Development of a South Atlantic Ecosystem Status Report

Kevin Craig and Todd Kellison

NOAA Fisheries

Southeast Fisheries Science Center

Beaufort Laboratory

kevin.craig@noaa.gov

todd.kellison@noaa.gov
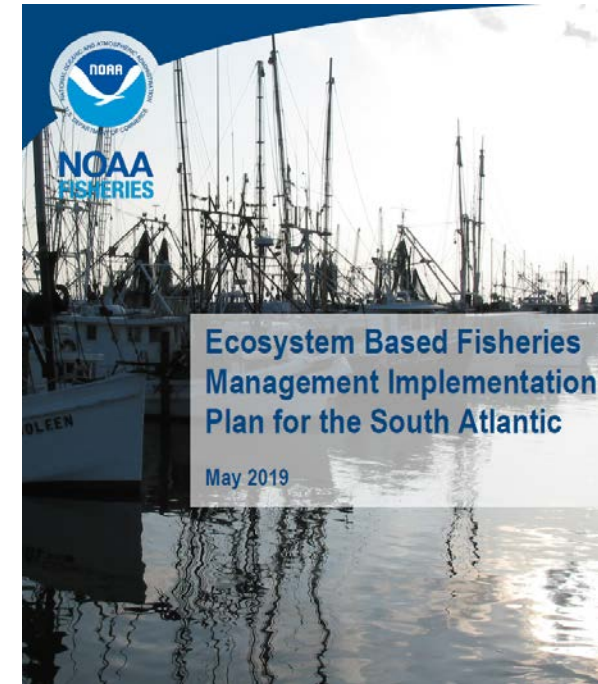
SECOORA Annual Meeting
June 19 2019

Outline

o Background on Ecosystem Status Reports (ESRs)

o Current status of South Atlantic ESR (progress update)

o Examples of trends in South Atlantic indicators

o Timeline and opportunities for collaboration and review

Ecosystem-Based Fishery Management (EBFM) in the South Atlantic

o Advance capacity for EBFM in the South Atlantic Region

o Increase coordination among NOAA Fisheries, Regional Fishery Management Councils, and partners

o Identifies key activities along with priorities & milestones

o Key activities: Develop a South Atlantic Ecosystem Status Report (ESR)

https://www.fisheries.noaa.gov/national/ecosystems/ecosystem-based-fishery-management-implementation-plans

Ecosystem Based Fisheries Management Implementation Plan for the South Atlantic
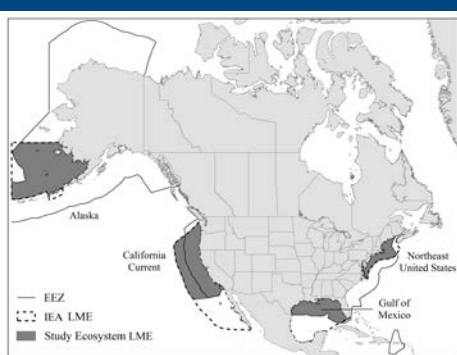
May 2019

National EBFM Policy Statement (2016)
- Defines EBFM and its benefits
- Establish relationship to current legal authorities (e.g., MSA, MMPA, ESA))
- Articulates guiding principles

National EBFM Road Map (2016)
- Operationalizing guiding principles in the policy statement
- Develop <u>fishery ecosystem plans</u>, <u>ecosystem status reports</u>, <u>management strategy evaluation</u>, <u>identifying tradeoffs</u> among ecosystem goods and services

NOAA FISHERIES

https://www.st.nmfs.noaa.gov/ecosystems/ebfm/creating-an-ebfm-management-policy

Ecosystem Status Reports

- Have been developed for Bering Sea, Gulf of Alaska, Arctic (in progress), California Current, West Hawaii, Northeast shelf, and Gulf of Mexico

- Intended for use by Fishery Management Councils, local and regional management bodies, and other stakeholders

- Used to complement species-level stock assessments and in risk analysis to guide fishery management decisions

