NC DWR Wetland Science Team

&

2 DECADES OF WETLAND AND STREAM GRANT PROJECT RESULTS

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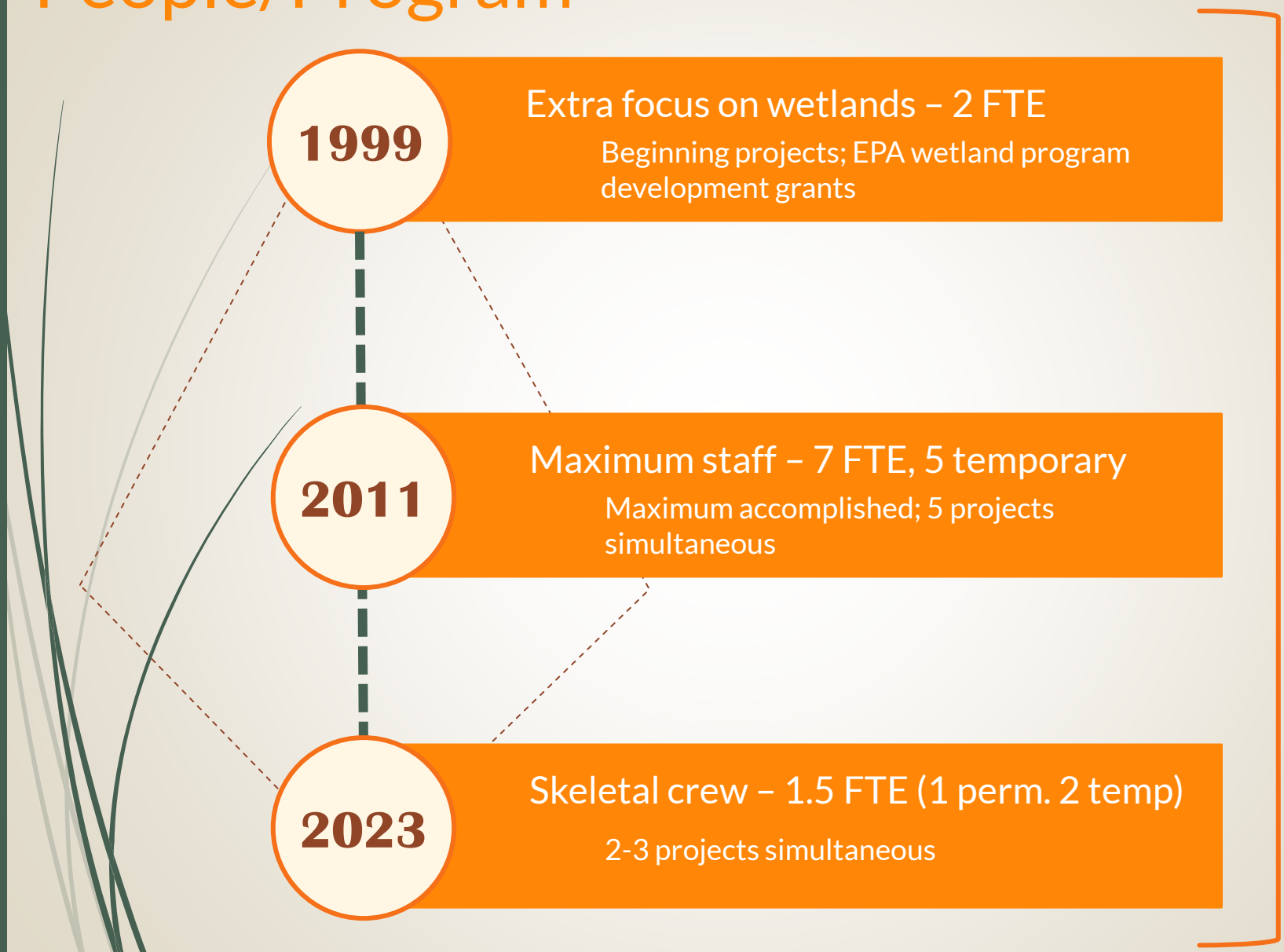
June 2023 update

