



## The Carolina Vegetation Survey

### *Southeast Region Inventory & Monitoring Network*

*The Inventory and Monitoring Initiative is part of the National Wildlife Refuge System and will directly support the science-based management of the Nation's 554 National Wildlife Refuges and 38 Wetland Management Districts that manage more than 150 million acres of public lands and waters across the United States in all 50 States, several Territories, and the marine environment.*

*The underpinning legislation guiding the formation of the Inventory and Monitoring Initiative is the National Wildlife Refuge System Improvement Act of 1997 (P.L. 105-57). The Act states that the Secretary shall, "monitor the status and trends of fish, wildlife, and plants in each refuge."*

#### Background

Plant species and the associations they form are critical components of Earth's ecosystems. All species within a region and their distribution within that region are known, collectively, as "vegetation". Understanding the processes that define vegetation distribution is necessary for successful conservation and restoration efforts on the lands managed by the National Wildlife Refuge System (NWRS).

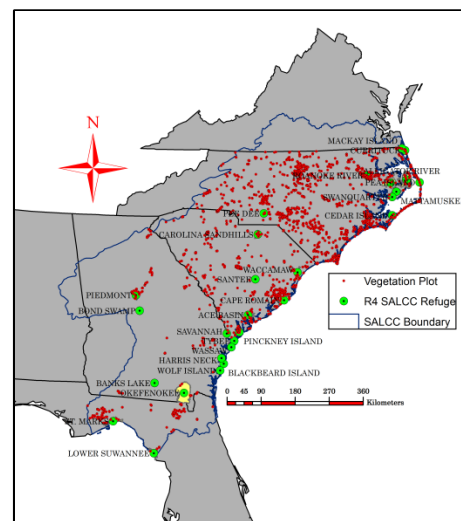


Plot setup at Pinckney Island NWR  
Credit: M. Forbes Boyle/USFWS

#### What is needed?

There are 28 National Wildlife Refuges in Region 4 that make up over 1.1 million acres of public conservation lands within the South Atlantic Landscape Conservation Cooperative (LCC). Although each refuge has varying degrees of information regarding its own vegetation—e.g., vascular species lists, forest cover map, timber inventory—there are too little robust, quantitative datasets describing refuge vegetation composition and structure, and how these systems relate to similar natural associations across the landscape. The Carolina Vegetation Survey (CVS) is a multi-institutional program designed to document and share information on

the natural vegetation systems of the Carolinas. The program offers a standard sampling protocol, national database design standards, and a catalog of over 8,000 plots dating back to the 1970's.



Current distribution of 4,400+ Level 5 CVS plots within the USFWS Region 4 and the South Atlantic LCC

#### The CVS plot

The protocol established by the CVS provides for flexibility of the size and shape of the vegetation plot, so that the observer and sample can account for the natural vegetation pattern of the targeted unit. A plot is defined as any array of 100 m<sup>2</sup> modules, with the standard size and shape containing ten 10x10 m modules arrayed in a 50x20 m rectangle. Within a plot, species presence is recorded across multiple scales of observation (e.g., 0.01, 0.1, 1.0, 10, 100 and 1000 m<sup>2</sup>), and areal cover is calculated for species. Woody stems are tallied by species and diameter class. Finally, soil and landform properties are described, along with plot metadata (e.g., plot location).

