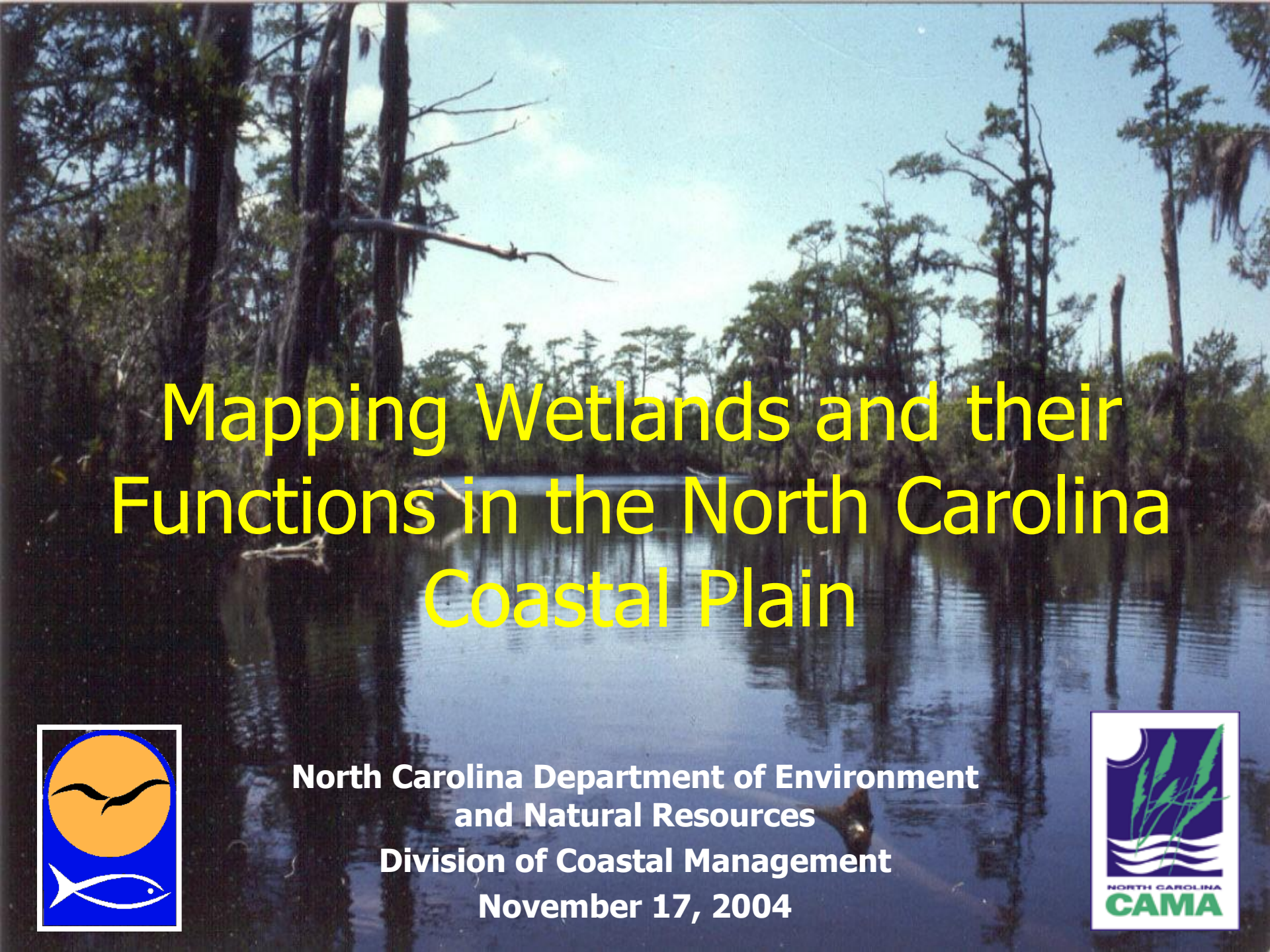


Mapping Wetlands and their Functions in the North Carolina Coastal Plain

North Carolina Department of Environment and Natural Resources

Division of Coastal Management

November 17, 2004

Background

- Freshwater wetlands receive less protection than coastal wetlands

- Needed to determine amount, type, location, functions and loss/gain trends

- Provide detailed information to aid decision-makers

Wetland Conservation Plan (1992)

- Wetland inventory
- Wetland functional assessment
- Wetland restoration
- Agency coordination
- Improve land use planning
- Education and outreach

Wetland Mapping Program

- **Wetland Mapping/ Classification**
- **Wetland Functional Assessment (NC-CREWS)**
- Locating Potential Restoration Sites
- Assessing Potential Functions of Restoration Sites

DCM's Wetland Type Data

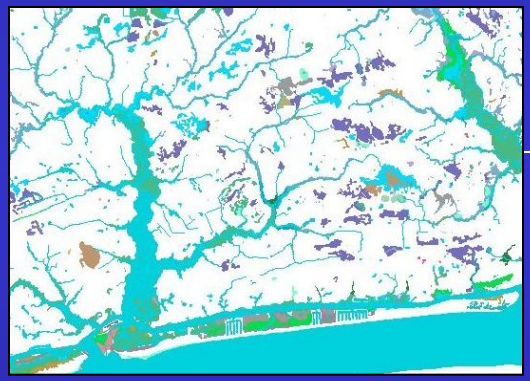
Wetland Mapping and Classification

About DCM's Wetland Maps

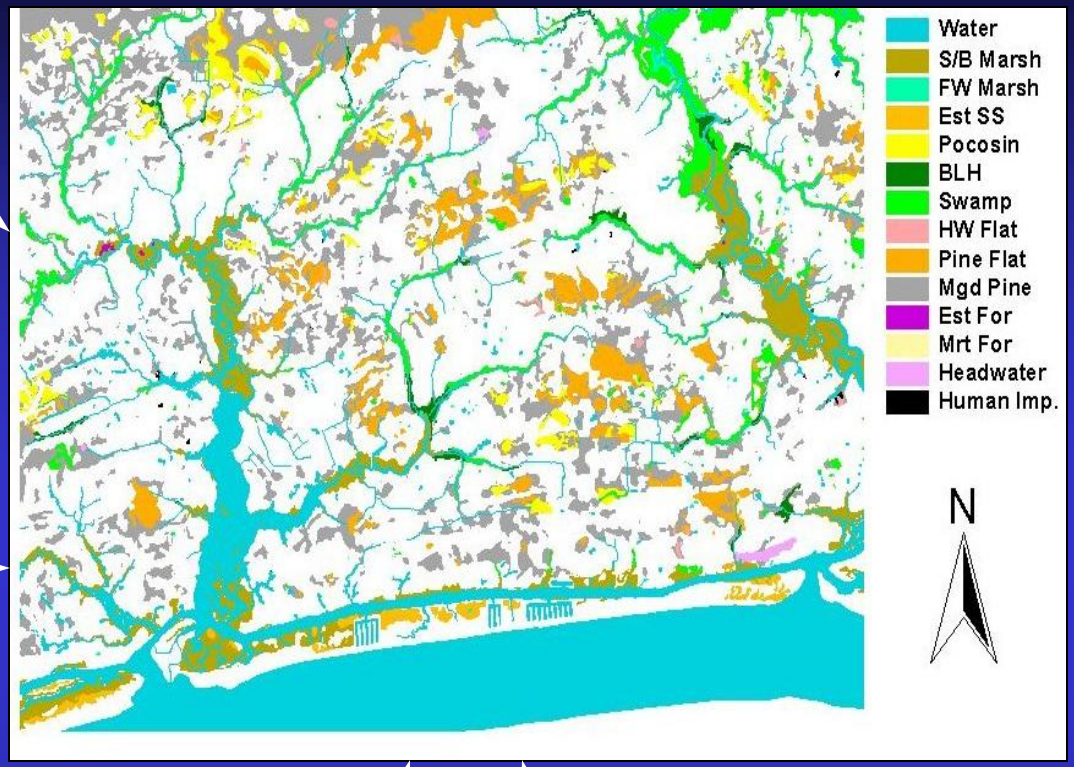
- Shows the ***location***, ***type***, and ***acreage*** of wetlands in the NC Coastal Plain
- Created by updating NWI maps using soils data and land use/land cover
- 13 manageable, easy-to-understand wetland types based on major HGM classes