NORTH CAROLINA
Department of Environmental Quality

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

People/Program








43 different people










Project Focus

30 projects

350 wetland sites

1,520 stream sampling points

Project Categories

- Mitigation Assessment
- Policy & Guideline Development
- Condition Assessment
- Tool Development

Mitigation Assessment

Spatial Relationship of Impact to Mitigation for Wetlands/Streams in NC (2009-2012)

Mitigation Assessment

Methods

5 years (2005-2010) impact + mitigation data

Key Results:

Aquatic resources have been relocated from urban → rural

Compensatory Stream and Wetland Mitigation in NC: Evaluation of Regulatory Success (2009 - 2011)

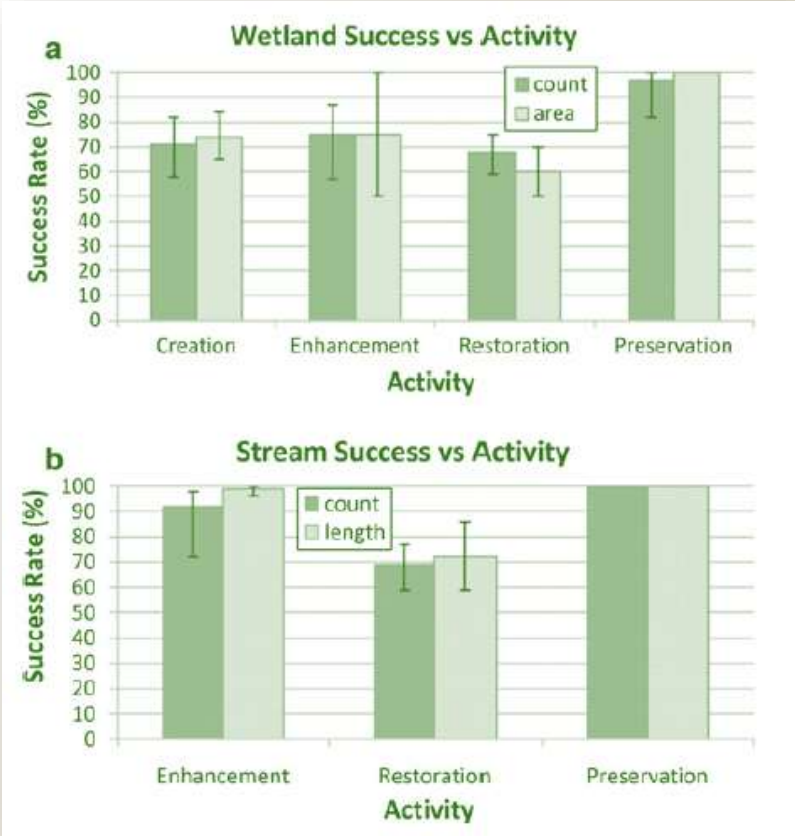
Mitigation Assessment

Methods

Data from 2002 – 2009
82 wetland sites, 79 stream sites evaluated

Key Results:

- Overall success (incl. preservation) estimated 75% for wetlands & streams
- Stream *enhancement* success rate significantly higher than stream *restoration*
- Piedmont- lower stream mitigation success rate



Field Evaluation of Mitigation Wetlands in NC (2011-2013)

Mitigation Assessment

ENVIRONMENTAL LAW • INSTITUTE

NC STATE UNIVERSITY

Methods

30 restored mitigation wetlands (credits released)
NWCA protocol

Key Results:

- Most sites rated medium or higher quality (veg, ORAM, NCWAM)
- All sites dominated by veg. with mid-range C-values

Policy & Guideline Development

Using natural wetlands for stormwater assimilation (2000-2004)

Policy/Guidelines

Methods

10 sites, Piedmont & Coastal Plain

Key Results:

- Much higher pollutant levels in wetlands receiving stormwater
- Each wetland was unique; variable assimilation capacities
- List of recommendations

Mitigation Guidance Document (2009-2013)