<p><b>Alligator River NWR</b></p> <ul style="list-style-type: none"> <li>• Atlantic Coastal Plain Blackwater Stream Floodplain Forest (1)</li> <li>• Atlantic Coastal Plain Embayed Region Tidal Freshwater Marsh (3)</li> <li>• Atlantic Coastal Plain Peatland Pocosin and Canebrake (12)</li> <li>• Central Atlantic Coastal Plain Maritime Forest (1)</li> <li>• Northern Atlantic Coastal Plain Subtidal Aquatic Bed (1)</li> <li>• Southern Atlantic Coastal Plain Depression Pond (2)</li> <li>• Southern Atlantic Coastal Plain Nonriverine Swamp and Wet Hardwood Forest (4)</li> <li>• Southern Atlantic Coastal Plain Tidal Wooded Swamp (2)</li> </ul>	<p><b>Currituck NWR, cont.</b></p> <ul style="list-style-type: none"> <li>• Northern Atlantic Coastal Plain Maritime Forest (1)</li> <li>• Southeastern Coastal Plain Interdunal Wetland (2)</li> <li>• Southern Atlantic Coastal Plain Dune and Maritime Grassland (8)</li> <li>• Southern Coastal Plain Oak Dome and Hammock (1)</li> </ul>	<p><b>Pinckney Island NWR</b></p> <ul style="list-style-type: none"> <li>• Atlantic Coastal Plain Small Blackwater River Floodplain Forest (1)</li> <li>• Southern Atlantic Coastal Plain Large River Floodplain Forest (1)</li> <li>• Southern Atlantic Coastal Plain Maritime Forest (5)</li> <li>• Southern Atlantic Coastal Plain Mesic Hardwood Forest (4)</li> <li>• Southern Atlantic Coastal Plain Salt and Brackish Tidal Marsh (9)</li> </ul>
	<p><b>Lower Suwannee NWR</b></p> <ul style="list-style-type: none"> <li>• Florida Longleaf Pine Sandhill (2)</li> <li>• Gulf Coastal Plain Near-Coast Pine Flatwoods (2)</li> </ul>	<p><b>Pocosin Lakes NWR</b></p> <ul style="list-style-type: none"> <li>• Southeastern Coastal Plain Natural Lakeshore (2)</li> <li>• Southern Atlantic Coastal Plain Nonriverine Swamp and Wet Hardwood Forest (1)</li> <li>• Southern Atlantic Coastal Plain Tidal Wooded Swamp (2)</li> </ul>
<p><b>Cape Romain NWR</b></p> <ul style="list-style-type: none"> <li>• Central Atlantic Coastal Plain Maritime Forest (1)</li> <li>• Southern Atlantic Coastal Plain Dune and Maritime Grassland (4)</li> <li>• Southern Atlantic Coastal Plain Salt and Brackish Tidal Marsh (3)</li> </ul>	<p><b>Mackay Island NWR</b></p> <ul style="list-style-type: none"> <li>• Atlantic Coastal Plain Embayed Region Tidal Freshwater Marsh (3)</li> <li>• Southern Atlantic Coastal Plain Dune and Maritime Grassland (1)</li> </ul>	<p><b>Roanoke NWR</b></p> <ul style="list-style-type: none"> <li>• Atlantic Coastal Plain Embayed Region Tidal Freshwater Marsh (2)</li> <li>• Atlantic Coastal Plain Small Brownwater River Floodplain Forest (4)</li> <li>• Northern Atlantic Coastal Plain Fresh and Oligohaline Tidal Marsh (1)</li> <li>• Northern Atlantic Coastal Plain Stream and River (3)</li> <li>• Southern Atlantic Coastal Plain Large River Floodplain Forest (32)</li> <li>• Southern Atlantic Coastal Plain Tidal Wooded Swamp (2)</li> </ul>
<p><b>Carolina Sandhills NWR</b></p> <ul style="list-style-type: none"> <li>• Atlantic Coastal Plain Fall-line Sandhills Longleaf Pine Woodland (8)</li> <li>• Atlantic Coastal Plain Sandhill Seep (1)</li> <li>• Atlantic Coastal Plain Streamhead Seepage Swamp, Pocosin and Baygall (2)</li> <li>• Southern Atlantic Coastal Plain Large River Floodplain Forest (1)</li> </ul>	<p><b>Pea Island NWR</b></p> <ul style="list-style-type: none"> <li>• Atlantic Coastal Plain Embayed Region Tidal Freshwater Marsh (1)</li> <li>• Atlantic Coastal Plain Embayed Region Tidal Salt and Brackish Marsh (8)</li> <li>• Central Atlantic Coastal Plain Sandy Beach (1)</li> <li>• Southern Atlantic Coastal Plain Dune and Maritime Grassland (2)</li> <li>• Southern Atlantic Coastal Plain Sea Island Beach (2)</li> </ul>	<p><b>St. Marks NWR</b></p> <ul style="list-style-type: none"> <li>• East Gulf Coastal Plain Maritime Forest (1)</li> <li>• East Gulf Coastal Plain Near-Coast Pine Flatwoods (5)</li> <li>• Florida Longleaf Pine Sandhill (5)</li> <li>• Southern Atlantic Coastal Plain Wet Pine Savanna and Flatwoods (1)</li> <li>• Southern Coastal Plain Herbaceous Seep and Bog (3)</li> </ul>
<p><b>Cedar Island NWR</b></p> <ul style="list-style-type: none"> <li>• Atlantic Coastal Plain Embayed Region Tidal Salt and Brackish Marsh (3)</li> <li>• Atlantic Coastal Plain Upland Longleaf Pine Woodland (1)</li> <li>• Central Atlantic Coastal Plain Wet Longleaf Pine Savanna and Flatwoods (4)</li> <li>• Southern Atlantic Coastal Plain Dune and Maritime Grassland (2)</li> </ul>	<p><b>Pee Dee NWR</b></p> <ul style="list-style-type: none"> <li>• Piedmont Seepage Wetland (2)</li> <li>• Southern Atlantic Coastal Plain Large River Floodplain Forest (1)</li> <li>• Southern Piedmont Large Floodplain Forest (6)</li> <li>• Southern Piedmont Small Floodplain and Riparian Forest (2)</li> </ul>	<p><b>Swanquarter NWR</b></p> <ul style="list-style-type: none"> <li>• Atlantic Coastal Plain Embayed Region Tidal Freshwater Marsh (1)</li> <li>• Atlantic Coastal Plain Embayed Region Tidal Salt and Brackish Marsh (5)</li> <li>• Central Atlantic Coastal Plain Maritime Forest (1)</li> <li>• Northern Atlantic Coastal Plain Tidal Salt Marsh (2)</li> </ul>
<p><b>Currituck NWR</b></p> <ul style="list-style-type: none"> <li>• Atlantic Coastal Plain Embayed Region Tidal Freshwater Marsh (5)</li> <li>• Central Atlantic Coastal Plain Maritime Forest (1)</li> <li>• Northern Atlantic Coastal Plain Dune and Swale (1)</li> </ul>	<p><b>Piedmont NWR</b></p> <ul style="list-style-type: none"> <li>• Piedmont Hardpan Woodland and Forest (1)</li> <li>• Southern Piedmont Glade and Barrens (1)</li> </ul>	

