Construction Stream Restoration Maintenance and Adaptive Management Plan

City of Greenville, South Carolina

Prepared for:

city of greenville South Carolina

City of Greenville
206 South Main Street
Greenville, SC 29601

Prepared by:

WILDLANDS ENGINEERING

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April 2020

Assessment - Reedy River at Cleveland Park

Stream

Maintenance and Monitoring Areas

- In-Stream Structure
- Bank Stabilization
- Overland Runoff and Floodplain Erosion
- BMP Maintenance
- Stream and Floodplain Planting
- Mowing Areas
- Invasive Species

Maintenance Activities

- Early evaluation and maintenance by entity involved in design and construction: Wildlands
- Current year inspection 2022 by intern / volunteer
- In-house staff or subcontract work
- City has joined with of "Alliance" of local groups to combat invasives

In the Weeds with the 'Stew Crew'

Capacity Building • Technology • Design Feedback Loop • Benefits

Adaptive Management Program Building

- Ecology and ecosystem function
- Plant identification
- Conservation easement compliance
- Soil Science & Plant Physiology

EXPERTISE

- Communication & coordination
- Contracting
- Long-term vision & planning
- So many field skills

- Process management
- Data management
- Resource allocation
- Training

PROCESS

EXECUTION

- Staff
- Volunteers/Interns
- Contractors
- Collaboration
- Education

Wildlands Stewardship Support App

Issue Point

Subtype

- Misc
- Weed Occurence
- Failed Structure
- Beaver Dam
- Soil Sample

Issue Line

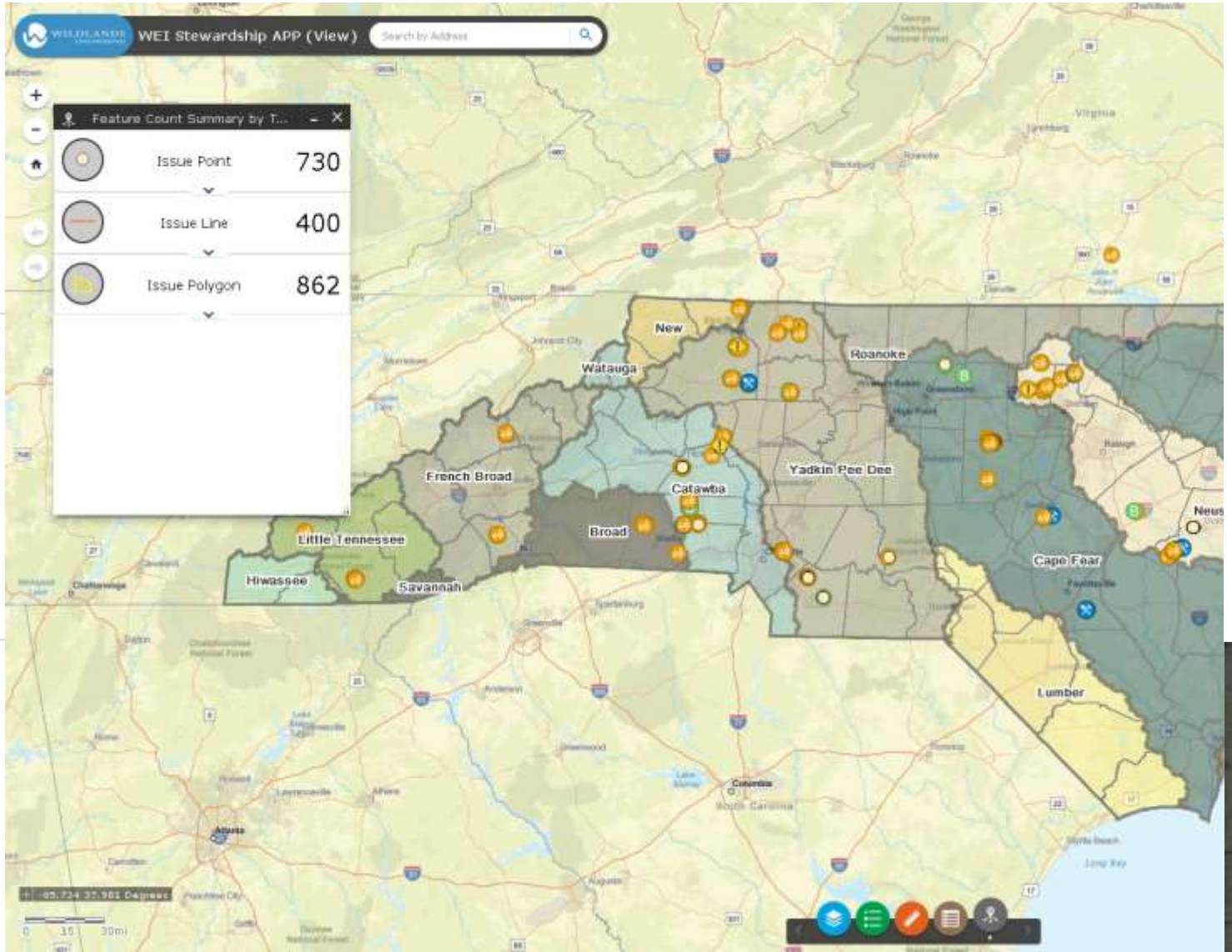
Subtype

- Misc
- Boundary Issue
- Channel Stability/Erosion
- In-Stream Vegetation
- Needs Livestakes

Issue Area

Subtype

- Misc
- Weed Occurrence
- Vegetation Issue
- CE Encroachment



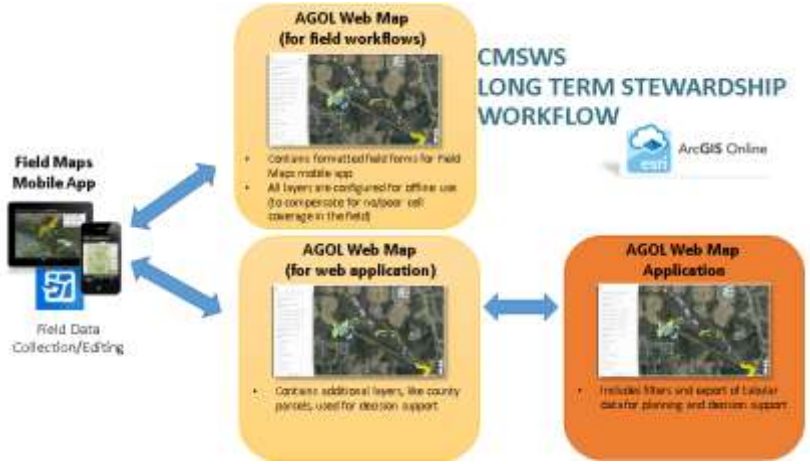
- Project background information
- Tracking of issues and corresponding management
- Shared real-time data enables rapid and multidisciplinary response

"Technology" for Adaptive Management










Design & Innovation Loop

- Post-construction interdisciplinary meetings to discuss performance and maintenance of projects
- Repetitive maintenance issues and root causes explored and addressed
- Innovation:
  - Seed and cover crop seed mixes
  - Hand repair and bioengineering
  - Soil management and amendment
  - Ideas that work!

Benefits of Adaptive Management

- More successful projects
- Increases visibility
- Less work over time
- Pollinate and educate
- Better design and implementation through feedback loop
- Advancing project support technology to meet life cycle needs

Thanks!

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