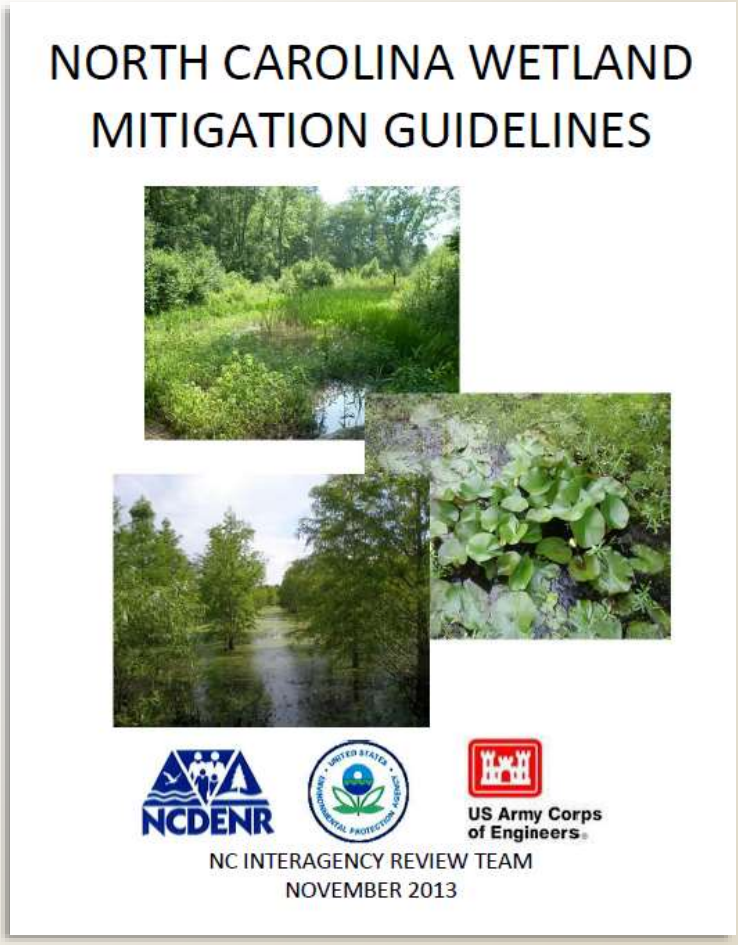
Policy/Guidelines

Methods

Prepared by interagency review team, including DWR wetland staff

Key Results:

- Guidance document posted on USCOE website

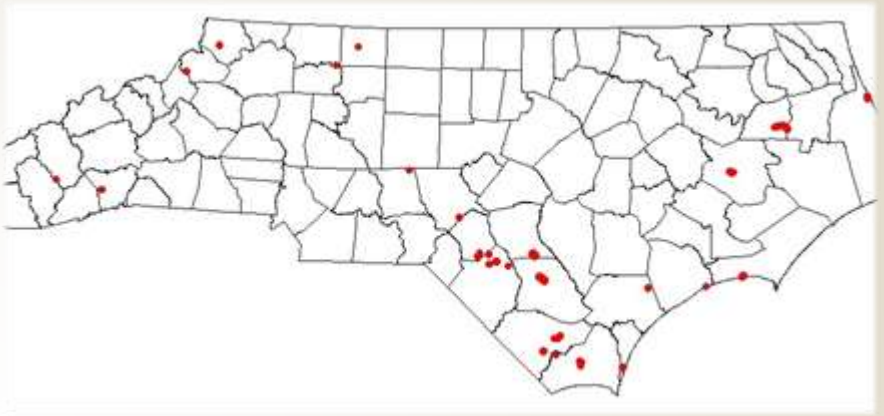


Unique Wetlands: Policy Guidelines and Locations (2000 – 2007)

Policy/Guidelines

Methods

- Natural Heritage data
- Boots on the ground



Key Results:

- Increased wetland protection for unique wetlands
- 17 wetland types (most acreage non-riverine swamp forest, pocosin)
- 3,800 acres placed under Unique Wetlands Classification (all on public land)
- Guidelines created for classifying further wetlands

Wetland Condition

Headwater Wetland Assessment (2005 - 2008)