NWI Wetland Maps

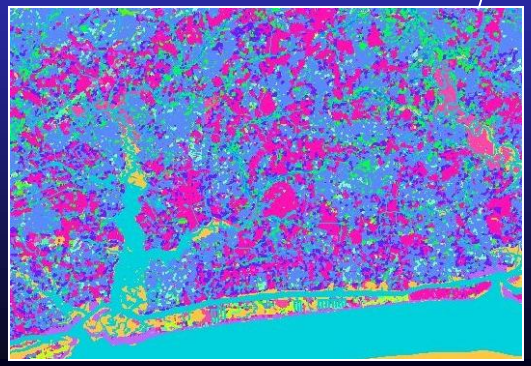
NRCS Digital County Soils Data



DCM Wetland Data



LandSat 30M TM Imagery - 1988, 1994



1:24,000 Hydrography

Mapping Wetlands

- A series of decision rules used to update NWI using the other data layers
- Hydrography used to separate BLH, Headwaters, and Hardwood Flats
- Land use data to locate cleared and recently cutover areas
- Hydric soils used to locate managed pine

DCM Wetland Classification

Riverine:

- Bottomland Hardwood
- Swamp Forest
- Headwater Swamp
- Freshwater Marsh

Estuarine:

- Salt/Brackish Marsh
- Estuarine Scrub Shrub
- Estuarine Forest
- Maritime Swamp Forest

Flat/Depressional:

- Pocosin
- Pine Flat
- Hardwood Flat
- Managed Pine
- Swamp Forest
- Freshwater Marsh

Other:

- Human Impacted

Condition Modifiers

- **Partially Drained/ Ditched** – Drained or ditched modifier in NWI

- **Cut-over** – NWI polygons without vegetation in 1994 imagery

- **Cleared** - NWI polygons without vegetation in both 1988 and 1994 imagery

Accuracy Assessment

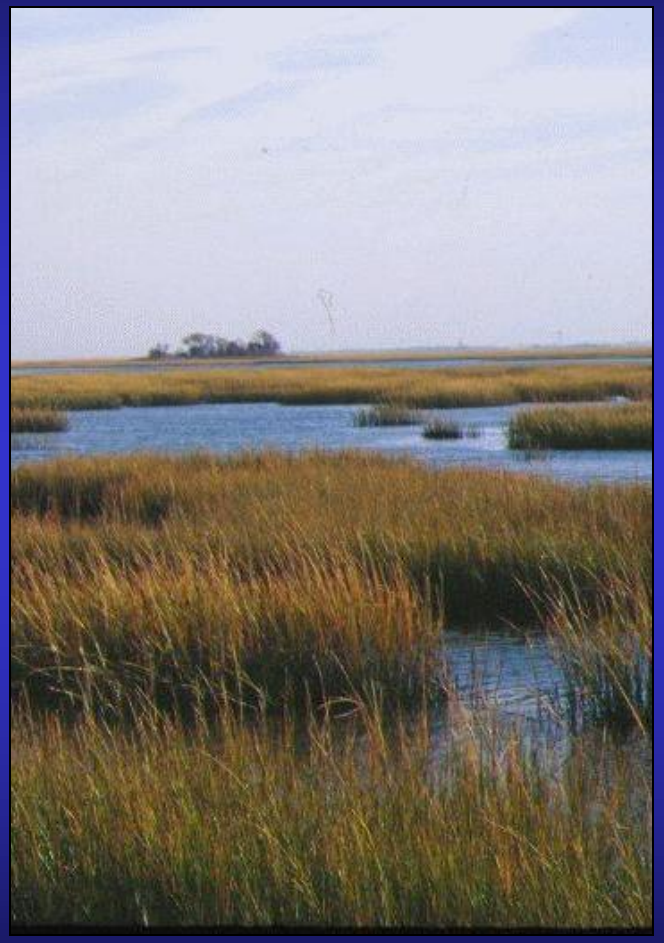
- Over 600 field sites visited
- Overall Accuracy = 81%

	Upland	Wetland
User's Accuracy	73%	89%
Producer's Accuracy	86%	79%

Wetland Classification

Highest Accuracy:

- Salt/brackish marsh
- Riverine Swamp/ BLH
- Estuarine Shrub/Scrub
- Freshwater marsh



Wetland Classification

Lowest Accuracy:

- Headwater Wetlands
- Hardwood Flats
- Pine Flats
- Managed Pine

NC-CREWS

The **N**orth **C**arolina **C**oastal **R**egion **E**valuation of **W**etland **S**ignificance