- Intended to be updated periodically

- Intended to be publically available
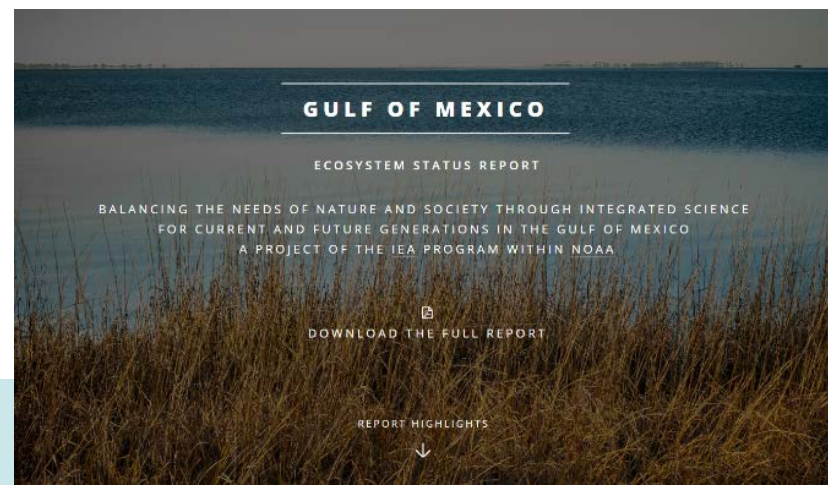
http://www.aoml.noaa.gov/ocd/ocdweb/ESR_GOMIEA/
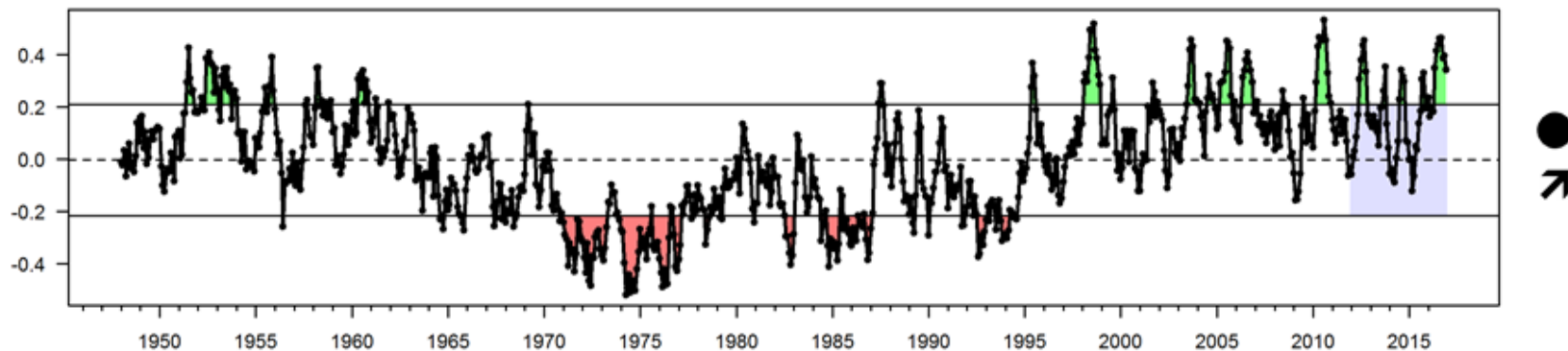

NOAA FISHERIES

Ecosystem Status Reports

Key Features:

- <u>Quantitative</u> trends over <u>time</u> across multiple ecosystem components

- Typically <u>regional</u> spatial scale and <u>monthly to annual</u> time scale

- Breadth not depth

- Standardized graphics format

Atlantic Multidecadal Oscillation (AMO)

https://climatedataguide.ucar.edu/climate-data/atlantic-multi-decadal-oscillation-amo

NOAA FISHERIES

Ecosystem Indicator Categories
(45 different indicators)

- Climate Drivers

- Physical & Chemical Pressures

- Habitat state

- Lower trophic levels

- Upper trophic levels

- Fisheries and protected species

- Human dimensions

5. Physical and chemical pressures

5.1 Sea Surface Temperature

5.2 Bottom Temperature

5.3 Florida Current Transport

5.4 Gulf Stream Transport/Position

5.5 River Flow

5.6 Nutrient Loading

5.7 Precipitation and Drought

5.8 Sea Level Rise

5.9 Storms and Hurricanes

5.10 Ocean Acidification

10. Human Dimensions

10.1 Human population

10.2 Population density

10.3 Coastal urban land use

10.4 Total ocean economy

10.5 Social connectedness

10.6 Fishing engagement

NOAA FISHERIES

South Atlantic Ecosystem Status Report

Contributors to South Atlantic ESR (18 organizations, 33 individual contributors)

- SEFSC (Beaufort, Miami, Pascagoula Labs)
- NOS (Beaufort, Charleston)
- AOML
- NCAR
- USGS
- ACCSP
- FL-FWC, GA-DNR, SC-DNR, NC-DMF
- U. Delaware, Duke, UGA, NCSU
- NC Wildlife Resources Commission

Current Status:
- Initial indicator list developed
- Data acquisition/analysis in progress
- Anticipate draft report in 2019
- Review and rollout forthcoming
- Input welcome!