Wetland Condition

Methods

11 Coastal Plain and 12 Piedmont headwater wetlands
Levels 1, 2, 3 data analysis (hydrology, water quality, amphibians, macroinvertebrates, vegetation)

Key Results:

- Monitoring protocols established
- ORAM and LDI validated by water quality parameters
- Headwater wetlands very important to amphibians & macroinvertebrates

Isolated Wetland Hydrologic Connectivity, Water Quality Function, and Biota (2009-2013)

Wetland Condition

Methods

22 isolated wetlands, NC and SC
- 11- hydrologic study
- 11- biotic community study

Key Results:

- Isolated wetlands ARE connected to nearest waterbody (stream or connected wetland)
- Isolated wetlands absorb pollutants
- All sites were high quality (floristic)
- NCWAM could successfully rate the function of isolated wetlands

Amphibian/Macroinvertebrate Communities in Restored and Reference Wetlands (2013-2016)

Wetland Condition

Methods

16 wetlands:

enhancement (tree removal)
open canopy reference
re-establishment (mitigation planting)
closed canopy reference

Key Results:

- Open canopy wetlands - better amphib./macroinvert. habitat than closed ref. or re-established
- Re-established wetlands - more taxa than closed reference (but still in transition)

National Wetland Condition Assessment (2011, 2016, 2021)

Wetland Condition

Methods

NWCA methods, 97 sites

Key Results:

- Rapid assessment + intensive data available
- Used in other project analyses to boost sample sizes

Forested Wetland Condition Assessment (Multi-state Intensification of NWCA) (2012 – 2017)

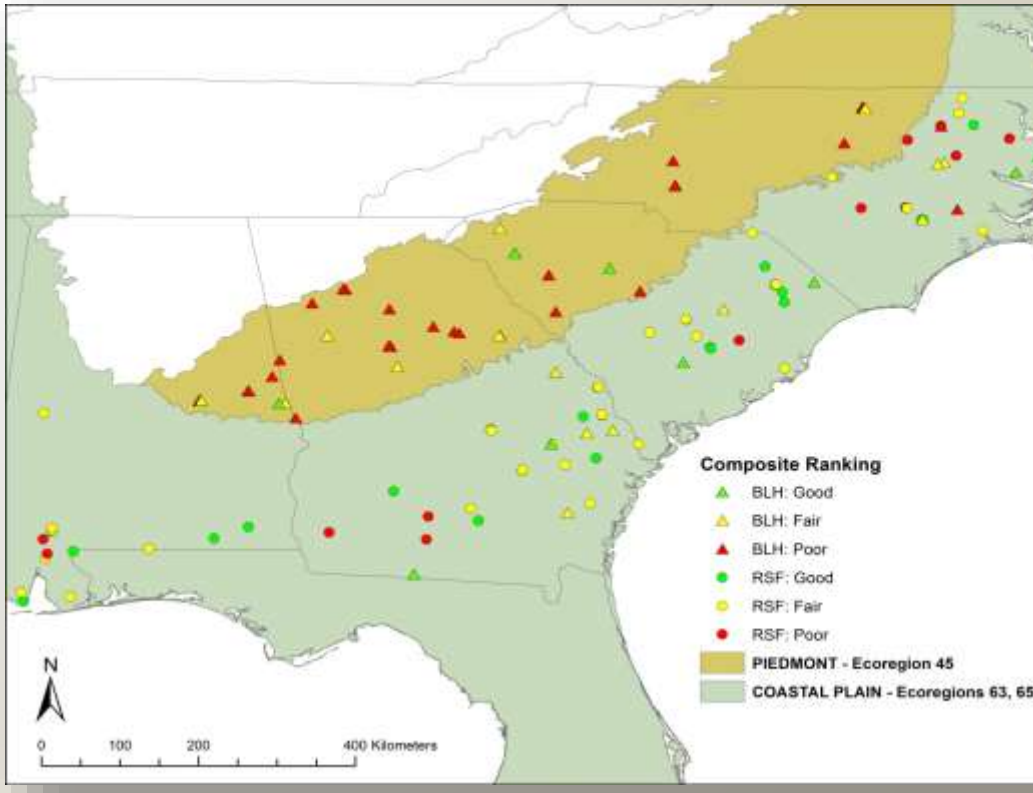
Wetland Condition

Methods

NWCA protocol + hydrology, amphibians, macroinvertebrates
Coalition of 4 SE states, 90 forested wetlands
Piedmont/Coastal Plain