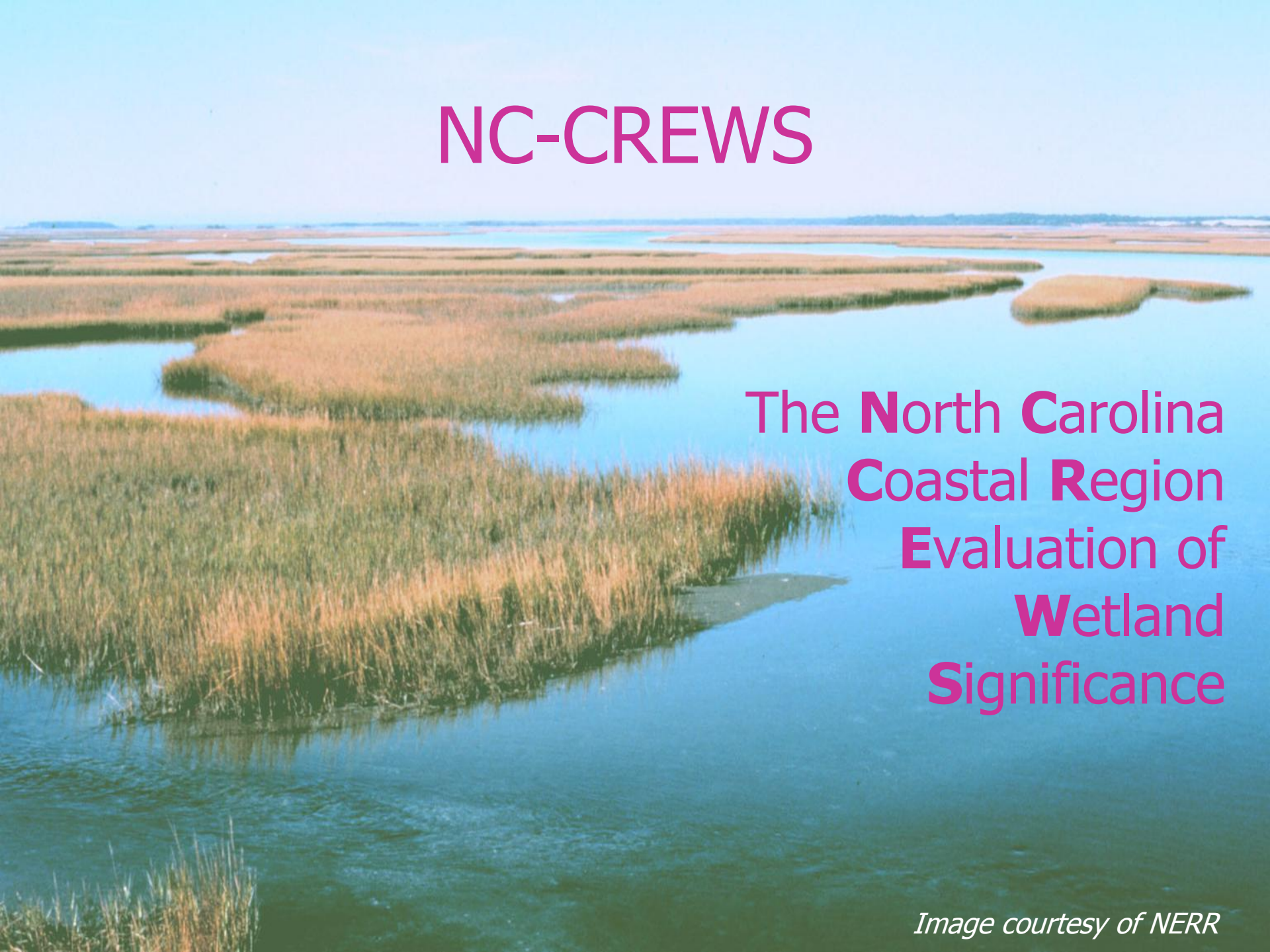


Image courtesy of NERR

"A ***GIS-based***, ***landscape scale*** procedure for predicting the ***relative ecological significance*** of wetlands throughout a region using fundamental ecological principles to determine the functions of wetlands ***within their watersheds***"

What is NC-CREWS ***Not***?

- Ground-truth data used to inform permitting decisions

- A substitute for a site visit or wetland delineation

Primary GIS Data Sources

- Wetland boundaries and types
- Digital soils data
- Land use / land cover
- Hydrography
- Watershed boundaries

Additional GIS Data Sources

- Threatened and Endangered species
- Natural Heritage Program
- Estuarine primary nursery areas
- Anadromous fish spawning areas
- Water Quality classifications

Field Assessments

- Data collected at nearly 400 sites to determine correlations between wetland type and specific wetland functions

- Used a survey of functional indicators developed by Dr. Mark Brinson (ECU)

The NC-CREWS Model

- Consists of 39 parameters grouped into 3 primary functions: ***Water Quality***, ***Hydrology***, and ***Habitat***
- 21 parameters represent landscape characteristics
- 18 parameters represent internal characteristics of the wetland itself

NC-CREWS Ratings

Boolean logic used to combine parameters into subfunction ratings, function ratings, and an overall rating:

