

# South Atlantic Landscape Conservation Cooperative

*Development and Operations Plan  
December 2009*



*USFWS/Garry Tucker*



## Acknowledgements

*While a number of individuals within several agencies and organizations were involved in pulling this plan together, the plan does not have the benefit of the multitude of individuals whose contributions will be instrumental to the success of the South Atlantic LCC. Thus, this plan is expected to undergo substantial improvements as the larger community engages in the cooperative.*

A core writing team consisting of Bob Ford (USFWS, Regional Science Coordinator), Joe DeVivo (US National Park Service, Southeast Regional Office), Amy Keister (USFWS, Lower Mississippi Joint Venture Office, on detail to SALCC), John Stanton (USFWS, Migratory Birds), Doug Newcomb (USFWS, Ecological Services, Raleigh, NC, Field Office) and Wilson Laney (USFWS, South Atlantic Fisheries Coordinator), prepared the original draft of this document. Sonya Jones and the scientists working on the Southeast Pilot Project (USGS) contributed text and reviewed portions of this document. Mike Harris (Georgia Wildlife Resources Division) provided comments and worked with other states in the LCC.

Additional materials and text were provided by members of the USFWS internal SALCC Advisory Team, Regional Office staff, and other field staff including Pete Campbell (USFWS, Ecological Services, Raleigh, NC, Field Office), Craig Watson (USFWS, Atlantic Coast Joint Venture), Raye Nilius (USFWS, South Carolina Lowcountry Refuges Complex), Bill Uihlein and Catherine Rideout (USFWS, Gulf Coastal Plain and Ozarks LCC), Andrew Milliken, Tim Jones, and Randy Dettmers (USFWS, North Atlantic LCC), Jeff Fleming (USFWS, Southeast Region, Assistant Regional Director-External Affairs), Stacy Shelton (USFWS, External Affairs) and Jackie Parrish (USFWS, Southeast Region, Assistant Regional Director-Budget and Administration).

The Interagency Scoping Team for the South Atlantic LCC had only a brief opportunity to review this document, but will be the group that continues to modify and grow the SALCC plan and concept until a Steering Committee and Coordinator are in place.

We thank those who had the opportunity to review and comment on short notice, including Laurel Barnhill (South Carolina Dept of Natural Resources), Mike Harris (GA WRD), Tom Eason (Florida Fish and Wildlife Conservation Commission), Emily Greene (Atlantic Coastal Fish Habitat Partnership), Scott Robinson (Southeastern Aquatic Resources Partnership), Mary Long (U.S. Forest Service), and Ashton Drew (North Carolina State University). We anticipate further review of this document as it evolves.

## Introduction

The South Atlantic Landscape Conservation Cooperative is one of 22 cooperatives proposed earlier this year by the U.S. Department of Interior to address unprecedented conservation challenges, headlined by climate change.

Landscape Conservation Cooperatives are envisioned as broad-based partnerships that will provide the science necessary to undertake strategic conservation efforts across large geographic areas. A coordinated network of these LCCs across the United States are the most effective way to address major environmental and human-related factors that limit fish and wildlife populations. The science provided by these partnerships will:

- Inform biological planning and conservation design;
- Help direct assumption-driven research and monitoring; and
- Ensure future conservation decisions are made in an adaptive management framework.

U.S. Department of Interior (DOI) agencies have committed financial and staff resources to make the South Atlantic LCC (SALCC) functional in 2010:

- The U.S. Fish and Wildlife Service (Service) will hire a full-time LCC coordinator in late winter, another position to be determined by LCC need, and provide dedicated staff support for other LCC needs, such as spatial analysis. The Service will also support core science projects that will be useful to all partners involved in the LCC.
- The U.S. Geological Survey (USGS) has committed to develop and continue southeastern regional science products via the Southeastern Pilot Project, and to also provide a science position in the South Atlantic.
- The National Park Service (NPS) has resources at hand to further science capacity and provide leadership for information management in the SALCC as well.
- Other DOI Bureaus, including Mineral Management Services, Office of Surface Mining, and Bureau of Indian Affairs, are exploring avenues for coordination with the Service's Southeast Region.

In addition, states and universities in the SALCC are exploring ideas for in-kind support, ranging from species climate change sensitivity assessments to GIS technology to sharing office space and staff expertise.

To date, the concept of such a dynamic partnership in the South Atlantic generally has been well received in the Southeastern U.S. and the South Atlantic region. Many organizations and existing partnerships recognize the need for coordinated efforts across multiple ecological scales to provide the science needed to act on traditional and new stresses to natural resources, while ensuring sustainable landscapes for our economy and standard of living.

The Service also is taking the lead in establishing LCCs covering the entire Eastern Seaboard (North Atlantic, South Atlantic, Peninsular Florida LCCs) and the Gulf of Mexico coast (Peninsular Florida and Gulf Coastal Plain and Ozarks). Furthermore, discussions have begun between the southeast and southwest regions of the Service to initiate a cooperative that includes the Texas and Louisiana coasts. This geography is among the most sensitive in the world to sea level rise, salt water intrusion, and storm surge from accelerated climate change. The interaction among these LCCs is extremely important, and is demonstrated in parts of this plan.

## The LCC Challenge: Changing the Business of Conservation So Society Can Meet Unprecedented Demands

One of the grandest achievements of U.S. society has been its public policies and investment in treasured landscapes where citizens are invited to experience natural wonders by fishing, hiking, boating, touring, hunting, bird watching -- or simply star-gazing. Moreover, we are learning that an investment in a healthy landscape, represented by both public and private lands, is a sound investment in our economic future, health, and well-being.

And yet society's progress has meant increased pressures on the natural resources we depend on and desire to protect. Climate change, above all other stresses, threatens to remake landscapes and extinguish species. No longer is it sufficient to protect and manage only pieces of a complex ecosystem. Climate change requires us to reconsider every

aspect of organizational and program operations and performance.

The conservation community understands that it cannot face these challenges by simply repeating past successes. A fundamental shift is taking place that's evolved over two decades. The catalysts are advancements in conservation and decision theory, as well as the new spatial planning capabilities and tools which are outgrowths of the global digital revolution.

Landscape Conservation Cooperatives embody this changing conservation business model. The name itself explains how:

- *Landscape* - LCC boundaries are not intended to be barriers to conservation, but should ensure complete spatial coverage while avoiding costly duplications. The LCC also should provide common ground for the intense level of coordination required to sustain ecological systems, processes and species.
- *Conservation* - The LCC will enable conservation partners to apply a conservation planning logic and science-based adaptive management process, which the Service calls Strategic Habitat Conservation (SHC). SHC integrates biological planning, conservation design, conservation delivery, outcome-based monitoring, and assumption-driven research as an iterative whole. The framework will continue to be refined and improved through the partnerships that comprise the national network of LCCs.
- *Cooperatives* - Coordination can no longer be our goal. We must recognize the need for working beyond our boundaries and accept interdependency as an organizing principle.

## The South Atlantic Landscape Conservation Cooperative's Proposed Geographic Area

The SALCC's proposed boundary is an ecologically diverse region in the southeastern United States that covers portions of six states and encompasses approximately 89 million acres.

The boundary was created by a joint USGS and Service team based on Bird Conservation Regions (BCR) that were modified to consider the needs of aquatic and terrestrial species. The SALCC geographic area is comprised of portions



of the Piedmont and Southeastern Coastal Plain BCRs, as well as the Atlantic Ocean from the shore to the seaward extent of U.S. Territorial waters 200 miles offshore. For a more detailed description of the SALCC boundary including various ecoregions, land cover, and land use maps, see end of document.

The SALCC includes five ecoregions: the Middle Atlantic Coastal Plain, Southern Coastal Plain, Southeastern Plains, the Piedmont, and the Blue Ridge.

### Middle Atlantic Coastal Plain

The Middle Atlantic Coastal Plain spans approximately 14 million acres and includes coastal areas in Virginia, North Carolina, and South Carolina. This ecoregion is characterized by low elevation flat plains, which contain swamps, marshes, and estuaries. The historic land cover, dominated by longleaf pine, has largely been converted to loblolly and shortleaf pine.