Indicator List

4. Climate drivers

4.1 Atlantic Multidecadal Oscillation
4.2 North Atlantic Oscillation
4.3 El Nino Southern Oscillation
4.4 North Atlantic Tripole
4.5 Atlantic Warm Pool

5. Physical and chemical pressures

5.1 Sea Surface Temperature
5.2 Bottom Temperature
5.3 Florida Current Transport
5.4 Gulf Stream Transport
5.5 Gulf Stream Position
5.6 Upwelling
5.7 Wind
5.8 River Flow
5.9 Nutrient Loading
5.10 Precipitation and Drought
5.11 Sea Level Rise
5.12 Storms and Hurricanes
5.13 Ocean Acidification

6. Habitat state

6.1 Areal extent of estuarine habitats
6.2 Wetland Cover
6.3 Coral Reef Cover

7. Lower trophic states

7.1 Net primary productivity
7.2 Zooplankton biomass
7.3 Forage fish abundance
7.4 Shrimp abundance

8. Upper trophic states

8.1 Nearshore demersal fish diversity and abundance
8.2 Offshore hard-bottom fish diversity and abundance
8.3 Apex predator diversity and abundance
8.4 Florida Keys reef fish diversity and abundance
8.5 Mean trophic level
8.6 Life history parameters

9. Ecosystem Services

9.1 Biomass of economically important species
9.2 Recruitment of economically important species
9.3 Commercial landings and revenue
9.4 Recreational landings and effort
9.5 Overfishing status
9.6 Bird abundance
9.7 Marine mammal strandings
9.8 Sea turtle nest counts

10. Human Dimensions

10.1 Human population
10.2 Population density
10.3 Coastal urban land use
10.4 Total ocean economy
10.5 Social connectedness
10.6 Commercial and recreational fishing engagement

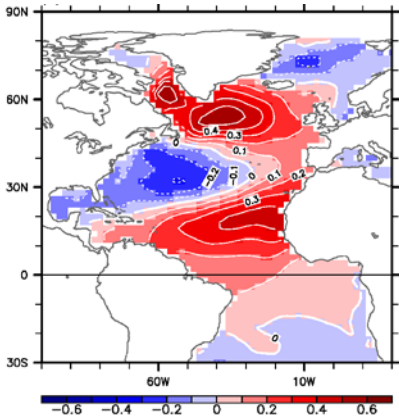**NOAA FISHERIES**

Examples of South Atlantic Indicators
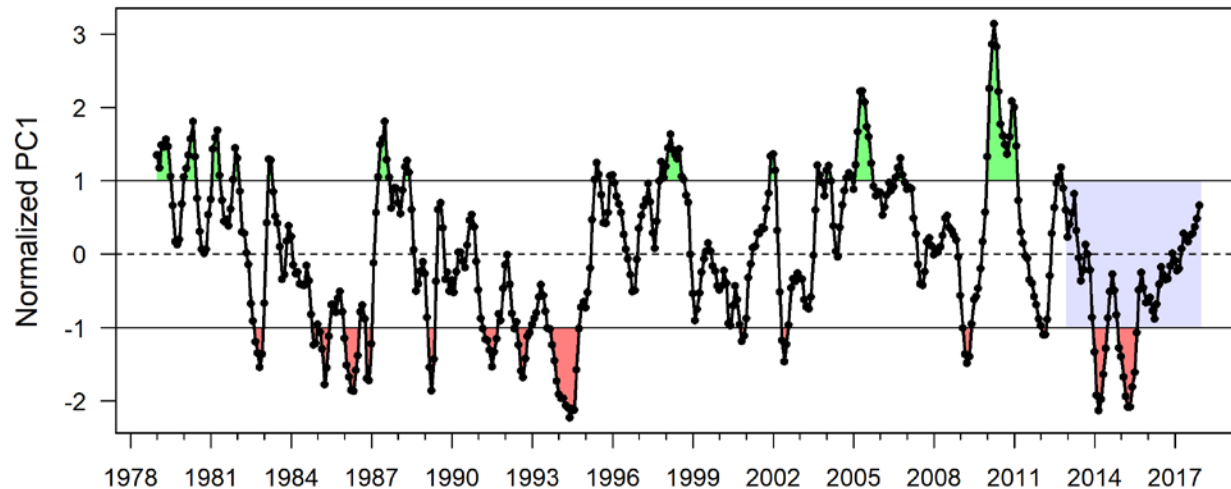
Climate Drivers

S. Lee (AOML)

Climate drivers
 Atlantic Multidecadal Oscillation
 North Atlantic Oscillation
 El Nino Southern Oscillation
 North Atlantic Tripole
 Atlantic Warm Pool


North Atlantic Tripole Mode

- Dominant mode annual SST variability in the winter and spring
- Influences atmospheric moisture transport and rainfall over the US
- Neg phase during 1980s and early 90s (warm SST, increased atmospheric moisture)
- Pos phase from mid-1990s through early 2010s (cold SST, decreased atmospheric moisture)

NOAA FISHERIES

Physical & Chemical Pressures

- Sea Surface Temperature (MODIS satellite imagery)
- Bottom Temperature (Annual MARMAP and SERFS fishery survey)
- Florida Current Transport (AOML, submarine cable voltage)
- Gulf Stream Transport (He, SA ecosystem model)
- Gulf Stream Position (He, SA ecosystem model)
- Upwelling Index (He, SA ecosystem model)
- Sea Level Rise (National Water Level Observation Network)
- River Flow (USGS, stream gauges)
- Nutrient Loading (USGS, sparrow model)
- Precipitation (Southeast Regional Climate Center)
- Drought   (National Integrated Drought Information System)
- Storms and Hurricanes (AOML Hurricane Research Divisions)
- PCO_2 (Noakes/Reimer, Grays Reef buoy)
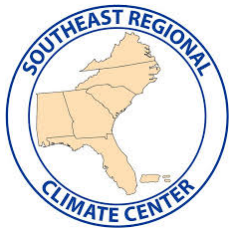
Example: Precipitation and Drought