Exceptional Functional Significance

Substantial Functional Significance

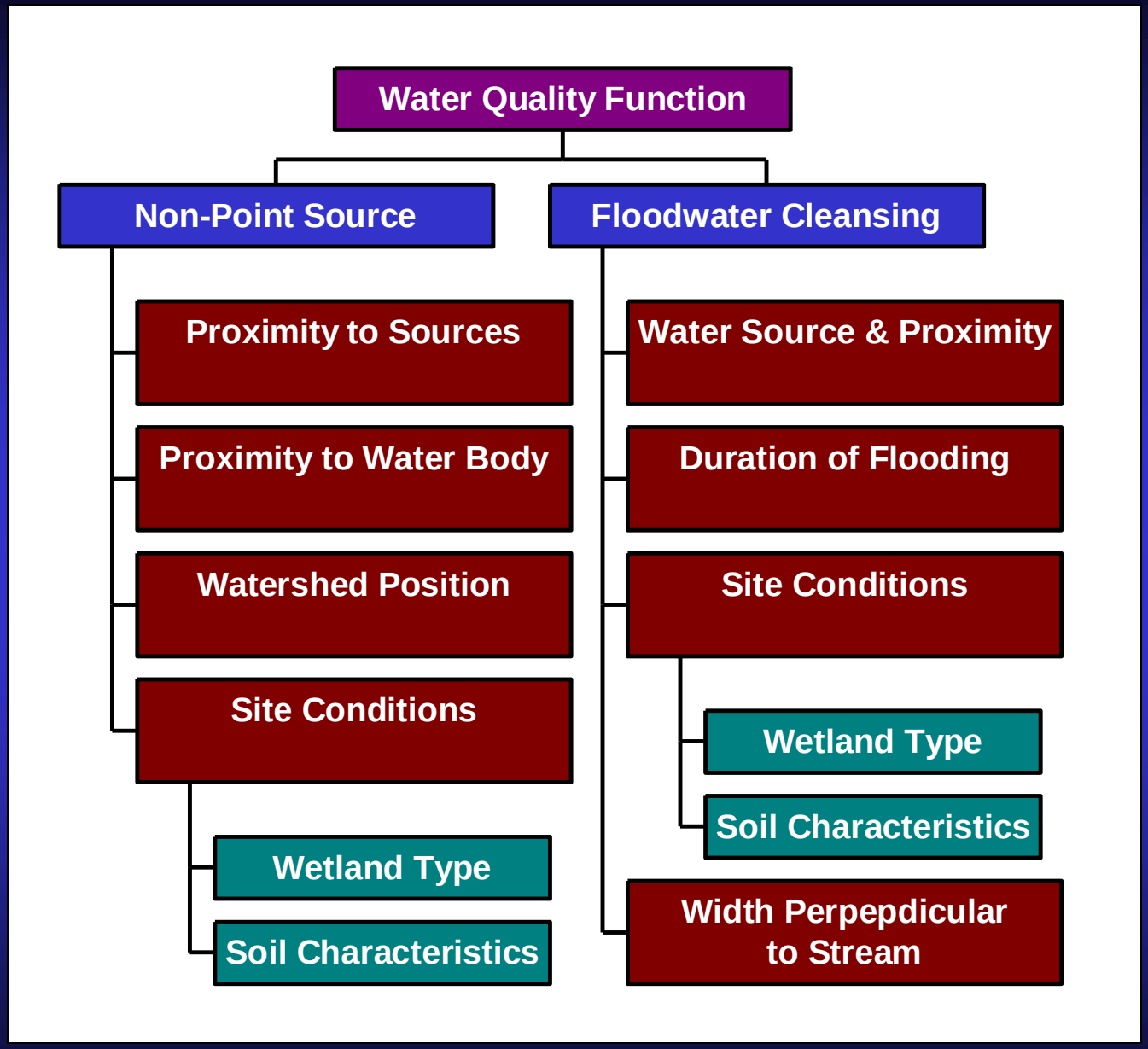
Beneficial Functional Significance

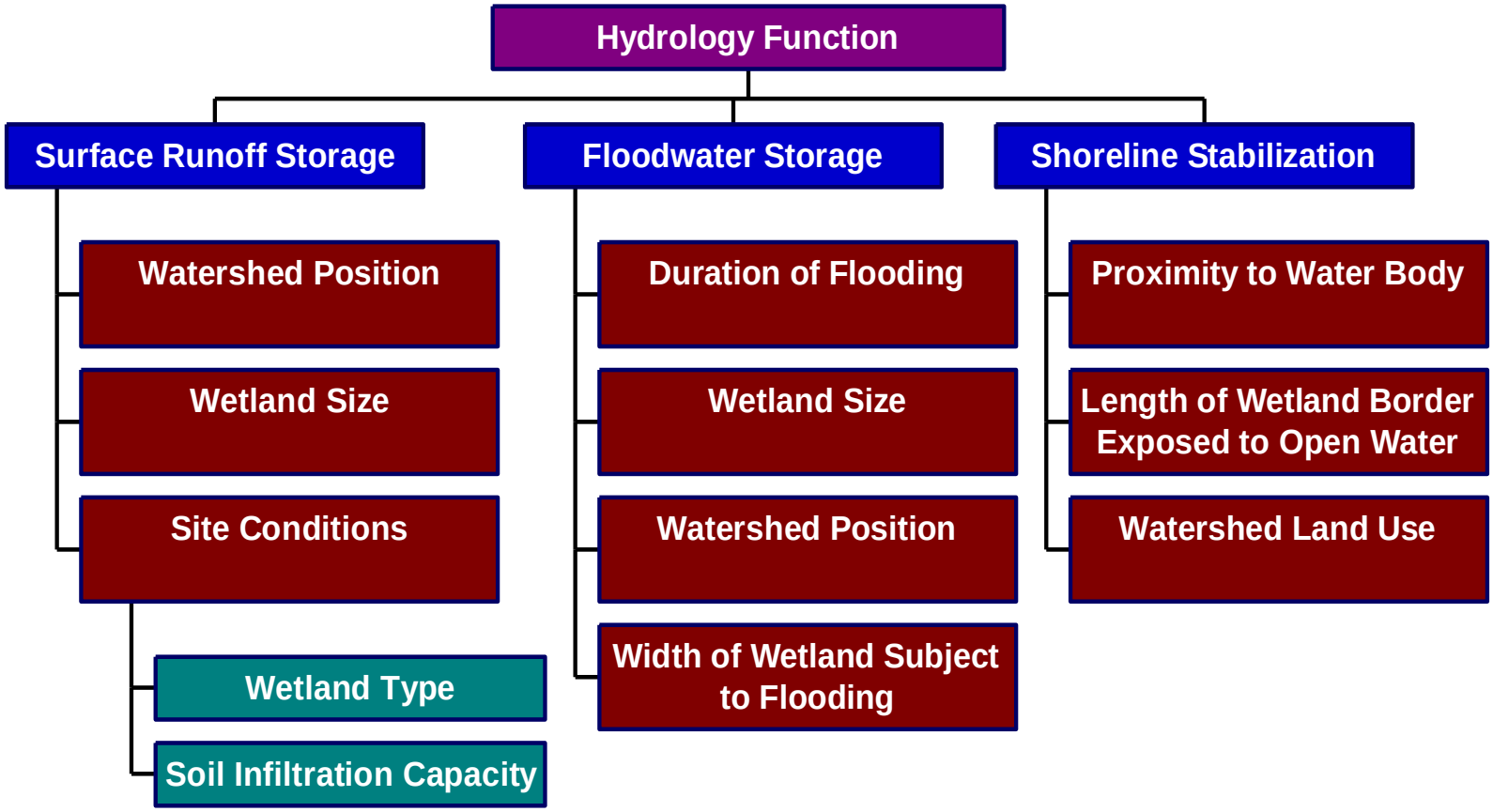
HGM Classifications

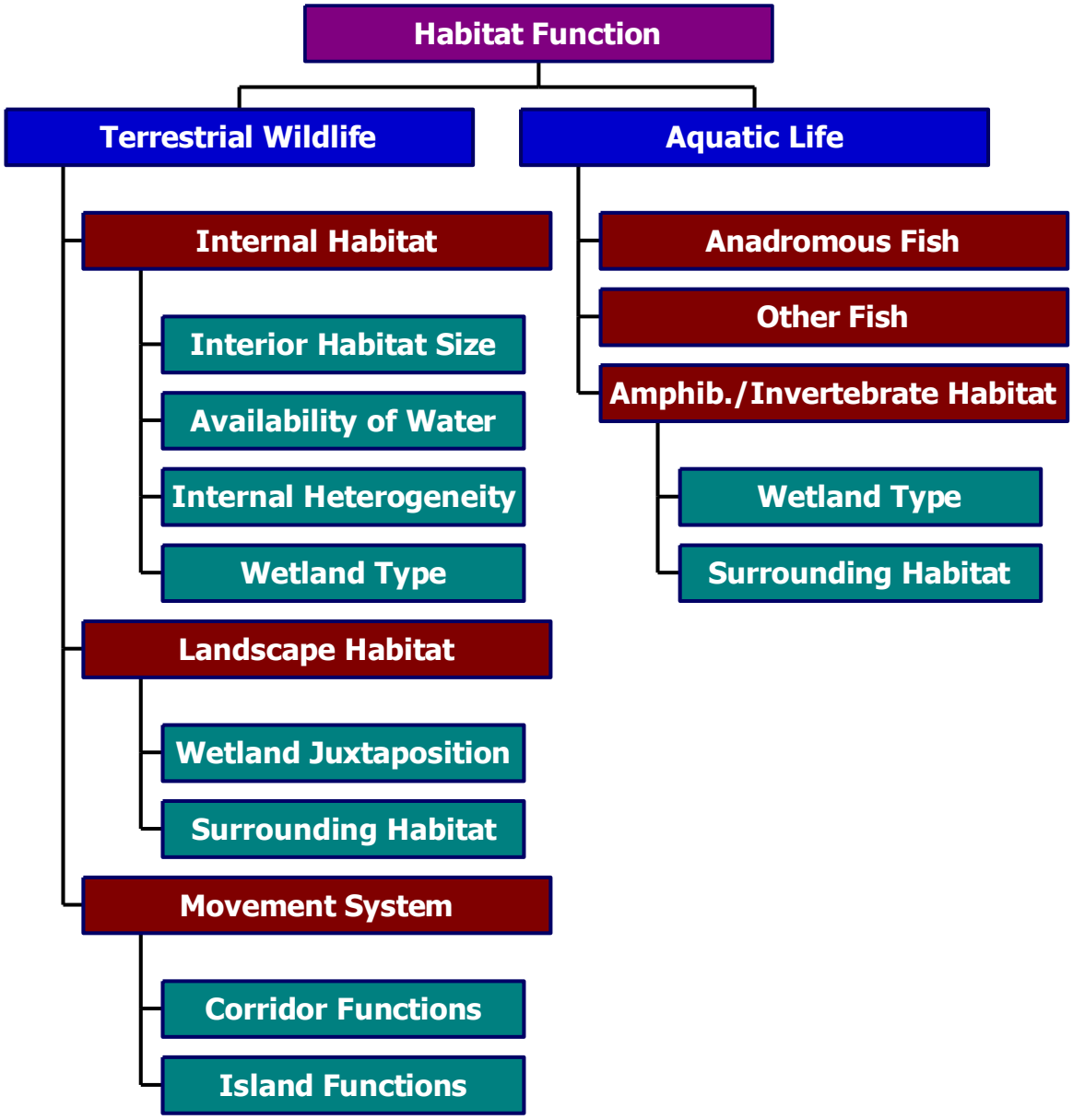
- A separate model for ***depressional*** wetlands than for ***headwaters*** and ***riverine*** wetlands
- All ***estuarine*** wetlands were assumed to have high functional significance

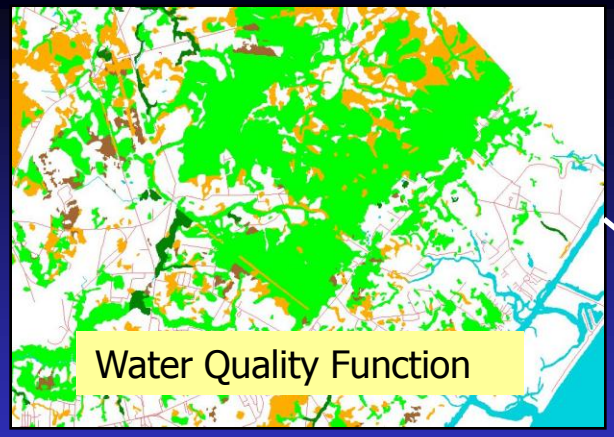
Opportunity vs. Condition

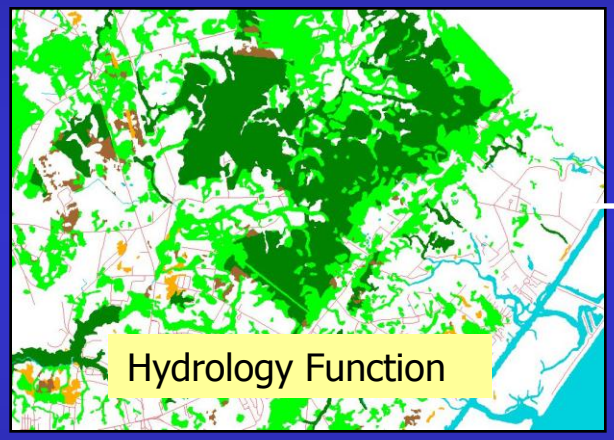
- Includes opportunity without discounting wetlands that lacked opportunity
- Opportunity treated as a "bonus"
- Opportunity is not required for an "exceptional" rating, but can increase the rating of "substantial" wetlands

