The South Atlantic Third Thursday Web Forum

Predicting future salt marsh change along the South Atlantic coast

Call in for audio: 866-720-8724 2917595555#
Agenda

- Introduction
- Monthly topic
- Q&A and discussion
- Preview of next webinar
- Staff updates
Predicting future salt marsh change along the South Atlantic coast

Daniel Slone, Research Ecologist with the U.S. Geological Survey Wetland and Aquatic Research Center

10-17-2019
Predicting future salt marsh change along the south Atlantic coast.

Daniel Slone, Research Ecologist
Steve Hartley, Geographer

U. S. Geological Survey, Wetland and Aquatic Research Center

Rua Mordecai, Coordinator
Amy Keister, GIS Coordination

South Atlantic and Southeast Conservation Blueprint
U.S. Fish and Wildlife Service, Science Applications
Importance of Salt marshes and coastal estuaries

- Essential for healthy fisheries, coastlines, and communities
- Food, refuge, or nursery habitat for more than 75 percent of fisheries species, including shrimp, blue crab, and many finfish.
- Protect shorelines from erosion by buffering wave action and trapping sediments.
- Reduce flooding by slowing and absorbing rainwater
- Protect water quality by filtering runoff and metabolizing excess nutrients.

(oceanservice.noaa.gov/facts/saltmarsh.html)
Salt Marsh Abundance by Marine Ecoregion

High

Low or none


**Threats to marshes and coastal estuaries from rising oceans**
Morris “Marsh Organ”

Morris, J.T., Sundberg, K., and Hopkinson, C.S. 2013. Salt marsh primary production and its responses to relative sea level and nutrients in estuaries at Plum Island, Massachusetts, and North Inlet, South Carolina, USA. Oceanography 26:78-84.

Addresses Six Primary Processes (Inundation, Erosion, Saturation, Overwash, Accretion, Salinity)

http://warrenpinnacle.com/prof/SLAMM
Our questions:

- Empirical model of measured trends
- Show relative risk of habitat loss or migration

- Rate of palustrine habitat loss compared with rate of open water intrusion.
  - $A>B = \text{increase in salt marsh}$
  - $A<B = \text{loss of salt marsh}$

- How far up streams will saltmarsh movement into palustrine forests occur?
South Atlantic Blueprint: https://www.southatlanticlcc.org/blueprint/
Winyah Bay
48,095 acres

download report

Sea level rise

Extent of inundation by projected average highest daily tide due to sea level rise within this subwatershed. Values from the NOAA sea-level rise inundation data.

Urban growth

Blueprint 2.2 Priority
- Highest priority
- High priority
- Medium priority
- Corridors
- Inland waterbodies
North Coastal Plain (NCP)

Central Coastal Plain (CCP)
North Coastal Plain (NCP)
Central Coastal Plain (CCP)
South Coastal Plain (SCP)
Model Inputs
National Land Cover Database (NLCD)
https://www.mrlc.gov/data/type/land-cover
Coastal Change Analysis Program (C-CAP)
https://coast.noaa.gov/digitalcoast/tools/lca.html
### National Land Cover Database (NLCD)
https://www.mrlc.gov/data/type/land-cover

**NLCD Land Cover Classification Legend**

- 11 Open Water
- 12 Perennial Ice/Snow
- 21 Developed, Open Space
- 22 Developed, Low Intensity
- 23 Developed, Medium Intensity
- 24 Developed, High Intensity
- 31 Barren Land (Rock/Sand/Clay)
- 41 Deciduous Forest
- 42 Evergreen Forest
- 43 Mixed Forest
- 51 Dwarf Scrub*
- 52 Shrub/Scrub
- 71 Grassland/Herbaceous
- 72 Sedge/Herbaceous*
- 73 Lichens*
- 74 Moss*
- 81 Pasture/Hay
- 82 Cultivated Crops
- 90 Woody Wetlands
- 95 Emergent Herbaceous Wetlands

* Alaska only

### Coastal Change Analysis Program (C-CAP)
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Coastal Change Analysis Program (C-CAP)
https://coast.noaa.gov/digitalcoast/tools/lca.html
Changes in C-CAP over time
(2001 → 2006 → 2011)
Coastal erosion represented in blue (Open water invading salt marsh; This is the pattern that we want to model) but the open water is also invading other habitat types (dark gray).
Change in this Grassland/Palustrine mosaic in the uplands, apparently due to logging, or pixel misclassification.
Reclassification to Urban

2011 Pixels
- Dev High
- Dev Med
- Dev Low
- Dev Open
- Grassland
- PW
- OW
- SM
Flooded agricultural fields switch between Palustrine and Open water.
Changes from salt marsh to grassland. Coastal development where the pixels appear over houses, or tidal changes between images.
## Coastal Change Analysis Program (C-CAP) Land Cover Classes

<table>
<thead>
<tr>
<th>CCAP class</th>
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<td>6</td>
<td>Cultivated Crops</td>
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<td>7</td>
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<tr>
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Barren Land

Unconsolidated Shore (19) – includes material such as silt, sand, or gravel that is subject to inundation and redistribution due to the action of water. Substrates lack vegetation except for pioneering plants that become established during brief periods when growing conditions are favorable.

Water and Submerged Lands

Open Water (21) – includes areas of open water, generally with less than 25 percent cover of vegetation or soil.

Palustrine Aquatic Bed (22) – includes tidal and nontidal wetlands and deepwater habitats in which salinity due to ocean-derived salts is below 0.5 percent and which are dominated by plants that grow and form a continuous cover principally on or at the surface of the water. These include algal mats, detached floating mats, and rooted vascular plant assemblages. Total vegetation cover is greater than 80 percent.
**Estuarine Wetlands**

**Estuarine Forested Wetland (16)** – includes tidal wetlands dominated by woody vegetation greater than or equal to 5 meters in height, and all such wetlands that occur in tidal areas in which salinity due to ocean-derived salts is equal to or greater than 0.5 percent. Total vegetation coverage is greater than 20 percent.