### Southern Coastal Plain

The Southern Coastal Plain spans approximately 13 million acres and includes coastal areas in South Carolina, Georgia and Florida. This heterogeneous region includes barrier islands, lagoons, marshes, swampy lowlands, wetlands and numerous lakes. The historic land cover, a variety of forest communities including longleaf pine, slash pine, pond pine, beech, sweetgum, southern magnolia, white oak, and laurel oak, has largely been converted to slash and loblolly pine, oak-gum-cypress forest in low lying areas, pastures, and urban centers.

### Southeastern Plains

The Southeastern Plains spans approximately 26 million acres and includes portions of Virginia, North Carolina, South Carolina, Georgia, and Florida. This ecoregion is characterized by irregular plains. This historic land cover, dominated by longleaf pine, now includes cropland, pasture, and woodlands.

### Piedmont

The Piedmont spans approximately 35 million acres and includes portions of Virginia, North Carolina, South Carolina, Georgia, and Alabama. This transitional area between the Appalachian Mountains to the northwest and the coastal plains to the southeast is characterized by moderately dissected plains and hills. The historic land cover, dominated by oak-hickory-pine and Southern mixed forest, has been largely cleared for agriculture and is now rapidly converting to urban and suburban communities.

### Blue Ridge

The SALCC will cover only a small portion (approximately 250,000 acres) of the Blue Ridge ecoregion in Virginia and North Carolina. This area is on the northwestern edge of the SALCC. It is likely that the Appalachian LCC will provide the lead for this ecoregion. The SALCC will need to coordinate closely with all bordering LCCs to ensure a seamless approach to biological planning and conservation design.

### Southeastern Outer Continental Shelf

This SALCC is adjacent to the Southeastern Outer Continental Shelf and shares many biotic and abiotic features, and can be classified into the Virginian and Carolinian marine ecoregions. In an area offshore of Cape Hatteras on the Southeastern Outer Continental shelf, two major Atlantic currents mix forming a very rich marine environment. Large mats of *Sargassum* form surface reefs and concentrate rare and endangered seabirds, marine mammals, marine turtles and fish. The site is important commercial and sport fishing area, as well. Within the southeastern U.S., this subunit has the greatest diversity of seabirds and marine mammals, and probably the greatest density of tropical seabirds.

### Starting Point

The SALCC is an extension of existing, powerful and fully functioning partnerships comprised of federal and state agencies and conservation non-governmental organizations. The two principal ones are the Atlantic Coast Joint Venture, which covers the full extent of the SALCC, and the Service's Eastern North Carolina-Southeastern Virginia Strategic Habitat Conservation Team, which covers the northern portion of the SALCC.

### Eastern North Carolina-Southeastern Virginia Strategic Habitat Conservation Team (ENC-SEVA SHC Team)

The SALCC has its roots in a national, cross-programmatic initiative launched by Service leaders in June 2004 to develop a landscape-level approach to conservation. The ENC-SEVA SHC Team developed the proposal to establish the SALCC, and remains a strong leader.

### Atlantic Coast Joint Venture (ACJV)

The ACJV is a partnership of federal, regional and state agencies and organizations focused on the conservation of habitat for native birds in the Atlantic Flyway region of the United States from Maine south to Puerto Rico, including

all the states in the North Atlantic, South Atlantic and South Florida LCCs. The ACJV Management Board met December 3- 4, 2009 and agreed to collaborate in broader strategic habitat conservation approaches for all wildlife and fish species. The Management Board will provide a leadership role for tying together the conservation science and conservation delivery of the three Atlantic Coast LCCs.

The joint venture will continue to develop biological planning, conservation design, monitoring and research projects throughout the joint venture area. Its partners and staff are willing to play a lead role in helping to establish LCCs in the South Atlantic as well as the North Atlantic, South Florida, Great Lakes and the Caribbean by building on existing ACJV projects and partnerships including a number of science projects that can serve as initial priorities for the LCCs.

### Working with Partners

The SALCC scoping team is in place with a number of partners. In addition to the Service, they include representatives from the USGS, NPS, the U.S. Forest Service, Southeastern Association of Fish and Wildlife Agencies' members Georgia, Florida, North and South Carolina and Virginia, the Atlantic Coast Joint Venture, the Southeastern Aquatic Resources Partnership, and the Atlantic Coastal Fish Habitat Partnership. Ultimately, top-level representatives from these partner organizations will form the Steering Committee to provide management direction and set the priorities for the SALCC.

The Southeast Natural Resources Leadership Group (SENRLG)<sup>1</sup> helped develop the idea for the South Atlantic Landscape Conservation Cooperative in 2008, then provided conceptual support for the proposal at their January 2009 meeting in Florida.

For southeastern states, an open session about LCCs and climate change was hosted by the Georgia Department of Natural Resources at the 2009 Southeastern Association of Fish and Wildlife Agencies (SEAFWA) meeting

<sup>1</sup> SNERGL consists of senior regional administrators from the Department of Defense, U.S. Army Corps of Engineers, U.S. Geological Survey, National Park Service, U.S. Fish and Wildlife Service, National Oceanic and Atmospheric Agency, Federal Highway Administration, U.S. Forest Service, Environmental Protection Agency, and the Tennessee Valley Authority.

in Atlanta. State wildlife agency directors and other state and federal biologists attended the meeting, such as, Florida Fish and Wildlife Conservation Commission; Georgia Department of Natural Resources; South Carolina

Department of Natural Resources; and the Southeast Aquatic Resources Partnership. Georgia wildlife biologists and the Service received feedback from the meeting, and there was strong conceptual endorsement of continuing development of the LCC. In concert with this meeting, the Service's Southeast Regional Director held individual conversations with each State Wildlife Director to strengthen the concept of LCCs.

Future discussions will be held with all partners to ascertain the role(s) which they are willing to play in the SALCC. In the interim, we include herein the roles which we envision could be played by some of the partners which have to date been contacted.

In addition, the Service's Southeastern Regional Directorate provided resources in 2008 to assign temporary staff to start partnership and science development. As a result, two teams were developed in the South Atlantic Region to guide and support the formation of the SALCC. The first team is advisory and internal to the Service, and has been networking with partners. The second is the SALCC Interagency Scoping Team<sup>2</sup>, which will:

- Provide input and guidance on hiring an LCC coordinator;
- Provide input into choosing a location for core staff, which has now been proposed for Raleigh, North Carolina;
- Consider possible office locations for other staff throughout the LCC geography;
- For the development of a Steering Committee, consider size, participating agencies and organizations, rotation of members, and, possibly, draft a preliminary vision and role of the Steering Committee to better identify partners;

<sup>2</sup> Members of the Interagency Scoping Team include Joe DeVivo (NPS), Breck Carmichael (South Carolina Department of Natural Resources), Laural Barnhill (SCDNR), Sonya Jones (USGS), Brian Branciforte (Florida Fish and Wildlife Conservation Commission), David Whitehurst (Virginia Department of Game and Inland Fisheries), Jason Bulluck (Virginia Department of Conservation and Recreation), Craig Watson (ACJV, USFWS), Mike Harris (Georgia Wildlife Resources Division), Mary Long (USFWS), Gordon Meyers (North Carolina Wildlife Resources Commission), Dr. Thomas Eason (Florida Fish and Wildlife Conservation Commission), Roger Pugliese (South Atlantic Fishery Management Council), Scott Robinson (Southeastern Aquatic Resources Partnership), Pat Campfield (Atlantic States Marine Fisheries Commission), Emile Greene (Atlantic Coastal Fish Habitat Partnership), Dean Carpenter (Albemarle Pamlico National Estuary Program). Staff support: Bob Ford, Amy Keister, Pete Campbell, and Wilson Laney (USFWS).

- Review and comment on this preliminary draft plan for the SALCC.

The Scoping Team may also provide suggestions for the expenditure of funds in the short term, with thoughts about a long-term process for expenditure of funds.

### Current and Potential Partner Roles

#### Department of Interior

- U.S. Fish and Wildlife Service (Service)

The Service is providing leadership and overall coordination, and will contribute to science support, inventory, monitoring, and conservation delivery in the SALCC. The Service will dedicate additional resources as determined by the LCC, including for example, spatial analysis. The Service has led development of this plan, provided the coordination to form an internal advisory team for the SALCC, and provided leadership to date for the Interagency Scoping Team for the SALCC.