Key Results:

- List of parameters ORAM, NCWAM, and LDI could predict
- Piedmont wetlands worse condition than Coastal Plain wetlands
- Multi-metric ranking



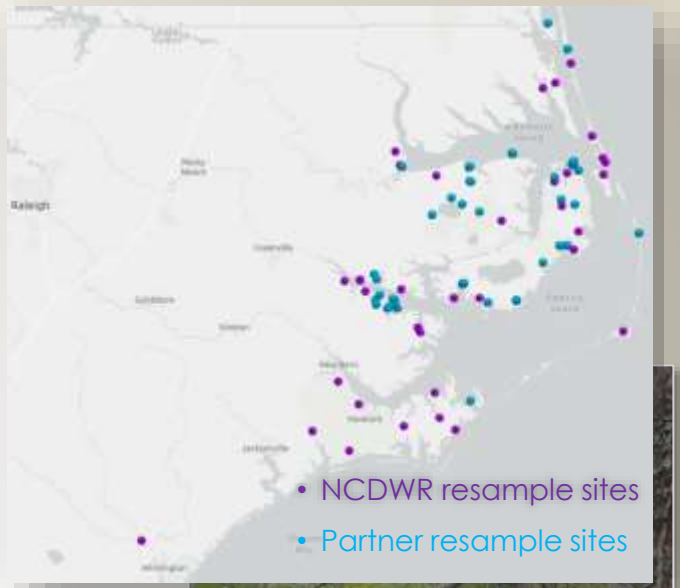
Assessing Change in NC Coastal Plain Wetlands (2022-2024)

Wetland Condition

Methods

Resampled 30 coastal wetlands w/historical plot data
(Rapid assessments, vegetation, soil, water)

Analyze along with resample data from several partners



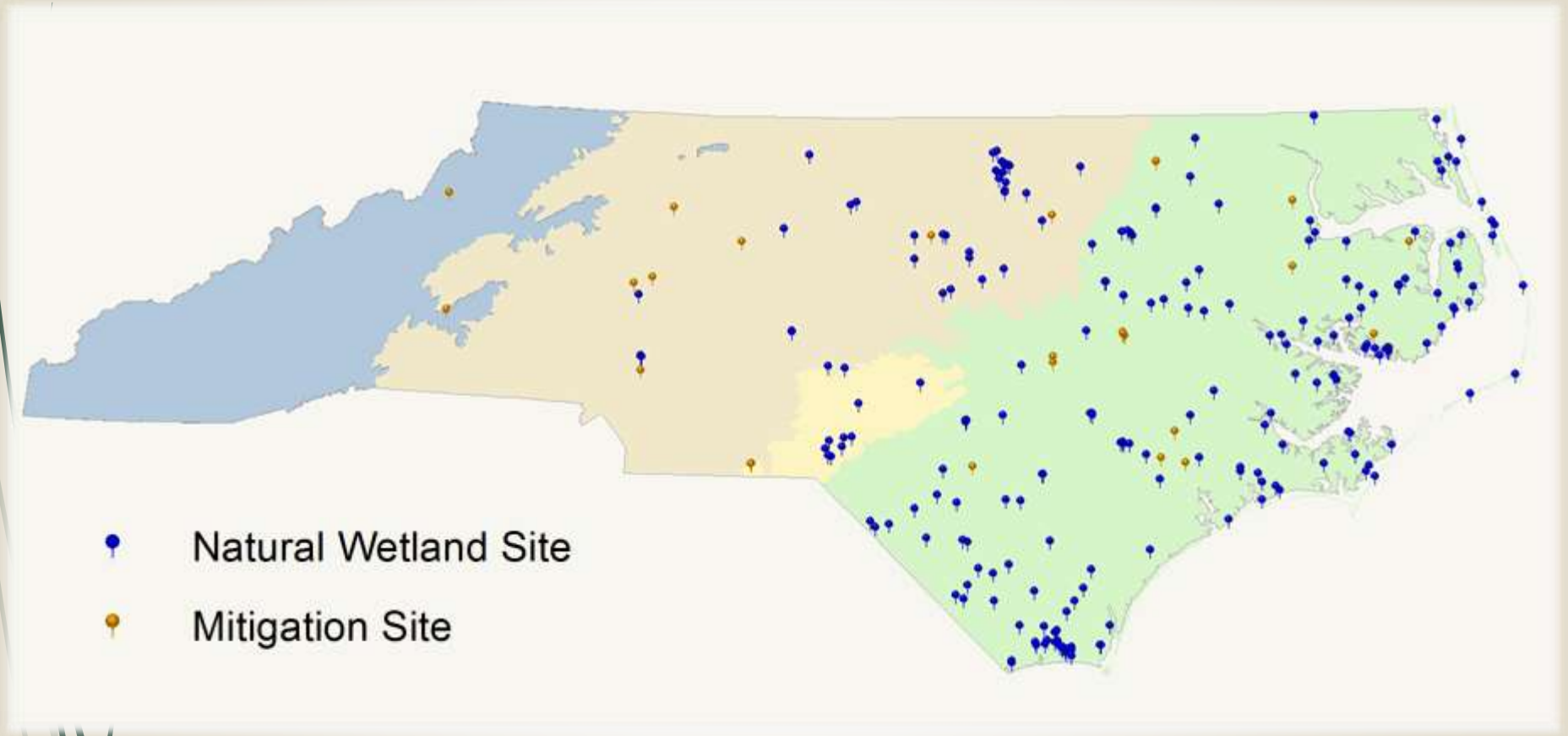
Key Results (Underway)