Annual Precipitation
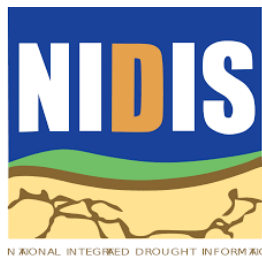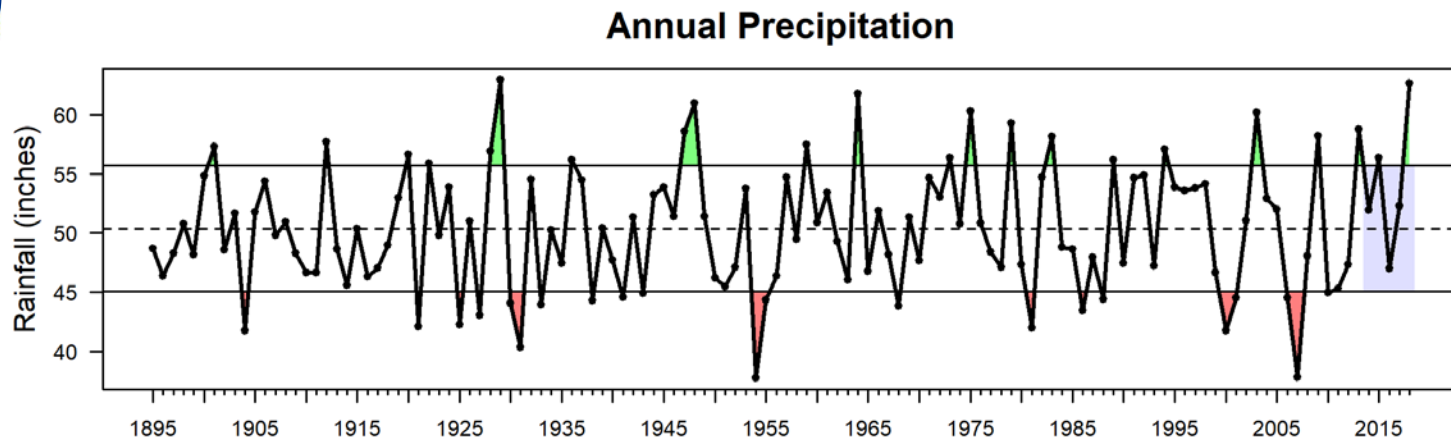
Drought Severity

National Integrated Drought Information System
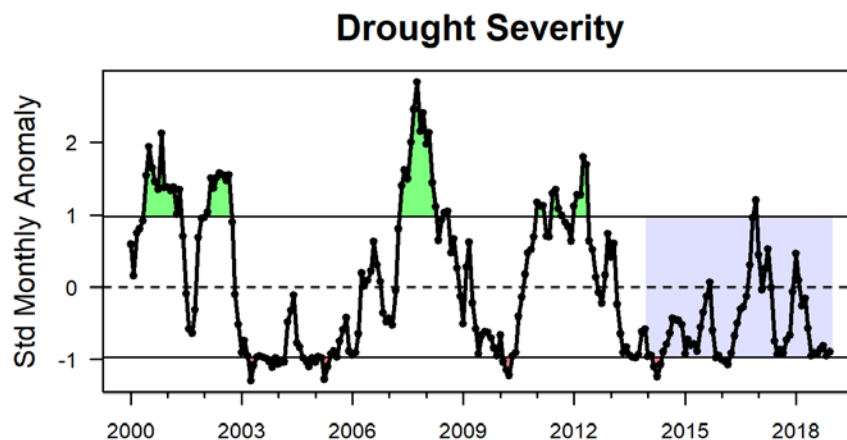
- Increasing precipitation and decreasing drought severity over the last 5 - 10 years
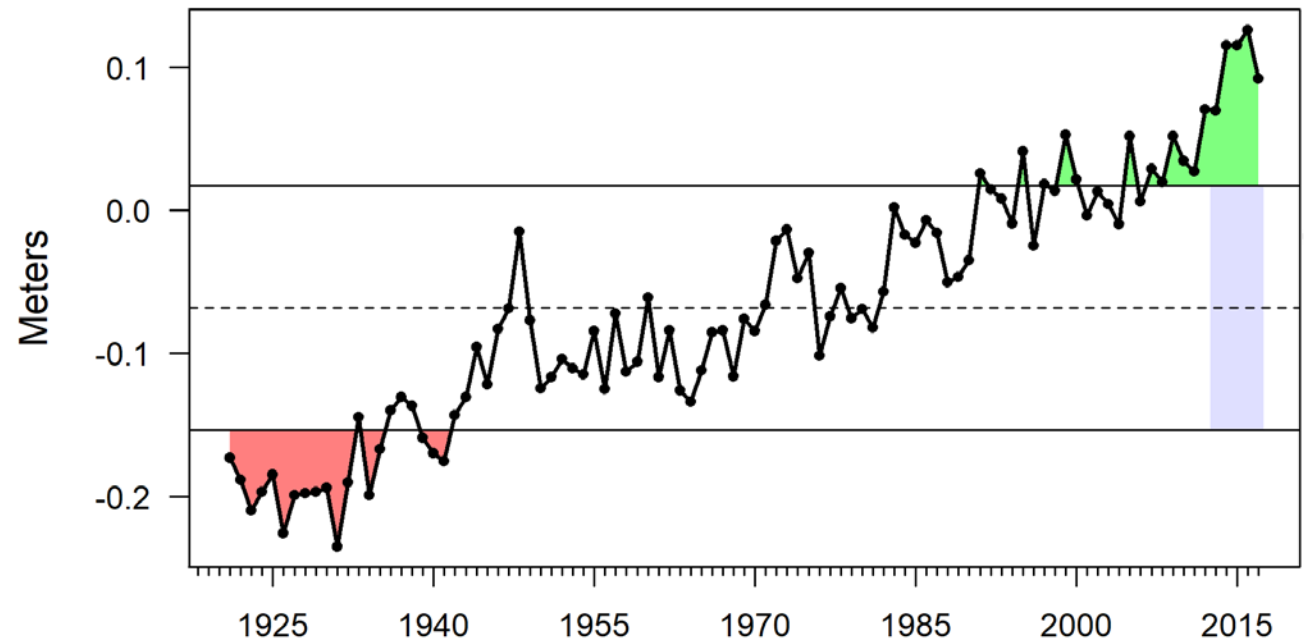
Example: Hurricane Activity