The Service has a significant land base consisting of 32 national wildlife refuges in the South Atlantic area. Furthermore, in fiscal year 2010, the Service will provide the resources necessary for an SALCC Coordinator and a science position. The Service has coordinated with USGS and NPS staff in the region to ensure the development of shared vision and objectives.

- U.S. Geological Survey (USGS)

The USGS is leading the effort in the southeastern U.S. to provide the necessary science tools for land managers and planners to address climate change. The USGS, in close partnership with the Service, developed the Southeast Pilot Project, which provides a series of coordinated research products ranging from downscaled climate change predictions to coastal sea level rise threats to terrestrial and aquatic modeling in the

South Atlantic and East Gulf Coast Plain regions. The USGS led the development of a plan and vision for the Southeast Regional Climate Impact Response Center (the "Regional Hub") and helped define the conceptual relationship between the regional center and the LCCs.

- National Park Service (NPS)

NPS's Southeast Coast Inventory and Monitoring Network (SECN) has been monitoring the natural resources of parks within the SALCC since 2005. The Network's program began in 2001 with initial funding to conduct baseline biological inventories. The SECN has selected and begun monitoring of 25 Vital Signs, or indicators of ecosystem health. Monitoring methodologies and data management strategies will be shared among LCC partners. Beginning in 2010, the SECN will receive additional base funding to augment its existing monitoring program to assess climate change impacts on park resources in coastal areas. The new monies to be programmed for climate change monitoring are intended to be applied within the context of the SALCC.

The NPS has a significant land base in the SALCC, including 17 national seashores, historic sites, and recreation areas.

- Other Bureaus

Other DOI bureaus have been exploring avenues for coordination, including the Minerals Management Service, Office of Surface Mining, and the Bureau of Indian Affairs.

#### Other Partners

- States and the Southeastern Association of State Wildlife Agencies (SEAFWA)

States that are active in the SALCC will provide essential and foundational support both as individual states and as a collective of states that share priorities through their State Wildlife Action Plans or Comprehensive Wildlife Conservation Plans. The State Wildlife Action Plans were completed in 2005 with input from the public and partners in each state. These plans provide a comprehensive assessment of wildlife conservation needs in each state including identification of species of greatest conservation need, habitats that support these species, problems affecting the



species and habitats, identification of research needs, conservation actions to address identified needs and plans for monitoring effectiveness of conservation actions and species and habitats.

These states are exploring methods through which to contribute to the LCC for projects that address shared interstate wildlife priorities. For example, states are well positioned to contribute to sustainable landscape-type projects that will require good habitat maps for modeling. They have extensive data and could share in updating GIS databases in regard to public lands, management status, and potential climate change sensitivity. States also could share in implementation of monitoring programs for a variety of species in a coordinated system. States may also be able to share in funding to update habitat maps through the Southeastern ReGap Project. Existing multistate projects have been initiated based on common needs and on-going partnerships.

Other state contributions -- such as expressed by the state natural heritage program support in Virginia and, as expressed by Florida in its state conservation planning efforts -- will be integrated into the LCC conservation planning and design process over time.

In addition, SEAFWA continues to offer opportunities for an exchange of ideas about the future of conservation and the role of states, as well as providing opportunity for specific reports and feedback.

### ■ Atlantic Coast Joint Venture (ACJV)

Joint venture staff and partners are already working on various aspects of biological planning, conservation design, monitoring and research for migratory birds in this area. They will also help guide funding to high priorities identified by the LCC through major grant programs including the North American Wetlands Conservation Act and National Coastal Wetlands Conservation Grants.

### ■ Federal Fishery Management Councils

Nationwide, eight Federal Fishery Management Councils develop fishery management plans to manage fishery resources within waters 3 miles to 200 miles offshore. Two of those are within

the SALCC, the Mid-Atlantic and South Atlantic Fishery Management Councils (MAFMC, SAFMC). A formal request for the Council to designate a member of the SALCC Scoping Team was submitted on November 20, 2009. The Council will benefit the SALCC through continued monitoring and assessing of fish stocks in the south Atlantic, as well as through their continued actions with regard to ecosystem-based fishery management. The SALCC will benefit the Council through the provision of biological planning and conservation design services.

### ■ National Fish Habitat Partnerships (NFHP)

The National Fish Habitat Action Plan is an unprecedented attempt to address an unseen crisis for fish nationwide: loss and degradation of their watery homes. A key component of the plan is to establish Fish Habitat Partnerships which operate in defined areas and are eligible for federal funding. There are currently two Fish Habitat Partnerships whose designated work areas overlap the geographic boundary of the SALCC, the Southeast Aquatic Resources Partnership (SARP), and the Atlantic Coastal Fish Habitat Partnership (ACFHP). The coordinators of both partnerships have been invited to serve as members of the Scoping Team.

### ■ Partners in Amphibian and Reptile Conservation (PARC)

PARC is an inclusive partnership dedicated to the conservation of the herpetofauna (i.e. reptiles and amphibians) and their habitats. Membership includes representatives from state and federal agencies, conservation organizations, museums, pet trade industry, nature centers, zoos, energy industry, universities, herpetological organizations, research laboratories, forest industries, and environmental consultants. PARC will be able to serve as a focal point for herpetofaunal planning and conservation efforts.

### ■ Partners in Flight (PIF)

PIF was launched in 1990 in response to growing concerns about declines in the populations of many land bird species, and to emphasize the conservation of birds not covered under existing initiatives. The central premise of PIF is in close alignment

to SALCC: Resources of public and private organizations in North and South America must be combined, coordinated and increased in order to achieve success in conserving bird populations. PIF is anticipated to be a key partner in bird conservation within the SALCC.

### ■ Southeast Regional Partnership for Planning and Sustainability (SERPPAS)

In 2005, state environmental and natural resource officials from across the southeast partnered with the Department of Defense and other federal agencies to form SERPPAS to prevent encroachment around military lands, encourage compatible resource-use decisions, and improve coordination among regions, states, communities, and military services. The region covered by SERPPAS includes the states of North Carolina, South Carolina, Georgia, Alabama, and Florida. Given that all SALCC states except Virginia participate in SERPPAS, we anticipate it will be an important partner in SALCC.

## Priority Species and Habitats

The South Atlantic LCC includes a tremendous diversity of ecosystems that include tidal river and estuarine ecosystems, barrier islands, near-shore marine habitats, vast intertidal marshes, blackwater river systems, the pocosin and Carolina Bay wetlands which host carnivorous plants, baldcypress swamps, live oak maritime forests, longleaf pine savannas, dunes of the Coastal Plain, oak-hickory forests, bottomland forests, prairies, glades, barrens of the Piedmont and continental interior, and the springs and extensive cave systems of limestone areas.

Because of diverse environments and long evolutionary isolation, a number of groups reach continental high points of species richness in the Southeast, making the region one of the richest areas in the temperate zone, surpassed only by eastern Asia. Groups that have their highest North American diversities in the Southeast include amphibians, fishes, mollusks, aquatic insects, and crayfishes throughout the region; salamanders, land snails, fungi, and plants in the southern Appalachians; and carnivorous plants on the Coastal Plain.

The six states within the SALCC, as noted earlier, have each prepared State Wildlife Action Plans that identify

priority species also known as species of greatest conservation need. These plans also identified priority habitats but classification systems varied among the states. The Service’s Southeast Region also is working to identify priority species and habitats.

In the interim, for the purposes of this planning exercise, we have identified representative habitats and system drivers present in the SALCC; this list is not intended to be comprehensive (Table 1), and some representative species of management concern; this list is not intended to be comprehensive (Table 2).

It is anticipated that this list will be refined as the steering committee/partnership formalizes. Species and habitats identified in the State Wildlife Action Plans are an obvious starting point but additional species and habitats could be included. The ACJV through South Atlantic Migratory Bird Initiative (SAMBI) has identified priority bird species and habitats through the vast SAMBI partnership. Additionally,

through the Designing Sustainable Landscapes project, surrogate species for the major habitat types for birds has gone through a Structured Decision Making process to refine the list of priority bird species to be modeled. The Steering Committee may use a similar process of SDM to determine priority species in other taxa.