Salinity tolerance thresholds by wetland plant species

Plant community shifts by location

350 NC Sites with Intensive Data Collected through 2022

(Mitigation and Natural Wetlands)



Water Quality in Urban Wetlands (2017-2021)

Wetland Condition

Methods

4 urban wetlands Raleigh
inlet/center/outlet water sampling, baseflow/storms
nutrients, metals, oil/grease, TSS

Key Results:

- Metals low, except centers (legacy contamination/algae concentration)
- Nitrate/nitrate reduced
- Overall water very clean entering these wetlands

Flood Storage Capacity/Duration in Natural Urban Wetlands (2023-2025)

Wetland Condition

Methods

Urban wetlands Raleigh along Walnut Creek
Detailed elevation surveys
Water level monitoring

Key Results (Project Underway)

- Quantify acre-feet of water storage for all wetlands along Walnut Creek
- Report attenuation times after overbank flooding events

Tool Development

Tools

Field Verification of Wetland Functional Assessment Methods (NCWAM) (2005-2010)

Methods

25 wetland sites, 3 wetland types;
basin wetlands (12), bottomland hardwood forests (6), riverine swamp forests (7)

Key Results:

- Significant correlations between NCWAM scores and…
  - some Level III amphibian and plant metrics,
  - water and soil chemistry results (DO, some nutrients, metals).
- Some NCWAM scores correlated with ORAM, but not with the Landscape Development Intensity Index (LDI).
- NCWAM adopted by the Wilmington District Corps

Developing a Regional C Value Database for Wetland Floristic Quality Assessment (2011-2013)

Methods

15 contributing expert botanists

Key Results:

- 2,523 taxa, 5 ecoregions, over 7,100 C values available for floristic quality assessment
- Available at → ncwetlands.org/research

Tools

Testing Rapid Floristic Quality Assessment Indices (2017-2018)

Methods

Analysis of veg plot data, 2,292 wetland plots
Compared rapid FQI results to full list FQI

Key Results:

- Dominant sp. mean C correlated well with full list mean C
- Rapid FQI also correlated with full FQI, but not as well as mean C
- Mean C with no graminoids also correlated well with full list mean C