Hurricane Research Division
Atlantic Oceanographic & Meteorological Laboratory
National Oceanic & Atmospheric Administration

Landfalling Hurricanes

https://www.aoml.noaa.gov/hrd/

Dennis, Floyd, Irene
(Sept-Oct, 1999)

ACE Index
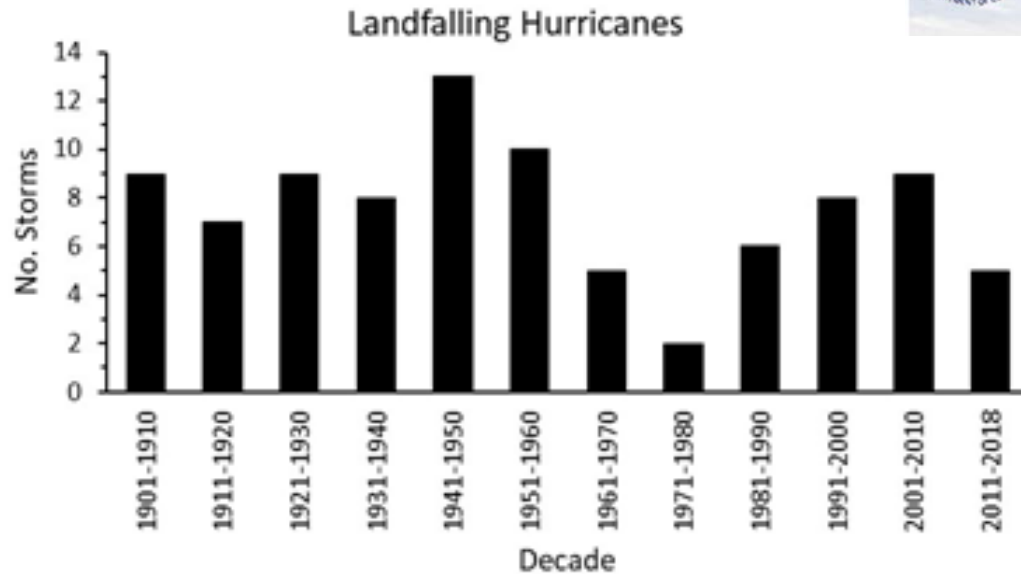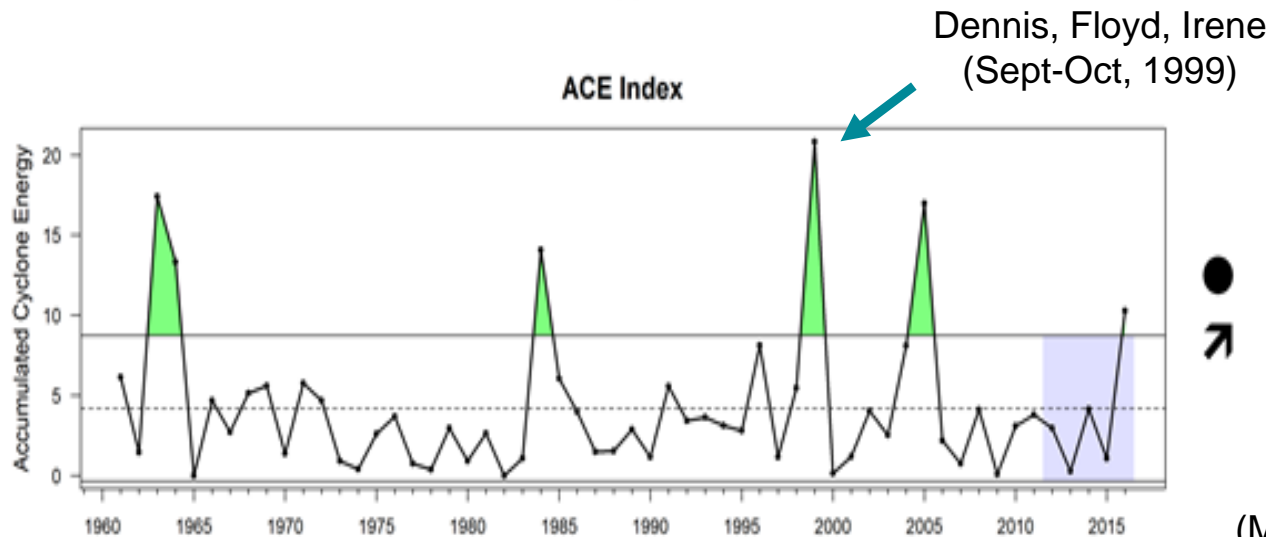
(M. Karnauskas, SEFSC)