**Anticipated Conservation Delivery Mechanisms Related to Priority Species and Habitats**

**Background**

The core staff of the LCC will focus on the development of science driven decision support tools, so that cooperators in the LCC can have a common and useful tool for making decisions about delivering the most effective conservation through ecosystem restoration, habitat management, and policy shifts. A myriad of opportunities exist for delivering conservation on the ground and in policy, and each opportunity can uniquely serve the needs of any particular project. We provide examples of a new, non-traditional

approach to habitat restoration in partnership with industry and others, as well as traditional conservation delivery programs in the text below.

**Cutting-edge tools**

Carbon sequestration partnerships with industry and others represent new opportunities for the SALCC. Carbon sequestration allows industry to offset their carbon footprint by mitigating their carbon emissions with replacement of native vegetation in locations that provide the most effective conservation of wildlife.

*Pocosins*

Pocosins are unique wetlands, also known as southeastern shrub bogs. These peatlands typically have a thick underlying layer of peat soils (Histosols) that act as a chemical sponge over geologic time, locking-up metals, carbon, and nutrients in vegetation and the deepening soil layer. Inundation of hundreds of thousands of acres of low-lying pocosins east of Pocosin Lakes from sea level rise is anticipated; conversion of thousands of acres of low pocosin to

**Table 1. Potential priority species, habitats and system drivers found within the South Atlantic LCC.**

Species and Assemblages	Habitats and Systems	Ecosystem Drivers and Threats
Carnivorous Plants	Bottomland and Floodplain Forests	Fire Suppression
Freshwater and Diadromous Fishes	Glades, Barrens, and Prairies	Altered Hydrology and Water Quality
Reptiles and Amphibians	Longleaf Pines and Southeastern Pinelands	Loss of Upland old-growth forests
Birds	Carolina Bays	Land Use Conversion and Development
Bats	Pocosins	Climate Change
Black Bear	Atlantic White-Cedar Swamps	Non-indigenous species
Small Mammals	Barrier Island Communities and Maritime Forests	Harvest
White-Tailed Deer	Rivers and Streams	Environmental Contaminants
Marine Mammals	Caves	Natural Disturbances
Shorebirds and Seabirds	Estuaries	Coastal urban development and sea level rise
Marine Reptiles (Turtles)	Oceans	Rising temperatures, sea level rise, and other climate change impacts on nesting beaches
Shorebirds, Seabirds, Marsh Birds, Wading Birds	Salt Marshes and Wetlands	Sea level rise and other climate change impacts, coastal urban development, and nutrient runoff

**Table 2. Representative species of management concern to LCC partners**

<i>Fish</i>
American Shad Blueback Herring Lionfish Robust Redhorse
<i>Mammals</i>
Northern Right Whale White-Tailed Deer Black Bear Southeastern Beach Mice (all subspecies) Indiana Bat
<i>Reptiles and Amphibians</i>
Gopher Tortoise Loggerhead, Green, Leatherback, and Kemp’s Ridley Sea Turtles Eastern Diamondback Rattlesnake
<i>Plants</i>
Venus Flytrap Red Bay Sea Beach Amaranth
<i>Birds</i>
Red Cockaded Woodpecker Swainson’s Warbler
<i>Invertebrates</i>
Freshwater Mussels Green Mussel Palamedes Swallowtail Carolina Heelsplitter St. Franci Satyr

marsh in and near Pocosin Lakes is likely. Restoring hydrology in the peatlands stops the loss of peat soils while allowing soil generation and biomass accumulation to resume. Over time, this results in increasing elevation of previously drained pocosins. Restoring peatlands, like those on the Albemarle-Pamlico peninsula, provides an adaptive mechanism to sea level rise. The re-accumulation of soil also helps mitigate the impacts of flooding and storm events while improving water quality, wildlife and vegetation. A 10,000 acre tract is proposed for restoration, using carbon sequestration partnerships, near Pocosin Lakes NWR. The project also will sequester an estimated annualized average of 10.8 metric tons of CO<sub>2</sub> equivalent per acre per year.

### *Tidal marsh*

In the United States, carbon stored in tidal salt marsh soils comprises 1-2% of its total carbon sink. Each molecule of carbon dioxide sequestered in tidal marsh soils and their tropical equivalents, mangrove swamps, probably has greater value than that stored in any other natural ecosystem due to the lack of production of other greenhouse gases. In the southern coastal region of North America, for example, the net primary production of these ecosystems averages approximately 8000 g m<sup>-2</sup> yr<sup>-1</sup>.

Tidal marshes also exhibit low rates of organic matter decomposition, because the anaerobic decomposers of these oxygen-depleted environments operate at slower rates than do their aerobic counterparts of terrestrial environments. Thus, it can readily be appreciated that as seas rise and encroach upon the land, rates of carbon sequestration in coastal marsh soils rise right along with them. A carbon sequestration habitat restoration project in tidal marsh near Waccamaw NWR is under development with the Service.

### **Traditional tools**

As the SALCC partnership matures, we expect that the SALCC will design appropriate landscape-level approaches for priority species and/or their habitats, and designs will be provided to the partners with the most effective delivery mechanisms and programs for their implementation.

For aquatic species and habitats, these include:

- Restoration of water quality through maintenance of riparian corridors;
- Implementation of best management

practices on agricultural, industrial forest and urban landscapes

- Wetlands protection, conservation and restoration;
  - Special designations such as Primary Nursery Area (PNA), Habitat Area of Particular Concern (HAPC), Essential Fish Habitat (EFH), and Critical Habitat designation;
  - Habitat Conservation Plan (HCP) development;
  - Enhancement and establishment of native aquatic vegetation;
  - Captive propagation and release;
  - Reconnecting fragmented habitats through barrier removal or provision of fishways; and
  - Development of fishery management plans.
- For terrestrial ecosystems, these include:
- Acquisition of significant habitats;
  - Forest restoration through carbon sequestration;
  - Restoration of riparian corridors; and
  - Best management practices which promote habitat and species diversity in urban, agricultural and industrial forest habitats.

### **Developing Capacity to Support the Science Needs of the SALCC**

Many projects in this section are partially or fully funded by LCC partners, including the Service's 2010 appropriation. However, exact budget balance and needs remaining for these projects are still under development.

### **Southeastern U.S. Projects with Regional Context for LCCs**

#### *Southeastern Regional Climate Change Response Center*

The USGS National Climate Change and Wildlife Science Center (NCCWSC) was authorized by Congress in the FY 2008 Omnibus Budget Act to help resource management agencies anticipate and adapt to climate change impacts to fish, wildlife, and their habitats. With the release of Secretarial Order 3289 on September 14, 2009, the mandate of the NCCWSC was increased to address climate change-related impacts on the full array of DOI resources. Furthermore, the NCCWSC's planned network of eight Regional Climate Science Hubs

was designated as DOI Regional Climate Change Response Centers. These Centers will work with a variety of partners to provide natural resource managers with tools and information that will help them anticipate and adapt conservation planning to climate change. The forecasting products produced by these regional Centers will enable fish, wildlife, and land managers to design suitable adaptive management approaches for their programs.

The SE Pilot Project was designed to demonstrate how a Regional Center could function to develop the science needed by resource managers. This project will begin to develop regional downscaled climate models, land cover change products, regional ecological models, regional watershed models, a web-based portal for information exchange, and other science tools. Models and data produced by the SE Pilot Project will be used in a collaborative process between USGS, LCCs, state and federal partners, NGOs and academia to produce science at appropriate scales to answer resource management questions.

Estimated funding: Over \$1.3M for FY2009 and \$1.2M for FY 2010; at the time of this writing, this USGS funding is anticipated to be in place, and will provide support to several projects listed below.

#### *Downscaling Global Circulation Models for Southeastern Application to Conservation*

A Geodata Portal will be created to support the regional Climate Change Response Center and LCCs. The portal will be a web-delivered computer application for discovery, selection, extraction, processing, quality control, and formatting of spatio-temporal data for ecosystem modeling applications. The purpose is to bring modelers, data providers, and resource managers together in a common framework. The initial version will support users in assessing the impacts of climate change on ecosystems in the Southeast Region, with the intent of eventually supporting national studies. The initial version also will support web-based access to climate change data in point form and gridded form, and support the loose coupling of models developed for the SE Pilot Project.