Published article on results

Tools

Development of Wetland Outreach Materials/Website (2016-2019)

Methods

- Science communication class, surveys of target audience
- Hired graphic designer & environmental educator
- 200+ site visits for interactive map and videos

Key Results:

- Release of new website: ncwetlands.org
- Won award
- YTD 2023 (June 15)
  - 25,600 page views
  - 13,000 new visitors
  - 8,100 visits to educational resource pages

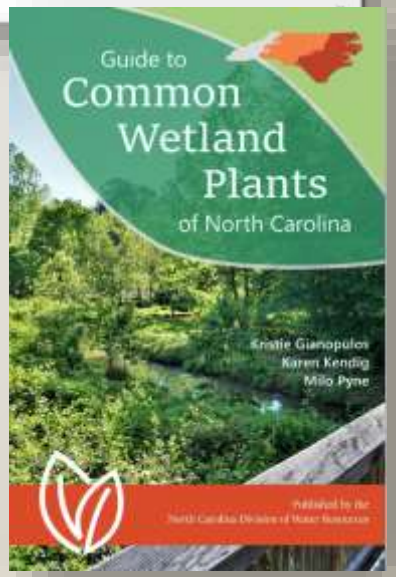
Update to Common Wetland Plant Guide (2019-2021)

Methods

Hired expert botanist
Took photos of all plants
Created new full-color guide

Key Results:

- Distributed 1,200 printed guides
- YTD (June 15) on website
  - 4,300 visits to ncwetlands.org/plantguide



EPA supporting new project

- *Develop a free mobile app and online guide*
- *Print more paper copies*

Other Projects

Mapping and Assessing Geographically Isolated Wetlands in SE Coastal Plain (2007-2010)

Other Projects

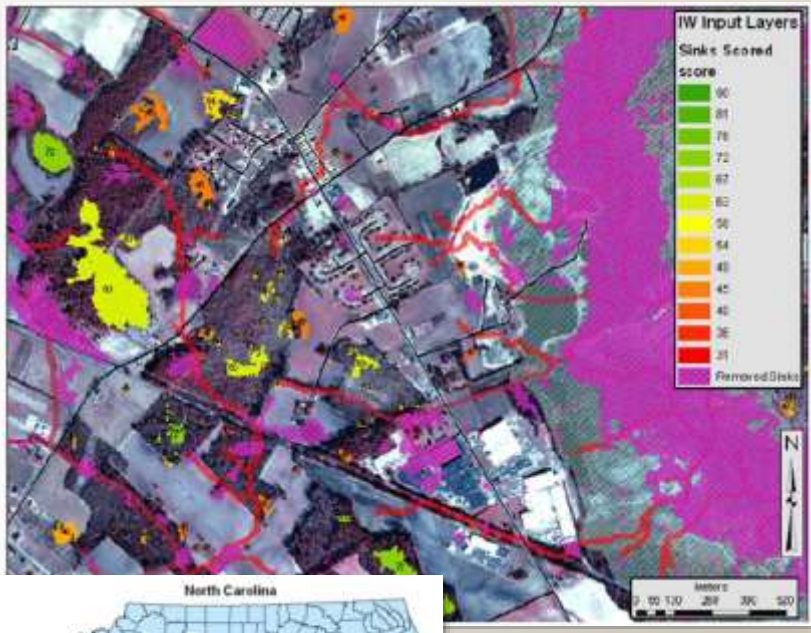
Methods

GIS, rapid field assessments, intensive field data

Key Results:

- Mapped candidate isolated wetland polygons – 69% were wetlands

  22% were isolated wetlands
- Estimated 52,000 isolated wetlands in study area (small – mean size 0.68 acre)(30,000 acres total)
- Fair to good ecological condition; sinks for nutrients, metals,carbon



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Assessing NWI Accuracy and Remotely ID'ing Wetlands with GIS Models (2021-2022)