NOAA FISHERIES

Example: Sea Level Rise

0-3 mm/yr

3-6 mm/yr

Data from National Water Level Observation Network

Mean Yearly Sea Level Rise

Average rate of sea level rise is 2.66 mm per year (range 2.01 to 4.55 mm per year) along the South Atlantic since the 1920s

Limited Information and Data Gaps

Habitat

- Wetland Cover (NOS C-CAP)

- Seagrass?
- Oyster cover?
- Coral reef cover?
- Offshore hardbottom?

Square miles of wetland loss and gain by county in the South Atlantic (1996-2010)

Myrtle Beach, SC

Gain: > 5, 0 to 5
Loss: 0 to 5, -5 to -25, -25 or more lost

Orlando, FL

https://coast.noaa.gov/digitalcoast/training/ccap-land-cover-classifications.html
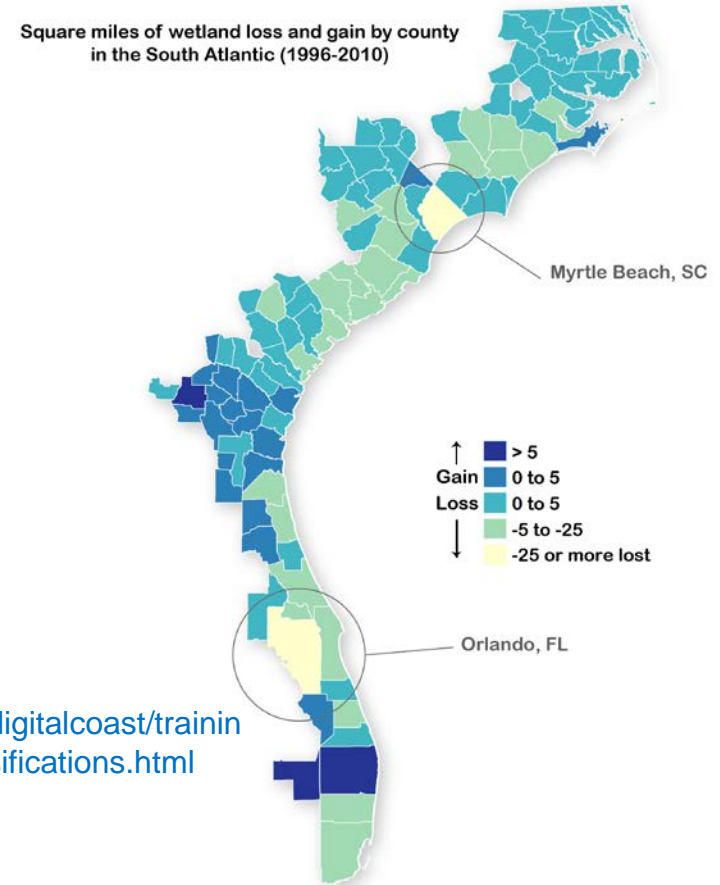
Lower trophic levels

- Chlorophyl-a (MODIS ocean color imagery)
- Zooplankton biomass?
- Larval and forage fish abundance?