Estimated cost of enhancements: \$150,000 is needed above the USGS support listed above, the Service has provided funds for this project as well.



### *Policy linkages between science and land conservation and management programs*

We need to pursue conservation at landscape scales as a science-based, socially-driven endeavor. Doing so will require that we lay before the public transparent, science-based assessments of population and habitat sustainability, and engage the public in non-regulatory forums in finding conservation solutions that will lead to socially viable populations of fish and wildlife. This initiative will link conservation science to conservation delivery via effective policy and incentive programs.

Cost: \$80,000

### **The Development of Tools for the SALCC Conservation Community**

#### *Designing Sustainable Landscapes in the Southeastern United States*

A high priority project which would benefit multiple partners in the SALCC area is the expansion of the Designing Sustainable Landscapes Pilot Project for bird populations in the Eastern U.S. The pilot project, which is scheduled to be completed in 2010, focuses on bird species in the Southeastern Coastal Plain portion of the SALCC area. The overall objective of the pilot is to develop a consistent methodology and to enhance the capacity of states, joint ventures and other partners to assess and design sustainable landscape conservation for birds and other wildlife in the eastern United States.

Expanding this project includes the development of core landscape projection datasets for the Piedmont Region including projections of climate change, urbanization, ecosystem disturbance processes, and land cover dynamics. It will also include expanding the stakeholder-driven process to identify priority species and evaluate available science to create species-habitat relationship models.

Estimated project cost: an additional \$174,000 is needed to support this project.

#### *Information Management*

As part of the SALCC's effort to improve natural resource conservation through greater reliance on scientific knowledge, a primary role of the LCC is to collect, organize, and make available natural resource data and to contribute to each partner's institutional knowledge by facilitating the transformation of data into information through analysis, synthesis, and modeling. To meet these objectives, the SALCC will develop a

decision support system that effectively stores, maintains, analyzes, and distributes the data, information and products of scientific work conducted by each partner agency. Thus, a foundation of the SALCC program is the strong emphasis placed on data and information management, particularly during the initial period of program development.

A pilot project to develop linkages and partnerships is proposed for fiscal year 2010 called Integrated Nesting Shorebird and Sea Turtle Data Management System. Working with partners at NPS, states, national wildlife refuges and others, the SALCC would develop a single data management system capable of managing and reporting out nesting shorebird and sea turtle data. The system would be based on existing efforts and would be designed to allow all partner agencies to efficiently enter, access, analyze, and report target species data at the local to landscape level for research, management, and planning for the conservation of priority species across multiple LCCs.

Estimated Project Cost: \$180,000

#### *Water Availability for Ecological Needs*

This component of the SE Pilot Project will develop information and modeling approaches to help resource managers assess potential effects of climate change on biological resources. The specific focus of this research is on aquatic biota, especially freshwater fishes and mussels, and on improving our ability to answer questions concerning how species are likely to respond to climate-induced hydrologic change.

Estimated Cost: Most of this project is supported by USGS, an additional \$40,000 is needed.

#### *Identifying Coastal Habitats at Risk – Gulf and South Atlantic Coasts*

In partnership with the Gulf Coastal Plain and Ozarks LCC, the South Atlantic LCC will support science tools that assess sea level rise impacts on the Gulf Coast. The South Atlantic and Gulf of Mexico coastal regions are prone to high rates of coastal erosion and flood disasters associated with hurricanes. Subsidence in some parts of the southeastern coastal plain serves to amplify the vulnerability of communities, infrastructure, and natural resources to storm surge flooding. The southeastern region ranks highest in the number of U.S. billion dollar weather-related disasters and flood insurance claims. The Gulf of Mexico coastal zone is already experiencing some of the highest

rates of coastal erosion and wetland loss in the world. The high vulnerability of this low-lying coastal zone to land loss and flooding is generally attributed to the combined effects of human development activity, sea-level rise, hurricanes and other tropical storms, and a natural physical setting that is sensitive to subtle changes in the balance of marine, coastal, and onshore processes.

This project is currently supported through the USGS SE Pilot Project for coastal zones of Mississippi and Alabama, which are in the Gulf Coastal Plain and Ozarks LCC. As part of a cooperative effort between LCCs, the South Atlantic LCC will explore opportunities to continue this project into panhandle Florida, and extend past the mouth of the ACF basin. This will provide geographic and scientific continuity between the Gulf Coastal Plain and Ozarks LCC and the South Atlantic LCC for the water availability project and the coastal mapping project. Furthermore, the Service will ensure consistency with the emerging LCC for the Texas and Louisiana coasts.

Estimated cost: an additional \$135,000 to add panhandle Florida to Gulf Coast Assessment and \$300,000 to add SALCC to Mid and North Atlantic sea-level rise modeling for marshes.

#### *Template for Strategic Habitat Conservation (SHC) implementation plan to meet Waterbird Management Needs within Atlantic and Mississippi Flyways*

In partnership with LCCs across the eastern U.S., the South Atlantic LCC will implement an integrated waterbird monitoring and management program to inform decision makers and resource managers in an adaptive management context. Improved resource contributions toward waterfowl, shorebirds and waterbirds may be realized by this cross-scale integration of management actions across multiple spatial scales from the Flyway scale down to local wetland management sites.

Presently, little coordination occurs among management sites, resulting in many disparate efforts that may not meet all waterbird needs at the appropriate spatial or temporal scales. Additionally, management decisions are often made in the absence of supporting monitoring information. The application of consistent monitoring protocols across spatial scales that informs management decisions will increase the collective contribution of

wetland management actions to meet waterbird habitat needs.

Estimated costs: \$150,000

### Staff Capacity

Conservation efforts to address unprecedented threats will require new organizational core competencies that interact with existing capacity. While competencies have to be considered at the level of the individual, competencies must also be considered at the organizational level. The needed competencies flow from the demands of society on the conservation community:

- Competence in assessing and predicting population and habitat sustainability within ecologically definable units;
- Competence in spatially depicting goals and objectives that reflect measurable biological outcomes; and
- Competence in assessing and characterizing the environmental sensitivity of landscapes to species and populations.

Resources are available within DOI Bureaus to start development of the core competencies that can complement and build upon efforts of existing capacity. For the South Atlantic, the Service start-up costs in fiscal year 2010 is estimated at \$540,000. This includes salary for an LCC coordinator, a FWS science coordinator, a part time, contract administrative assistant, as well as office space, two vehicles and computer support. Negotiations are underway for partnership sharing of these costs, such as office space. Increased capacity from USGS is tentatively for one scientist to be established in the region, with possible costs similar to the above estimates.

#### *LCC Coordinator*

This position has three primary components: oversight of conservation science development for the LCC, partnership development and support, and developing and implementing appropriate multi-organizational conservation strategies.

Costs: Approximately \$150,000 for salary support, plus additional support for office space, vehicle, computer and other needs. The LCC partnership may provide additional support for some needs, such as office space.

#### *Science Technology Coordinator*

This position is responsible for

coordinating science for the full spectrum of priority aquatic and terrestrial species, including population-habitat modeling, simulation modeling, development of decision support tools, monitoring, and research. This position's primary responsibilities will be to prepare proposals, secure funding, and oversee and implement projects to develop relevant models and decision support tools needed to formulate objectives and priority actions, and to continually test the assumptions behind them.

Costs: Approximately \$150,000 for salary support, plus additional support for office space, vehicle, computer and other needs. The LCC partnership may provide additional support for some needs, such as office space.

#### *Science (USGS)*

The USGS has committed to establishing science positions in LCCs across the nation. For the South Atlantic LCC, the science coordinator would develop a science program and specific research projects in support of LCC needs, as defined by the LCC core staff and LCC Steering Committee. We envision that this position would be different from the Service's science function, in that the USGS scientist would conduct active research, whereas the Service's science position would help develop, coordinate, and disseminate priority science needs and results.

During FY 2010, the USGS, the Service and other conservation will identify key conservation issues related to potential landscape change and needs associated with implementation of the first eight LCCs. Assessment of needs at the level of individual LCCs, and identification of challenges common to multiple LCCs (requiring larger joint efforts), are both important.