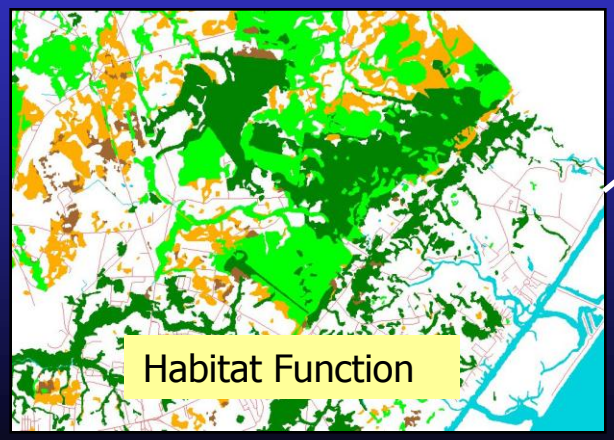

Water Quality Function
Non-Point Source
Floodwater Cleansing
Proximity to Sources
Proximity to Water Body
Watershed Position
Site Conditions
Wetland Type
Soil Characteristics
Water Source & Proximity
Duration of Flooding
Site Conditions
Wetland Type
Soil Characteristics
Width Perpepdicular to Stream

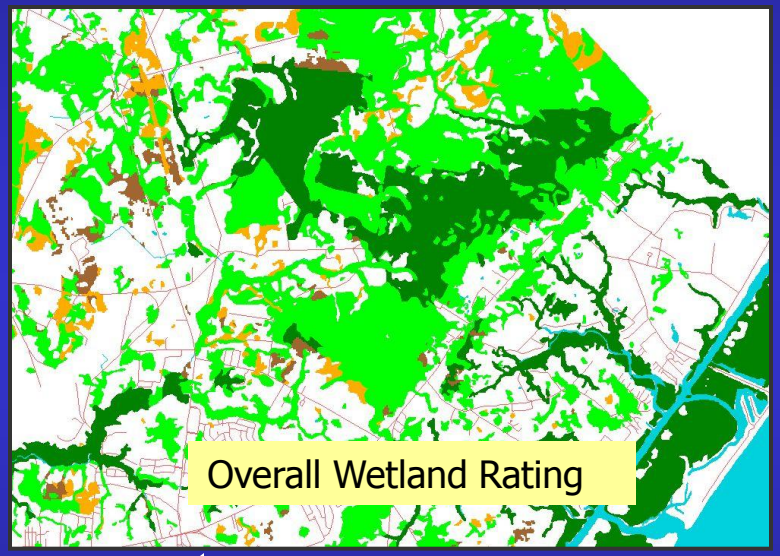

Hydrology Function
Surface Runoff Storage
Floodwater Storage
Shoreline Stabilization
Watershed Position
Wetland Size
Site Conditions
Wetland Type
Soil Infiltration Capacity
Duration of Flooding
Wetland Size
Watershed Position
Width of Wetland Subject to Flooding
Proximity to Water Body
Length of Wetland Border Exposed to Open Water
Watershed Land Use


Habitat Function
Terrestrial Wildlife
Aquatic Life
Internal Habitat
Interior Habitat Size
Availability of Water
Internal Heterogeneity
Wetland Type
Landscape Habitat
Wetland Juxtaposition
Surrounding Habitat
Movement System
Corridor Functions
Island Functions
Anadromous Fish
Other Fish
Amphib./Invertebrate Habitat
Wetland Type
Surrounding Habitat









Overriding Conditions

Overriding Considerations

Automatically rated "exceptional":

- Estuarine or Coastal Wetlands
- Primary Nursery Areas
- Threatened or endangered species
- Natural Heritage Program

Wetlands adjacent to an "exceptional" wetland can not rate lower than "substantial"

Determining Overall Ratings

How do wetlands get rated as ***Exceptional***?

- Any two primary functions rated High
- Overriding consideration

Determining Overall Ratings

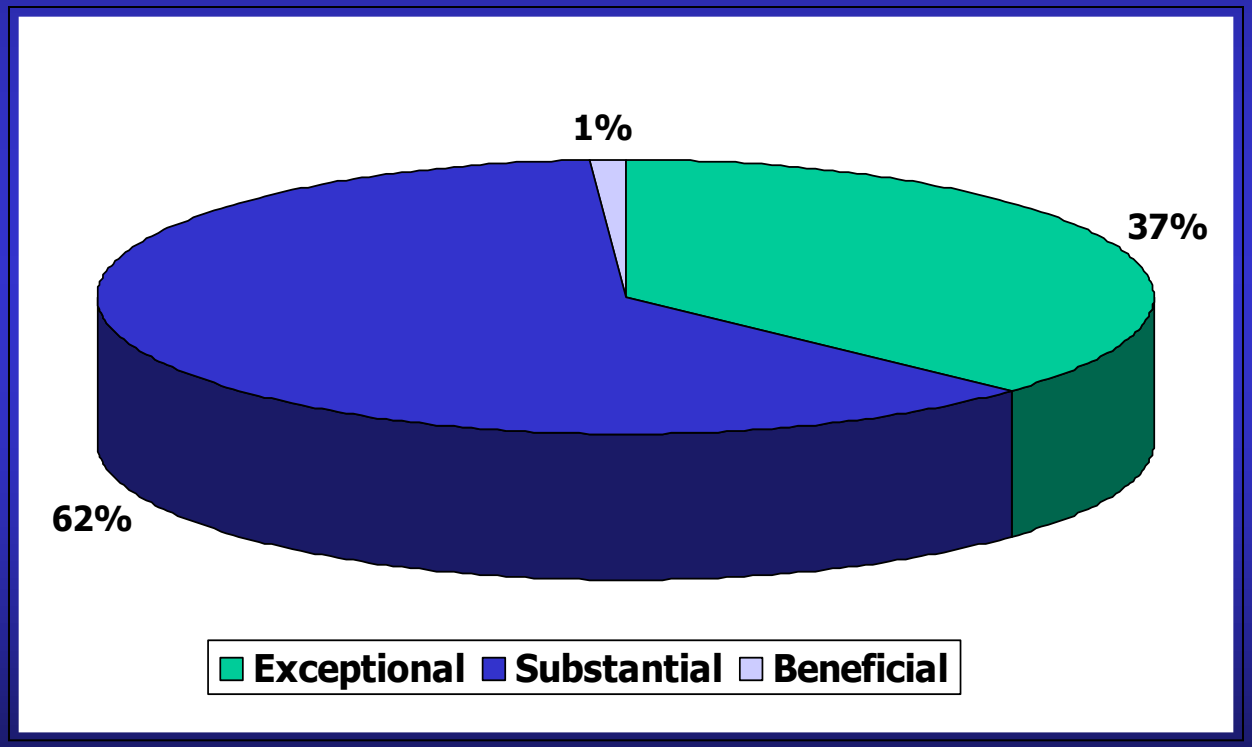
How do wetlands get rated as ***Substantial***?