Upper Trophic Levels and Protected Species

- Offshore hard-bottom fish diversity and abundance (Trap-Video Survey)
- Apex predator diversity and abundance (Longline survey)
- Nearshore demersal fish diversity and abundance (Trawl Survey)
- Marine mammal strandings (National MM stranding network)
- Sea turtle nest counts (state surveys)
- Bird abundance (Ebird)

3 Coastwide Fishery Surveys

Trap-Video
(MARMAP/SERFS)

2010-present

2017 Monitoring Deployments
- Chevron Trap
- Short Bottom Longline
- 105 m
- 35 m
- 15 m
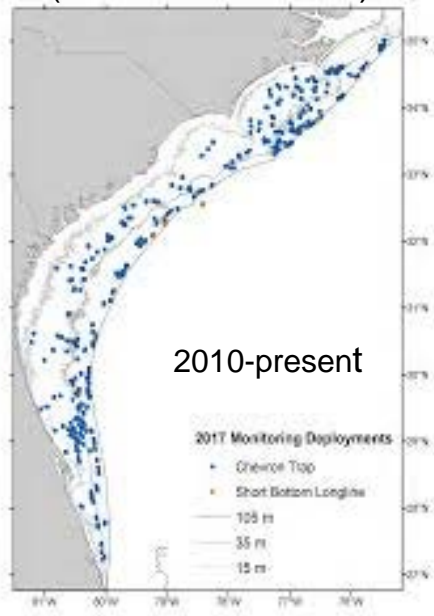
Bottom Longline
(NMFS)

2002-present

Bottom Trawl (SEAMAP-SA)

1989-present
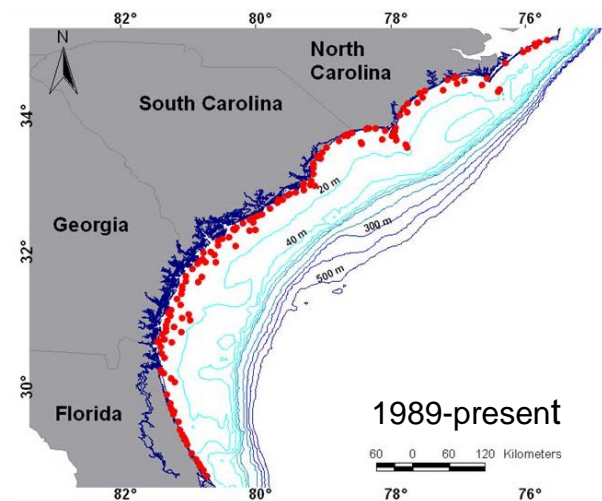
Example: Upper Trophic Levels
(3 Coastwide Fishery Surveys)

Trap-Video Survey (MARMAP/SERFS)

Bottom Longline Survey

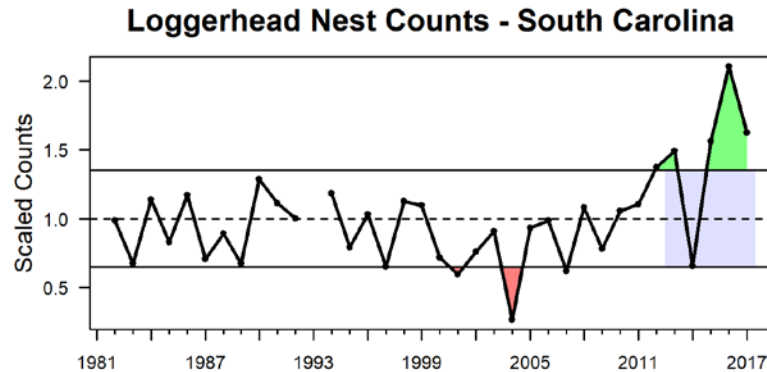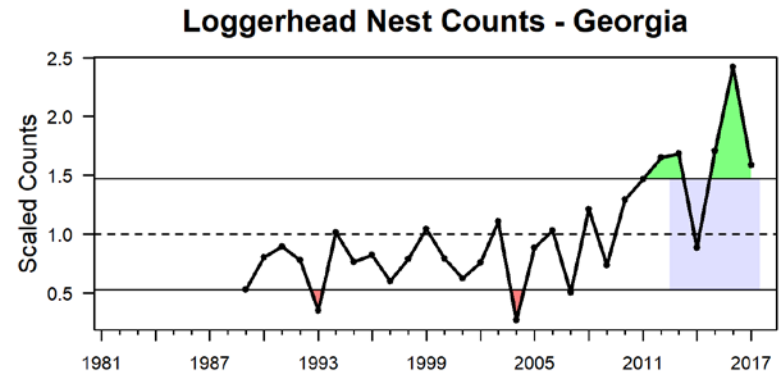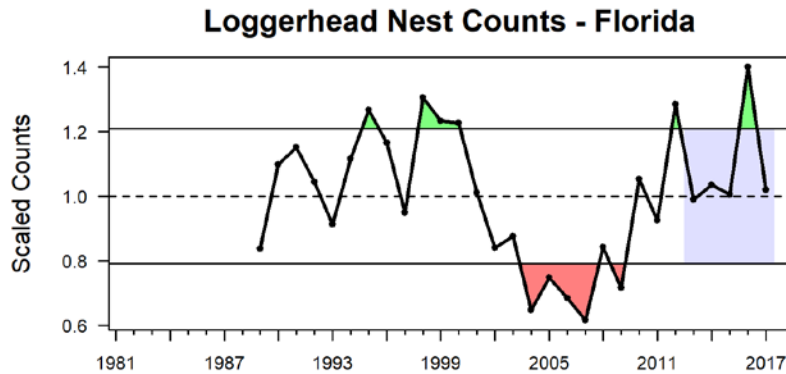SEAMAP Trawl Survey