Costs: under development

#### *Science (NPS)*

New monies to be programmed for climate change monitoring are intended to be applied within the context of the SALCC.

Costs: under development

#### *Spatial Analyst*

The Service will dedicate staff time to spatial analysis needs of the LCC until such time that the LCC is prepared to create such a position.

#### *Out-year positions (all SALCC partners)*

Out-year needs include the following possible positions. Gaining this expertise,

as well as definition of other needs within the LCC, will be an ongoing, high priority function of the LCC Steering Committee. The Service will provide additional resources and support as the LCC determines its highest priority needs.

- Fisheries/Aquatics Scientist
- Ecosystem Simulation Modeler
- Population-Habitat Modeler
- Hydrologist
- Coastal/Marine Fisheries Scientist

### Top Science Needs Exceeding the Initial Regional Allocation for Science Capacity in the SALCC

The implementation of specific, thematic research can help managers and land planners understand impacts on natural landscapes in the SALCC. Habitat impacts are driven by a variety of factors, including climate change and sea level rise, increased urban development, the spread of invasive species, and the ongoing cumulative impact associated with fragmentation of wildlife corridors. As an example, habitats in the coastal plain are increasingly impacted by rapid urban development. Coastal habitats that are influenced by the tides are subject to losses due to accelerated coastal erosion, submergence of barrier islands and low-lying coastal habitats, dissection of salt marsh due to sea level rise, impacts on coastal dune formations following extreme storm events, and the conversion of freshwater marshes and wetlands due to saltwater intrusion.

An array of research is needed to develop models and monitoring protocols to evaluate the potential effects of climate change and sea level rise on wildlife populations and habitats. Results and recommendations would be used to facilitate management decisions to minimize or mitigate impacts both on local and regional scales. The ability to identify changes in habitats across the landscape over time will help land managers address the impacts with strategies that are holistic in nature, on a landscape scale, with a view toward ensuring that migration corridors remain intact, protected landscapes for high priority species continue function, and viable ecosystems are in place and protected for Federal Trust species.

The following research needs are not listed in priority order:



## Examples of Research Needs

### *Hydrological Conditions*

More understanding is needed of ground water variations and change over time throughout the SALCC. The establishment of a network of wells and surface water level data loggers that can be tracked by individual stations for immediate use as well as by a regional team will produce consistent baseline data that can be evaluated over time. This data can also lead to the development of predictive hydrological models for a variety of important habitats in the SALCC including interior wetland swamps such as Okefenokee NWR's 396,000 acres and other important habitats that are greatly affected by groundwater. Additional data that would be collected would include changes in rainfall quantities, periodicity of rainfall, considering the topography, evaporation, and evapotranspiration.

Estimated cost: GW real time well installation \$11,000

Yearly O&M costs \$6,000 – these cost include QA/QC, real-time dissemination of the data and archival of the data.

### *Hierarchical Landscape Models for Endemic Unionid Mussels: Building Strategic Habitat Conservation Tools for Mussel Recovery in the South Atlantic Landscape Conservation Cooperative.*

The Southeast is a hotspot of mussel biodiversity, but an integrated approach is urgently needed to effectively conserve endangered mussel species. Key habitat where extant populations are found must be protected, but it is also crucial to prioritize restoration areas and identify additional suitable habitat for population augmentations.

Estimated Costs: \$365,000

### *Longleaf Pine Ecosystems*

One of the most important habitats in the SALCC and the Gulf Coastal Plain and Ozarks LCC is the longleaf pine ecosystems. Red-cockaded woodpecker, gopher tortoise, indigo snake, and Bachman's Sparrow are some of the high priority species that occur in longleaf pine forest habitats. Management is currently geared toward faster-growing tree species. However, studies are needed to identify the tolerance levels of soil moisture. A better understanding of genetic differences among longleaf pine will help conservation delivery.

Estimated cost for start and linkages of these projects: \$150,000

### *Population Status for 4 Threatened and Endangered Freshwater Mussels in the Ochlockonee River Basin*

A key component to recover freshwater mussel species is to determine population size, rates of recruitment, survival, growth, and fecundity that constitute a viable population and evaluate these demographics to determine the long-term population viability of each species. Currently, little information on these parameters exists for four listed mussels in the Ochlockonee River Basin. It is especially important to know the population size so that mortality can be evaluated. This study will provide a baseline for developing and evaluating a comprehensive monitoring program for the seven listed mussels in the Northeast Gulf of Mexico watersheds.

Estimated Cost: \$120,000

### *Develop Historic Rate of Change Models for Coastal Barrier Islands*

Using historic aerial photography and a sequence of spatially explicit GIS data sets, this project will reveal changes over time in shorelines and in terrestrial, intertidal, and beach ecosystems. From this, we can develop rate-of-change models to inform land managers of the quantity and quality of habitat changes that have occurred and are expected to occur.

Estimated Cost: \$250,000

### *Improve Land Managers Access to Current Body of Science*

For the SALCC geographic area identify the literature and data locations across natural resource disciplines (i.e., geology, ecology, biological, down-scaled and more refined climate and sea level rise models) and synthesize the information in a way that land managers can better understand the natural processes that will inform their management decisions and identify information gaps which can be used to target needed applied research.

Estimated Cost: \$10,000

### *SALCC Inventory and Monitoring System*

In close cooperation with the Inventory and Monitoring Programs of the NPS and the National Wildlife Refuge System, design a scientifically based inventory and monitoring protocols for use by partners in the SALCC. Baseline species surveys are needed to identify the locations of suites of species and to match those species with habitats that are vulnerable to the impacts of climate change and other challenges.

Estimated Project Cost: \$200,000

### *Carbon Sequestration Studies*

This project represents the first step in a cross-country partnership devoted to understanding carbon sequestration rates in tidal freshwater swamps and marshes. It is designed to determine rates of carbon sequestration in managed and tidal freshwater marshes in the Waccamaw National Wildlife Refuge, Georgetown, SC. This three-year project will be funded through an agreement between the U.S. Fish and Wildlife Service and the USGS California Water Science Center.

Budget Request: \$150,000

### *Expansion of Blueback Herring and American Shad Habitat Models for Use in NALCC and SALCC.*

Habitat models for these two species are currently under development as part of the ENC-SEVA SHC Team's ongoing SHC project in the Roanoke-Tar-Neuse-Cape Fear river basins in southeastern Virginia and eastern North Carolina. This project would entail modifying these two models for use throughout the US east coast range of these two species. Both species are currently in a depleted status throughout much of their range (see Limburg et al. 2007, Limburg and Waldman 2009). Both species are under ASMFC management and their management plans are the subject of recent extensive modifications designed to begin restoration of their populations, which were once of immense ecological, economic and cultural significance throughout the NALCC and SALCC.

Total Estimated Project Cost: under development

### *Climate Change Impacts of Forest Dynamics*

Studies are needed to determine the effects of a changing climate on forests and the species that depend upon them. Changes in weather patterns and temperatures could change forest fuel patterns, species composition, and volume. Of equal importance is an understanding of how alterations in weather patterns will impact prescribed fire as a management strategy in forest communities.

Estimated Cost: \$50,000

### *Assessment of Habitat of the Flatwoods Salamander*

This is a long-term project on the Flintrock Preserve in Florida to boost populations of the flatwoods salamander



and Red-cockaded woodpeckers, two umbrella species that encompass the entire pine upland/isolated wetland mosaic. The ecological importance of the preserve is centered upon water quality, upland conservation and Threatened and Endangered species recovery.

Estimated Cost: \$380,000

### *Assess health and status of Bottomland Hardwood Forests in the South Atlantic*

Bottomland hardwood forests are an important ecosystem sustainability and resilience, as well as critical fish and wildlife habitat. In the South Atlantic coastal zones, bottomland hardwood forests are being stressed by salt water intrusion as well as storm surge events, making the health of bottomland forest further inland even more important to sustain.