- One primary function rated High and no more than one rated low
- Adjacent to Exceptional wetland

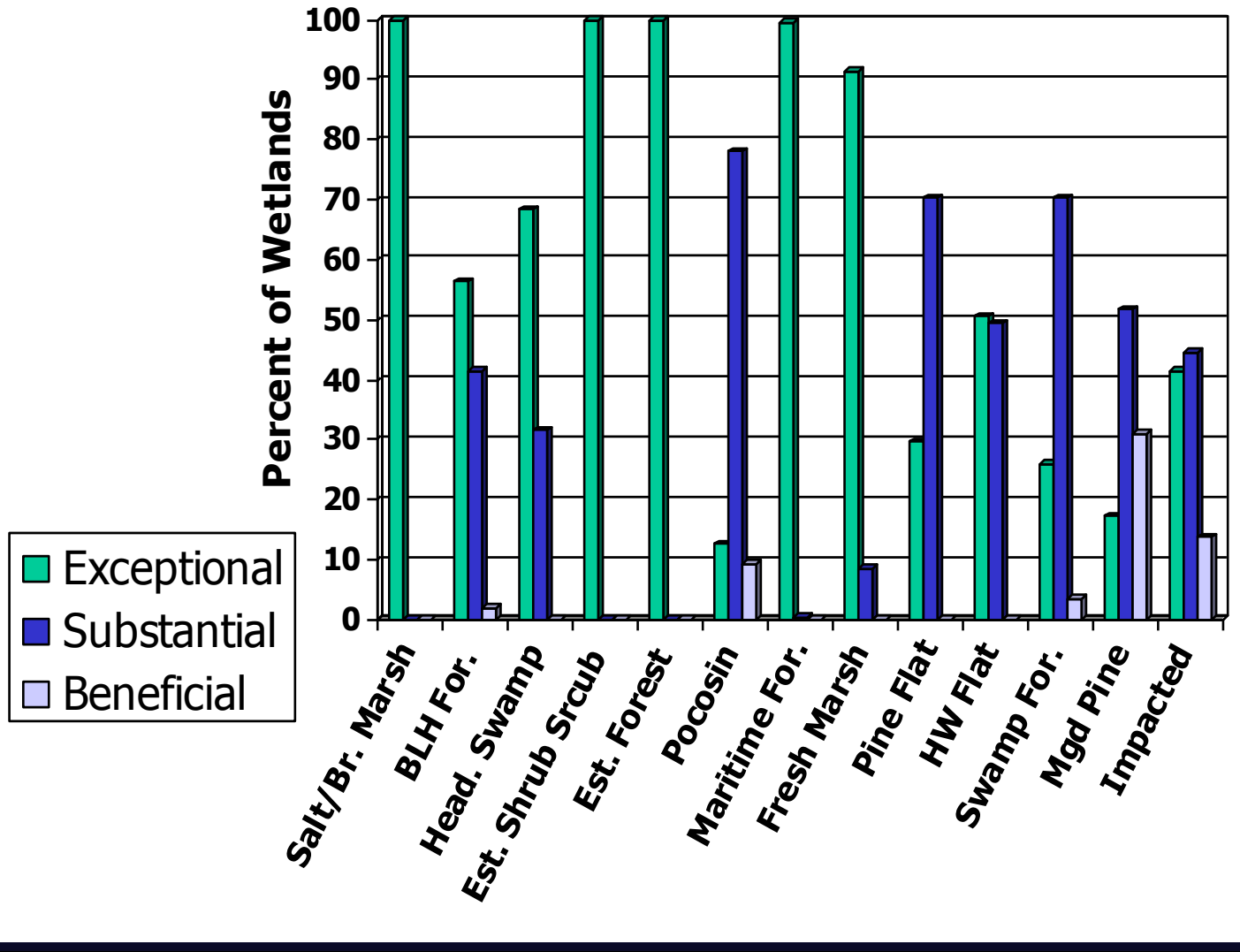
How do wetlands get rated as ***Beneficial***?