**Estuarine Scrub/Shrub Wetland (17)** – includes tidal wetlands dominated by woody vegetation less than 5 meters in height, and all such wetlands that occur in tidal areas in which salinity due to ocean-derived salts is equal to or greater than 0.5 percent. Total vegetation coverage is greater than 20 percent.

**Estuarine Emergent Wetland (18)** – Includes all tidal wetlands dominated by erect, rooted, herbaceous hydrophytes (excluding mosses and lichens). These wetlands occur in tidal areas in which salinity due to ocean-derived salts is equal to or greater than 0.5 percent and are present for most of the growing season in most years. Total vegetation cover is greater than 80 percent. *Perennial plants usually dominate these wetlands.*
Palustrine Forested Wetland (13) – includes tidal and nontidal wetlands dominated by woody vegetation greater than or equal to 5 meters in height, and all such wetlands that occur in tidal areas in which salinity due to ocean-derived salts is below 0.5 percent. Total vegetation coverage is greater than 20 percent.

Palustrine Scrub/Shrub Wetland (14) – includes tidal and nontidal wetlands dominated by woody vegetation less than 5 meters in height, and all such wetlands that occur in tidal areas in which salinity due to ocean-derived salts is below 0.5 percent. Total vegetation coverage is greater than 20 percent. Species present could be true shrubs, young trees and shrubs, or trees that are small or stunted due to environmental conditions.

Palustrine Emergent Wetland (Persistent) (15) – includes tidal and nontidal wetlands dominated by persistent emergent vascular plants, emergent mosses or lichens, and all such wetlands that occur in tidal areas in which salinity due to ocean-derived salts is below 0.5 percent. Total vegetation cover is greater than 80 percent. Plants generally remain standing until the next growing season.
Grassland

**Grassland/Herbaceous (8)** – contains areas dominated by grammanoid or herbaceous vegetation, generally greater than 80 percent of total vegetation. These areas are not subject to intensive management such as tilling but can be utilized for grazing.
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*Only within marine buffer zone*
Application to spatial data
C-CAP Classification
300 m in-shore, convert C-CAP grasslands/NLCD barren land to “Dunes”
Migration space layer

created by Analie Barnett; part of the TNC Resilient Coastal Sites assessment
Open water connected to ocean; buffered 120 m
Marsh migration landscape
Open Water → Saltwater Marsh → Palustrine Wetland
Open Water → Saltwater Marsh → Palustrine Wetland
Open Water → Saltwater Marsh

Saltwater Marsh → Palustrine Wetland

Open Water → Uplands

Uplands → Palustrine Wetland
Numerical Results
Spatial convolution model

migrate lower habitats into upper habitats
Protected salt marsh experiences little change
Exposed salt marsh experiences more change.
Palustrine wetland near open water is converted to salt marsh.
2080 Model

NCP

Pamlico sound
2001 C-CAP
Little River

CCP
2020 Model
Little River

CCP
2060 Model
Little River

CCP
2080 Model
Little River

CCP
2100 Model
Little River

CCP
Fancy Bluff Creek

Imagery: DigitalGlobe
2050 Model
Fancy Bluff Creek
2100 Model
Fancy Bluff Creek
2001 C-CAP

Blackbeard Creek
2100 Model
Blackbeard Creek
2001 C-CAP
Econfina River

GCPM
2001 C-CAP
Econfina River

GCPM
2001 C-CAP

Econfina River

Small channels in salt marsh not represented in C-CAP
2100 Model
Econfina River

GCPM

**“Ecological Rachet Model”**

- **Regeneration Zone**
- **Persistence Zone**
- **Press: Sea Level Rise**
- **Pulse: Storms**

*USGS*
Future Steps:

Incorporate into Blueprint

Inform other indicators
Identifying Resilient Coastal Sites in the South Atlantic and Gulf of Mexico

11-21-2019
10:00 am

Analie Barnett and Mark Anderson
The Nature Conservancy
Staff updates

- Upcoming symposia at Land Trust Rally and SEAFWA Annual Meeting

- Southeast Blueprint 4.0 and *Recent Trends in Southeastern Ecosystems* report to be released at SEAFWA
Upcoming symposia at Land Trust Rally and SEAFWA annual meeting

- **Land Trust Rally**
  - Rua – conserving wildlife corridors - Friday 10/18 @ 1:30, Room 304
  - Louise – regional conservation data – Saturday 10/19 @ 1:30, Room 303

**WE’RE ALL IN THIS TOGETHER**

Regional data for local conservation

Saturday, October 19th | 1:30 - 3:00 pm | Room 303

*Four tools to help prioritize conservation, show how your actions contribute to larger conservation strategies, and tell compelling stories about what makes your lands and waters special.*
Upcoming symposia at Land Trust Rally and SEAFWA Annual Meeting

• SEAFWA

Are we moving the needle for conservation?

Find out at the Southeast Conservation Adaptation Strategy (SECAS) special symposium!

The SECAS 10% Goal: How do we get there?

Tuesday, October 29th
Ballroom Section I
8 am - 12 noon
Southeast Blueprint 4.0 and *Recent Trends in Southeastern Ecosystems* report

- Will be released in time for SEAFWA, just putting on the finishing touches!
Questions?
How to get involved in the Blueprint

• Join the South Atlantic LCC web community
  southatlanticlcc.org

• Connect with Blueprint staff or other cooperative members

• Explore the Conservation Blueprint
  southatlanticlcc.org/blueprint