Estimated Cost: \$60,000

### *Demonstrate how to manage flow for the benefit of ecological systems and human needs.*

Estuarine Instream Flow Requirements - Freshwater from the South Atlantic Coastal Plain rivers help support the greatest extent and highest quality estuaries of the North Atlantic Ocean. The amount and timing of freshwater inflows regulate the salinity interface and are key to the health of these productive ecosystems, yet the flow requirements are undefined.

Research question: Research is needed to determine the relationships between altered freshwater hydrologic regime and estuarine ecosystem conditions to inform and support development of state instream flow standards for these critical areas.

Research question: The dams on the eight major drainages in this region reduce the range of water level fluctuation as well as alter the seasonality of flow. Research is needed to determine the flows required to support the natural assemblage of plants and animals of these riverine ecosystems.

Research question: If these large systems are to be manipulated to improve hydrologic regimes, research is needed to determine how these ecosystems respond to restoration of flows after more than 50 years of altered conditions.

Research question: Information is needed as to how freshwater resources of the South Atlantic Coastal Plain will likely be impacted by climate change.

Estimated Cost: under development

### *Characterizing basic units of conservation*

The most basic level of conservation is the population. Populations are used as a critical metric in many local and national conservation plans (e.g., The Strategic Habitat Conservation plan), as well as in key pieces of legislation, such as the Endangered Species Act. Therefore it is important to have a firm understanding of the number of populations dispersed across the landscape and the extent to which they interact. Science support needs are as follows:

The goal of this study is to develop a GIS-based approach for explicitly mapping patterns of genetic divergence and diversity for multiple terrestrial and aquatic species. Using this approach, we will analyze mitochondrial DNA datasets from vertebrate and invertebrate species in both North and South Atlantic ecoregions for phylogeographic breaks and high intrapopulation diversity. The result will be an evolutionary framework for the Atlantic within which patterns of genetic diversity can be analyzed in the context of historical processes, future evolutionary potential and current reserve design. This multi-species genetic landscape will be able to pinpoint biogeographic hotspots where interpopulation and intrapopulation genetic divergence, connectivity, and/or diversity are consistently high.

Comparisons genetic connectivity for estuarine species. We seek to integrate genetic, ecological, and life history data to assess larval recruitment and genetic connectivity for various aquatic species inhabiting estuaries from North Carolina to Florida. This work will provide for an understanding of patterns of recruitment and connectivity in estuarine ecosystems and serve as a necessary base-line data for predicting the fate of these populations under climate change scenarios.

Estimated cost: under development

### *Distribution and Habitat Use of Keystone Species, including northern right whales, in the SALCC Nearshore Atlantic Ocean*

This project would entail expanding the mission of the existing Cooperative Winter Tagging Cruise (Cruise) to include surveying northern right and other large whale distribution and habitat use during January-February in the nearshore Atlantic Ocean off NC and VA. The Cruise is an existing

partnership which tags species managed by the Atlantic States Marine Fisheries Commission (Atlantic sturgeon, striped bass, horseshoe crab, red drum) and managed jointly by ASMFC and the Mid-Atlantic Fishery Management Council (spiny dogfish, summer flounder). The northern right and other species of large whales (fin, humpback) annually migrate along the Atlantic coast, using the Atlantic Seaway pathway described elsewhere in this plan. The National Marine Fisheries Service Large Whale Take Reduction Team (ALWTRT), Mid- and South-Atlantic Sub Group, at their last meeting in April, 2009, identified a need for data on northern right whale distribution and habitat use in the mid-Atlantic (Red Munden, North Carolina Division of Marine Fisheries, Morehead City, NC and Diane Borggaard, National Marine Fisheries Service, Northeast Regional Office, personal communication to RWL; also see ALWTRT 2009; online on the NOAA-NMFS web site at the following location: <http://www.nero.noaa.gov/whaletrp/trt/meetings/ALWTRT%20Meeting%20Summary.April.2009.pdf>). We envision that collaborating researchers (possibly Dr. Doug Nowacek, Duke University Marine Laboratory, but we haven't been able to contact him yet) would deploy pop-up acoustic monitors during the Cruise to detect whale vocalizations, as well as conducting a visual survey from the research vessel. Monitors could be retrieved at the end of the Cruise, having been deployed for a multi-week (two weeks, longer if additional ship time could be secured) period. This project would fill a gap between existing surveys in the northeast, and south Atlantic.

Total Estimated Project Cost: under development

## **Anticipated Successes in 2010**

### **Partnership and staff development**

We expect to have a fully functional Steering Committee, which represents non-government organizations, industry, universities, an dfederal and state governments, in place that guides the conservation science and priority conservation delivery mechanisms in the South Atlantic. To manage against -- and with -- threats caused by accelerating climate change, we expect the Steering Committee to embrace new challenges in conservation for the 21<sup>st</sup> Century. That likely will mean acquiring new technologies in information management and spatial analysis and developing non-traditional expertise in core staff,

such as conservation biology and land-use policy. We expect members of this Steering Committee to be leaders in the conservation effort in the South Atlantic, and reach out to traditional and non-traditional partners in the LCC for the use and development of science products and conservation delivery.

### Biological Foundation

The basic elements of conservation depend on a biologist's knowledge of species, species-habitat relationships and ecosystem function. Based on high priority needs expressed in this proposal, we expect substantial progress and success in learning more about the life history traits of high priority species in the South Atlantic, including those off shore. The biological planning work for birds in the South Atlantic Coastal Plain will be expanded to the Southern Piedmont by partners working through the Atlantic Coast Joint Venture and South Atlantic Migratory Bird Initiative in preparation for conservation design work in that area. Furthermore, we expect the development of a process with stakeholders in the LCC model that determines species sensitivity to different climate change scenarios (part of the Designing Sustainable Landscapes project).

### Conservation Design

The development of tools to design conservation and sustainable landscapes will happen at multiple spatial scales. We expect to have success in the development of downscaled General Circulation Models, and the easy access to that information by scientists, for us in the LCCs. We expect successful and significant progress in the development of models that help us predict and manage for coastal vulnerability with climate change on the Gulf Coast side of the SALCC. We expect the completion of spatial analysis for the coastal zone of the South Atlantic (part of the Designing Sustainable Landscapes project).

### Conservation Delivery

We expect the start of a successful model demonstration of conservation delivery in the restoration of a 10,000 acre tract of pocosin wetlands in North Carolina using carbon sequestration as the restoration/conservation delivery tool. This project is in partnership with industry and others who need to offset their carbon footprint, and are willing to do so by the restoration of this high priority tract of pocosin wetlands. The FWS will manage strictly for wildlife and ecological benefit, while industry can mitigate carbon emissions.

### Inventory and Monitoring

We expect the establishment and integration of an Inventory and Monitoring Program by the FWS National Wildlife Refuge System, and we expect to demonstrate success in integration with the NPS and the USGS in survey methods, objectives, and data compatibility. We expect to complete initial steps on the Atlantic Flyway Integrated Waterbird Management and Monitoring Project including model development and testing and protocol development.

### Assumption-Driven Research

The development of research priorities that are driven by the assumptions we make in modeling and management requires time to consider the effectiveness of those models and management decisions. While the SALCC will support several integrated research projects, many of which are designed to test basic assumptions, we expect our success in this year to be the development of a process by which we can thoroughly tease out the most important assumptions in models and management.

### Information sharing and Adaptive Management

We expect a successful demonstration project that integrates the data of NPS, FWS, USGS, states and others to examine sea turtle and shorebird response to accelerating beach erosion. By way of this project, we hope to establish the basis for long term linkages among data and to establish a process of information management that can feed into management decisions at several spatial scales.

### Unique Characteristics of the SALCC

The SALCC supports numerous unique habitats and species which occur nowhere else on the planet; provides unique ecosystem functions which are vital for sustaining migratory species of avifauna, anadromous and pelagic fish, marine mammals and sea turtles; and is subject to intense demographic pressure from a burgeoning human population and climate-change induced sea level rise, more so than many other parts of North America. The SALCC may perhaps best be identified from an ecosystem services perspective as hosting two significant migratory pathways for charismatic fauna: one for avifauna (primarily shorebirds and waterfowl), the Atlantic Flyway; and the other for nearshore marine fauna (marine mammals, sea

turtles, and anadromous and pelagic fish), which may be characterized as the Atlantic Seaway, and includes the Gulf Stream.