- Two primary functions rated Low and none High

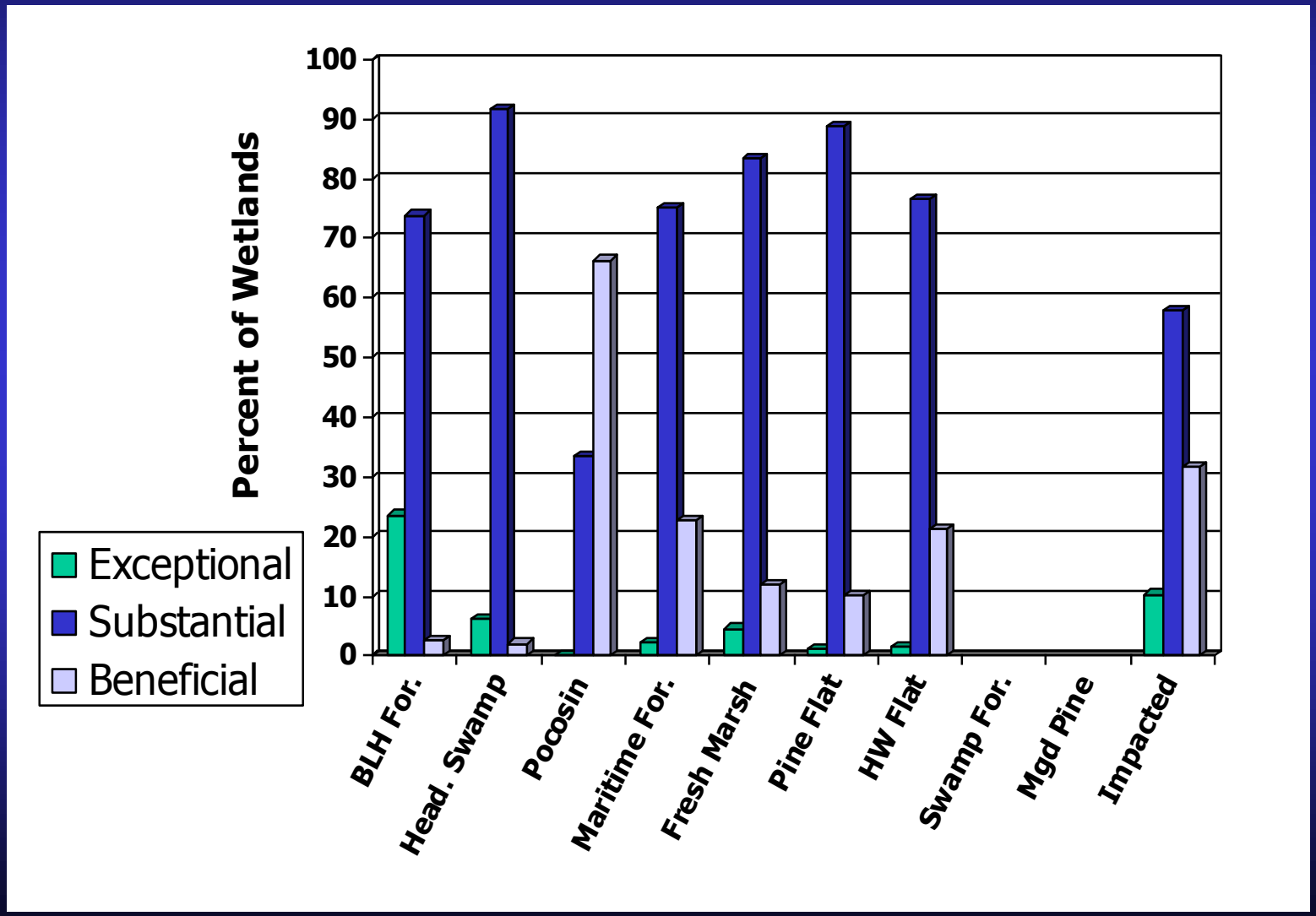
Distribution of Overall Wetland Ratings



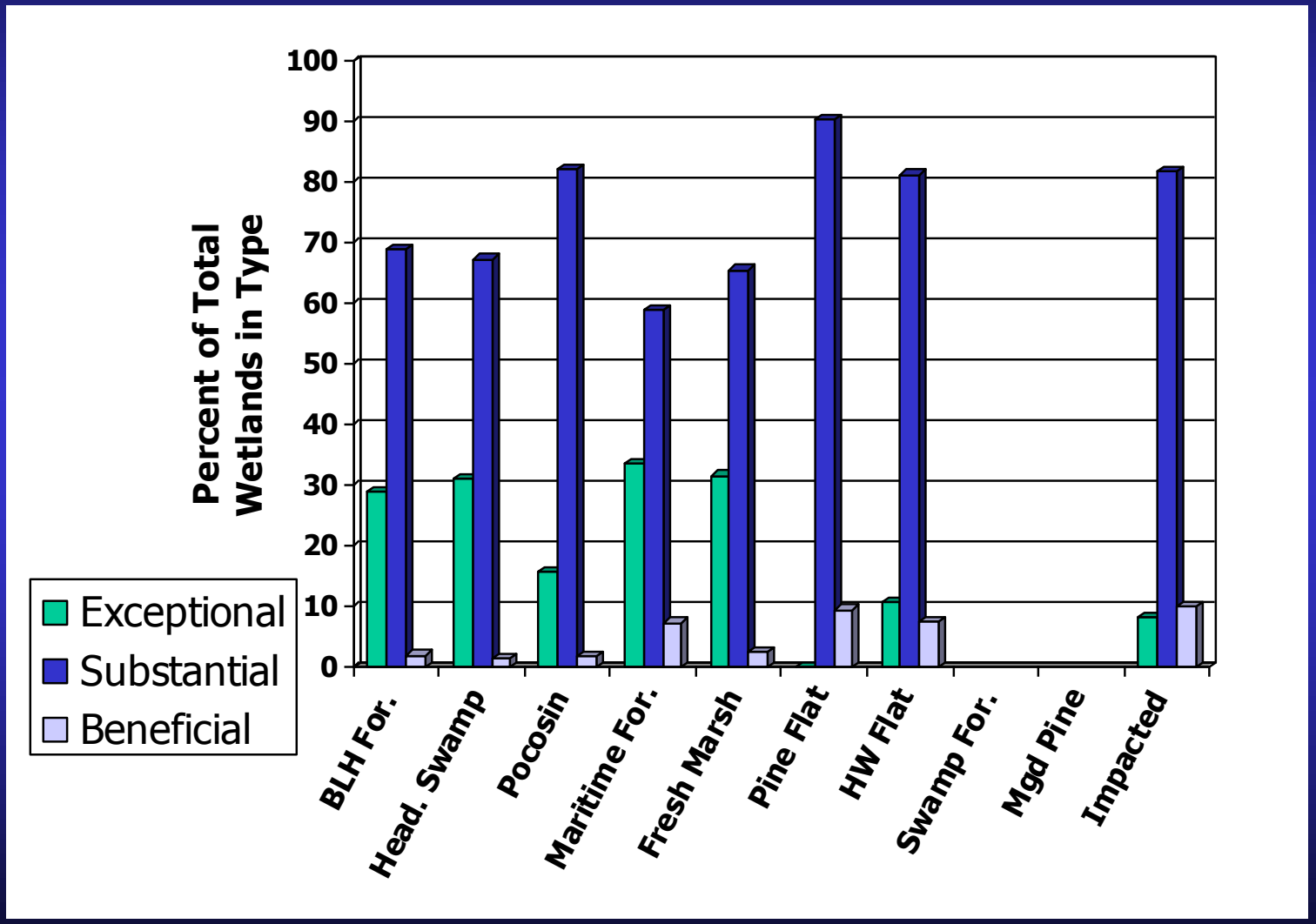
Overall Ratings



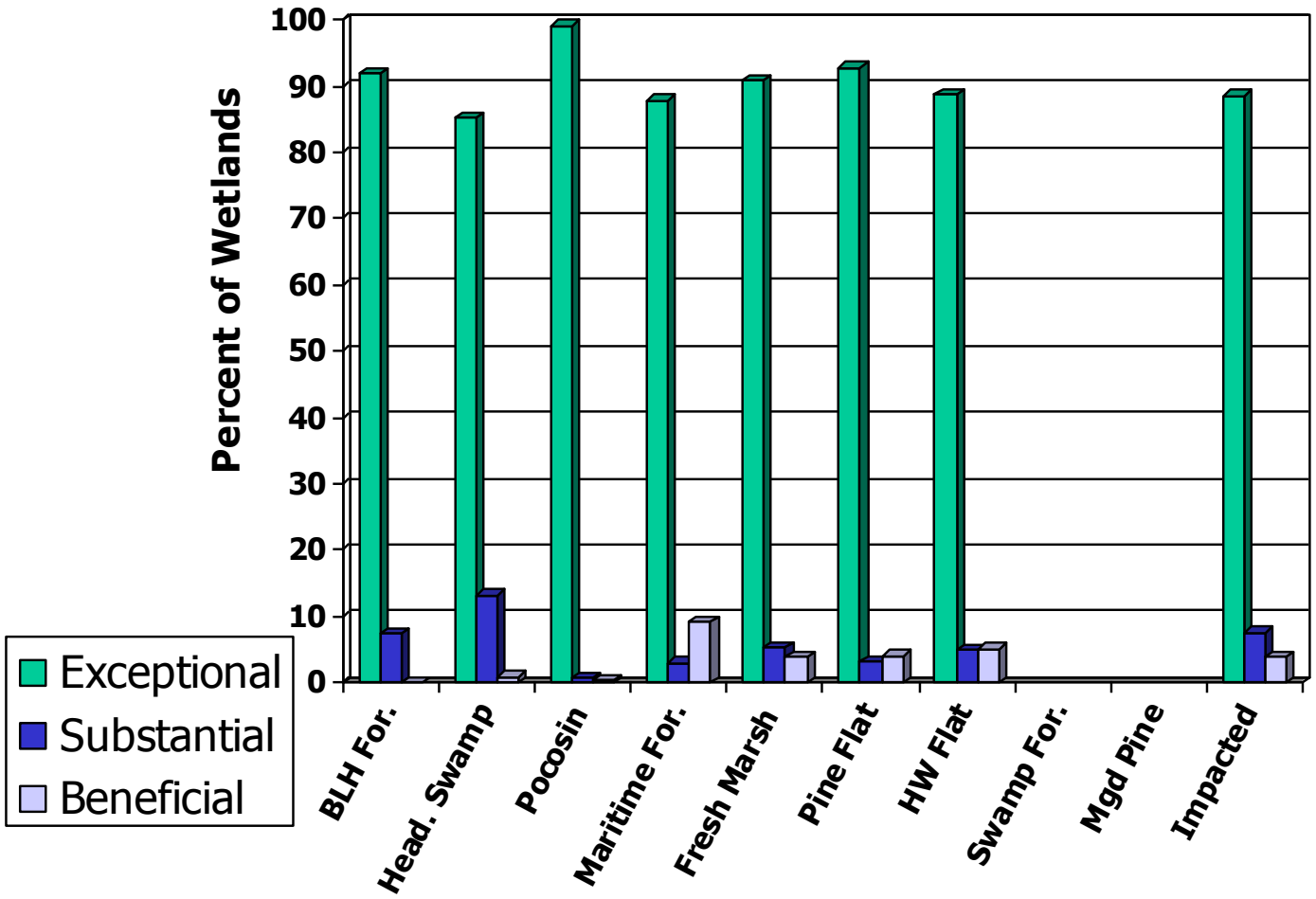
Water Quality Function



Hydrology Function

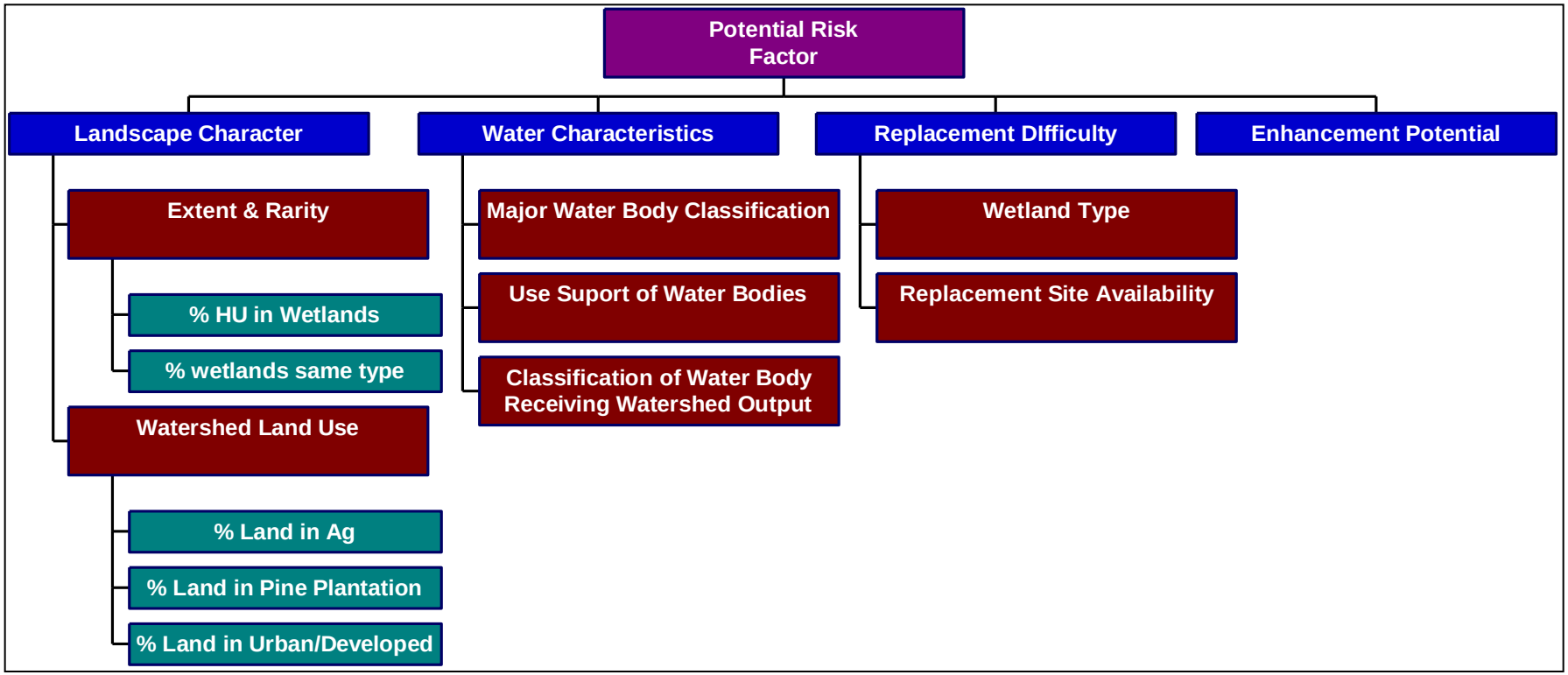


Habitat Function

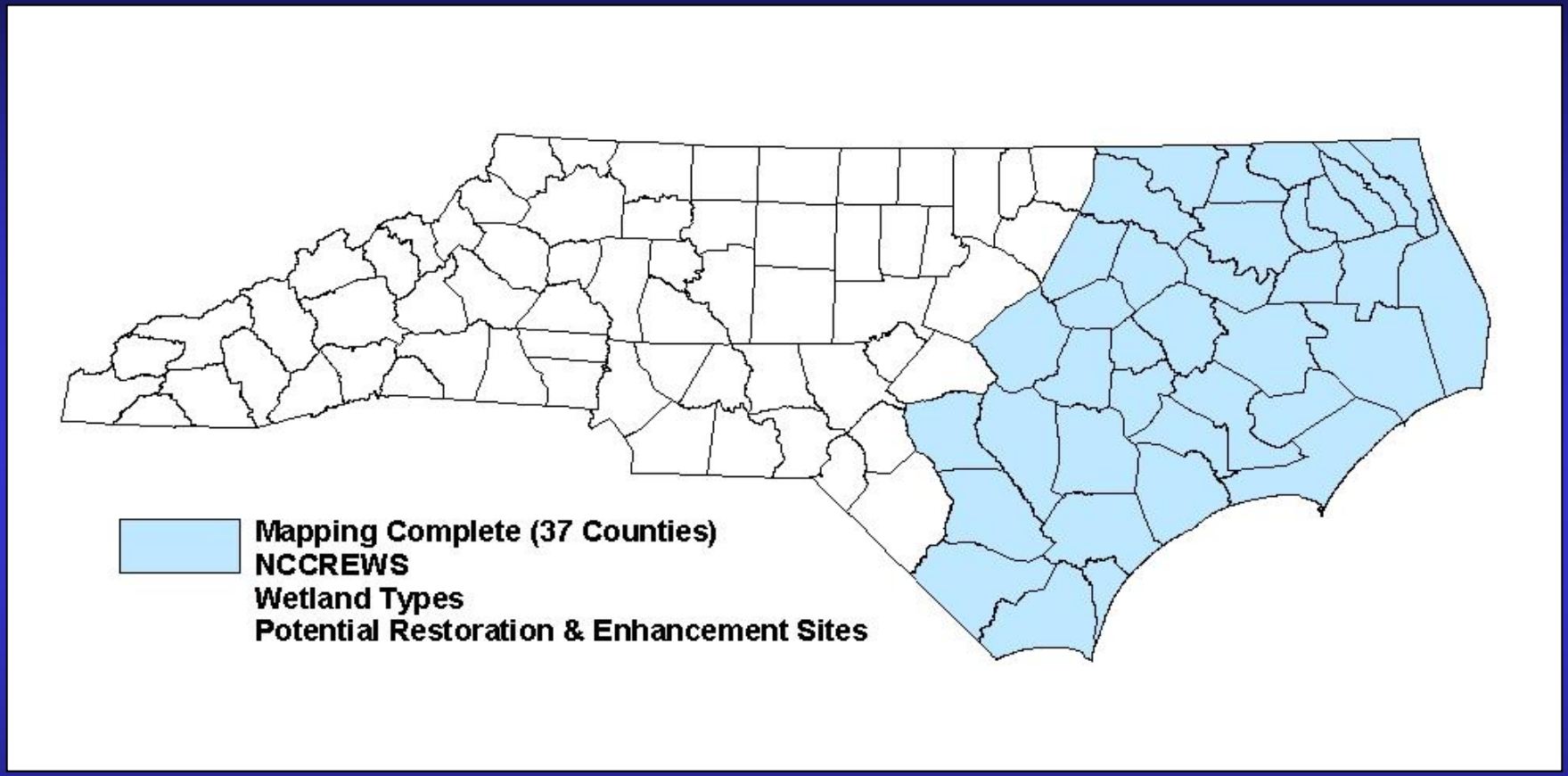


Potential Risk Factor

- Estimates potential risk to watershed and landscape integrity if the wetland functions were lost
- Indicator of cumulative impact
- Separate model (not included in overall NC-CREWS rating)


Potential Risk Factor
Landscape Character
Water Characteristics
Replacement DIfficulty
Enhancement Potential
Extent & Rarity
% HU in Wetlands
% wetlands same type
Watershed Land Use
% Land in Ag
% Land in Pine Plantation
% Land in Urban/Developed
Major Water Body Classification
Use Suport of Water Bodies
Classification of Water Body Receiving Watershed Output
Wetland Type
Replacement Site Availability

DCM Data Availability



Download Data, Metadata, and Documents for CAMA Counties Online:
http://www.nccoastalmanagement.net/Wetlands