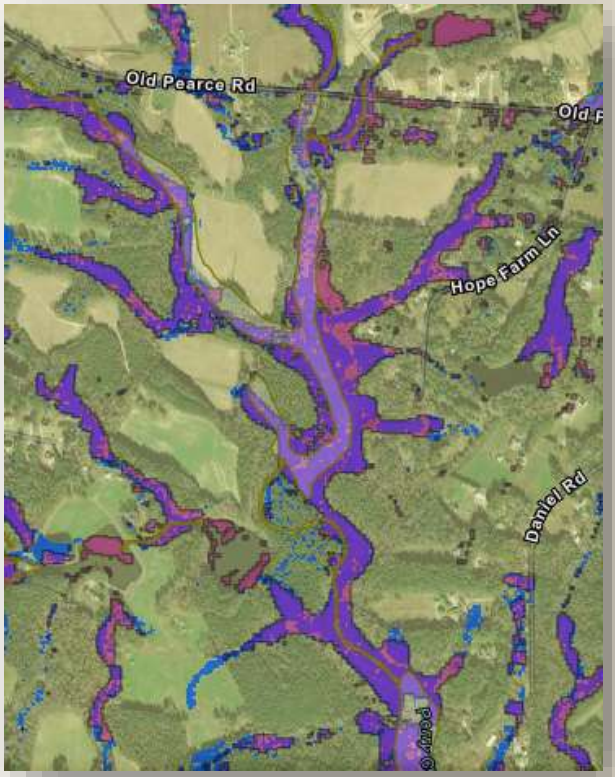
Other Projects

Methods

GIS, jurisdictional wetland surveys across NC

Key Results:

- NWI drastically underestimated wetland acreage in NC Mountains
- NWI overestimated wetland acreage in Piedmont
- NWI unreliable data source for wetlands <1.0 acre in NC
- GIS data overlay approach for detecting wetlands in pilot area showed promise and needs further testing



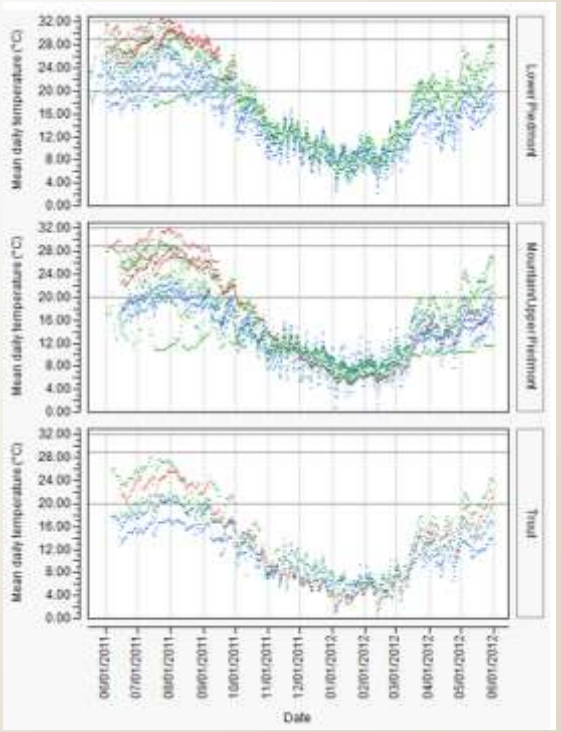
Stream Projects (Macroinvertebrate Focused)

Stream Restoration and Urban Streams

- Reassessing criteria for impaired urban waters and stream restorations (2018)
- Stream restoration ecological function: Macroinvertebrates (2002)
- Small stream mitigation biocriteria (2014)

Impacts of small impoundments

- Abiotic and biotic impacts of small impoundments (2013, 2016)



Stream Projects

Significant nexus

- Documenting significant nexus – headwater streams/wetlands to navigable waters in the Southeast (2011)

Coastal Streams

- Aquatic life in coastal streams (2010)

Buffers

- Correlating stream biology with buffer quality (2006)

Intermittent Streams

- Aquatic life in ephemeral, intermittent, and perennial reaches (2005)

THANK YOU

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Alabama Department of Environmental Management

US Army Corps of Engineers

U.S. FISH & WILDLIFE SERVICE

THE UNIVERSITY of NORTH CAROLINA at CHAPEL HILL

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