*NatureServe Ecological Systems with current CVS plot coverage within National Wildlife Refuges of the South Atlantic LCC. The number of plots for each System is in parentheses.*

## The CVS database design

For data management the CVS uses the VegBank model, which supports multiple cover and stratum methods, in order to include projects not affiliated with the standard protocol. Several databases comprise the management system. These include a 1) Central Archive Database (normalized storage of all vegetation plots), 2) Data Entry Tool (optimized for efficient data entry), and 3) Analysis Database (searching, viewing, exporting plot information). All three were designed in Microsoft Access and are currently stored at the University of North Carolina-Chapel Hill.

## Vegetation description

Most of the dataset is summarized by vegetation association—the lowest

hierarchy within the National Vegetation Classification Standard (NVCS)—and can be viewed on the CVS website:

<http://cvs.bio.unc.edu>,

“Vegetation of the Carolina’s” tab. The detail contained within these plots can be applied in defining and refining vegetation types recognized by the NVCS. A total of 210 CVS plots, representing 42 Ecological Systems (NatureServe), are located on NWRS lands within the South Atlantic LCC (see table above). The majority of these plots occur on refuges in the Carolinas.

## Future directions

The CVS protocol is currently being used to describe and monitor vegetation structure and composition on marsh

elevation monitoring sites across 18 refuges in the South Atlantic LCC. Three 10x10 m permanent plots were established at each site by the Region 4 Inventory and Monitoring Network and refuge staff in the summer of 2013. Data from this baseline status assessment are currently being summarized, and will be available in the Fall of 2014.

## Contact

For additional information about the CVS effort, contact:

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