Habitats within the SALCC support species traveling in the vast migration pathway known as the Atlantic Flyway. In the southern portion of the Atlantic Flyway the route narrows considerably in the five coastal states that comprise the SALCC; Virginia, North Carolina, South Carolina, Georgia, and Florida. It is this narrowing of the route that effectively concentrates and increases the number of birds and other species found in any one location in the SALCC.

Large concentrations of waterfowl, shorebirds, neotropical migrants, and raptors, along with some species of bats, dragonflies, and butterflies use this pathway during migration events. Of those groups, shorebirds are in greatest decline. At least half of all coastally migrating shorebirds have declined by at least 39%. They face threats from pollution, over-fishing, and warming sea temperatures caused by climate change, as well as threats at island and coastal nesting sites. Sea level rise caused by accelerating climate change will inundate shoreline habitats.

The SALCC encompasses a rich tapestry of landscapes and seascapes in North Carolina, South Carolina, east central Alabama, Georgia, northern Florida, and Southern Virginia that support a diversity of species. Many endangered, threatened, and declining species are dependent upon these habitats, including the loggerhead sea turtle, wood stork, red-cockaded woodpecker, and piping plover. The SALCC's coastal and estuarine habitats support crab, shrimp, and oyster industries, while the region's abundant wetlands and forests sustain small and large game species, recreational fisheries, and a diversity of unique and rare habitats of national and international importance.

Mature southern pine forests, including the longleaf pine ecosystem are home for many species of eastern forest birds that are currently suffering consistent and troubling declines. Red-cockaded Woodpecker, Brown-headed Nuthatch, and Bachman's Sparrow, year-round residents of mature southern pine forests, are especially impacted. Many eastern forest birds are suffering consistent and troubling declines, including neotropical migrants that require large blocks of intact forest, such as



the Kentucky Warbler, Wood Thrush, and Eastern Wood-Pewee. Likewise, species dependent on disturbed or early successional forest or natural disturbance (including pine barrens) such as the Golden-winged Warbler, Whip-poor-will, Prairie Warbler, Eastern Towhee, and Field Sparrow, and popular game species such as Northern Bobwhite and American Woodcock are at risk.

The SALCC's contribution to entire populations of migratory birds, bats, and butterflies not only affects species diversity in the U.S., it also affects species diversity in Canada and other countries because the U.S. shares many bird species with other countries along the pathway.

The SALCC is also known for a second vital species migration corridor, which we proposed to name the Atlantic Seaway. The marine portion of the SALCC, from the beach to 200 miles offshore, includes both pelagic and nearshore migration routes off the Atlantic Coast, and many of the species that use this route rely upon the SALCC's salt marsh, estuarine systems, coastal wetlands, and other habitats along that oceanic pathway for food, resting, and breeding. The SALCC's great expanses of salt marsh along the Atlantic Coast are known as some of the most productive ecosystems on earth. Salt marsh habitats provide a source of food for estuarine species as well as for the pelagic species that migrate along the off-shore corridor of the Atlantic Ocean. Salt marsh ecosystems with their rich tidal creeks and diverse estuaries also support the crab, shrimp, and oyster industries, and commercial fisheries, along with the birds, fish, and turtles that migrate along the coast each year.

The exclusively oceanic pelagic route extends from Labrador and Nova Scotia to the Lesser Antilles, and on to the mainland of South America. The pelagic migration paths are traveled by thousands of water birds and shore birds, marine mammals (bottlenose dolphins, humpback whales, northern right whales), bluefin tuna, dolphin-fish, wahoo, yellowfin tuna, swordfish, Atlantic sturgeon, migratory striped bass, spiny dogfish, weakfish, and the loggerhead and leatherback sea turtles.

In addition to these two unique migratory pathways, the SALCC also hosts numerous endemic species and habitats which are again restricted to it alone. These include numerous plants, insects, amphibians, reptiles and fish.

### Additional LCC Support from the Southeast Region in FY 2010

The FWS has taken a strong lead to start development of LCCs that cover the entire eastern seaboard (North Atlantic, South Atlantic, Peninsular Florida LCCs) as well as much of the Gulf of Mexico coastal (Peninsular Florida and Gulf Coastal Plain and Ozarks). This geography is among the most sensitive in the world to sea level rise, salt water intrusion, and storm surge from accelerated climate change. The interaction among these LCCs is extremely important, and is demonstrated in parts of this plan.

#### Gulf Coastal Plain and Ozarks LCC

The Southeast Region of the FWS will support the start up functions of the Gulf Coastal Plain and Ozarks LCC in federal fiscal year 2010, in strong partnership with members of the Lower Mississippi Valley, East Gulf Coastal Plain, and Central Hardwoods Joint Venture Management Boards. FWS Regions 2 and 3 will be heavily engaged as well. The Lower Mississippi Valley Joint Venture Board agreed to provide a strong leadership role in the development of the LCC. A concept plan, to be drafted at the same time as this plan (December 2009) is complete and develops actions for 2010 LCC development. Please see that plan for details.

#### Peninsular Florida LCC

The southeast region of the FWS will support the development of the Peninsular Florida in federal fiscal year 2010, in strong partnership with the NPS, USGS, the state of Florida and others. The development of the Peninsular Florida plan will be developed by early spring 2010, and a staff will be provided on detail for the LCC to begin a higher level of conservation planning and to initiate or sustain high priority science projects.

#### Cooperation with the North Atlantic LCC

A portion of the SALCC lies in southern Virginia, part of the Northeast Region, and the Northeast Region has resource program offices operating there. The two regions already coordinate on topics of mutual concern through the Atlantic Coast Joint Venture and Atlantic Coastal Fish Habitat Partnership, whose boundaries include both the NALCC and SALCC areas. These partnerships can serve as conduits for coordination between the two LCCs. The Northeast Region has offered to continue to provide significant support to these program

offices in the SALCC in a coordinated effort to most effectively and efficiently conserve migratory birds and other trust resources common to these congruent geographic areas.

#### Cooperation with the Appalachian LCC

Although the South Atlantic LCC is targeted for full implementation in 2010, the Southeast Region also has great interest in initiating an LCC for the Appalachian area. The Northeast Region will be the lead for the Appalachian LCC and will coordinate closely with the Southeast and Midwest Regions on the development of this LCC. With existing partnerships, projects, and Service offices moving forward with landscape scale planning, this LCC has the opportunity to start immediately to build biological planning and conservation design capacity that complements existing efforts, host partner meetings, and develop contracts in FY 2010.

More formal conversations will be scheduled later in 2010, including key contacts from the Service and partners in all three Service regions overlapping the Appalachian LCC area.

#### Conservation Lands in the SALCC







SE GAP Terrestrial Ecological System	Acres
Evergreen Plantations or Managed Pine (can include dense successional regrowth)	12,773,963
Southern Piedmont Dry Oak-(Pine) Forest - Hardwood Modifier	8,967,658
Pasture/Hay	8,593,966
Row Crop	8,314,236
Developed Open Space	5,016,924
Atlantic Coastal Plain Upland Longleaf Pine Woodland	4,552,839
Other - Herbaceous	4,372,056
Atlantic Coastal Plain Dry and Dry-Mesic Oak Forest	2,392,710
Successional Shrub/Scrub (Other)	2,287,624
Atlantic Coastal Plain Small Blackwater River Floodplain Forest	2,168,984
Low Intensity Developed	2,120,380
Clearcut - Grassland/Herbaceous	1,817,020
Atlantic Coastal Plain Blackwater Stream Floodplain Forest - Forest Modifier	1,709,835
Atlantic Coastal Plain Peatland Pocosin	1,495,203
Open Water (Fresh)	1,444,622
Southern Piedmont Mesic Forest	1,399,041
Southern Piedmont Dry Oak-(Pine) Forest - Loblolly Pine Modifier	1,361,653
Atlantic Coastal Plain Small Brownwater River Floodplain Forest	1,236,144
Southern Piedmont Dry Oak-(Pine) Forest - Mixed Modifier	1,229,181
Successional Shrub/Scrub (Clear Cut)	1,041,155

South Atlantic Landscape Conservation Cooperative  
 Geographic Extent - 18 August 2009