Reef fishes

Apex Predators

Demersal forage fish

Richness

Richness

Bacheler & Smart (2016)
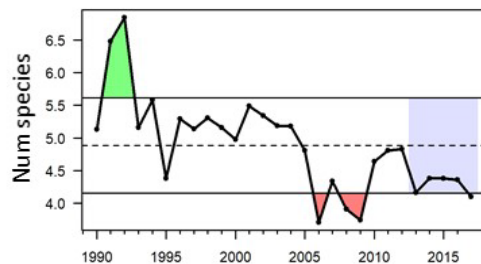
Abundance
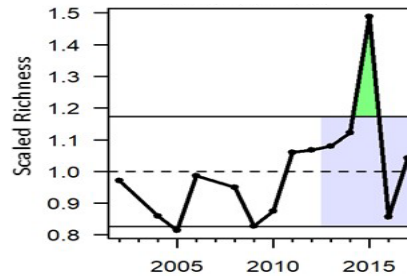
Abundance

SEAMAP Nearshore Bottom Trawl Survey (in progress)
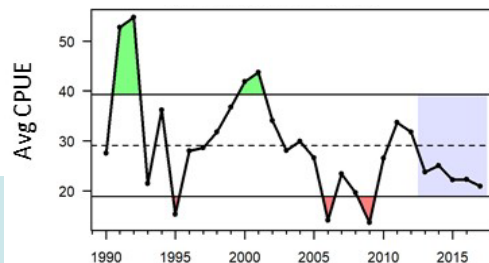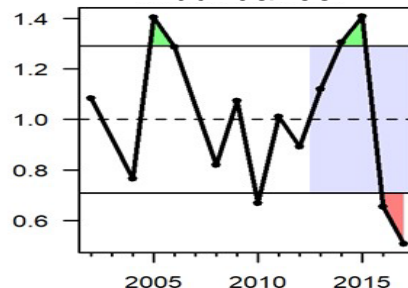
Example: Protected Species

Loggerhead Nest Counts - Florida

Loggerhead Nest Counts - Georgia
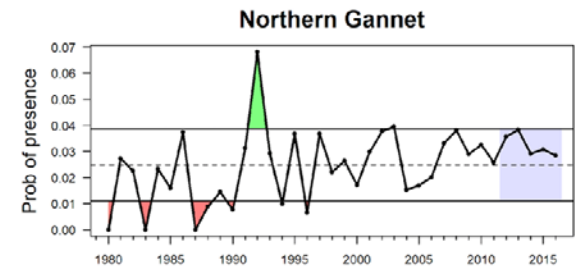
Loggerhead Nest Counts - South Carolina

Loggerhead Nest Counts - North Carolina
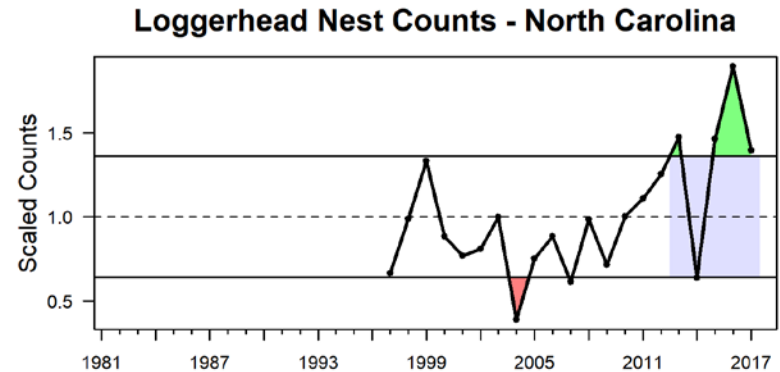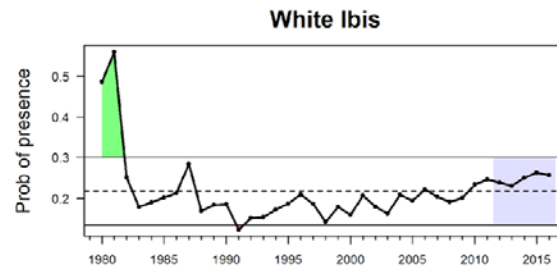
Nest counts from standardized surveys have increased coastwide since the mid-2000s

**NOAA FISHERIES**

Example: Bird Abundance
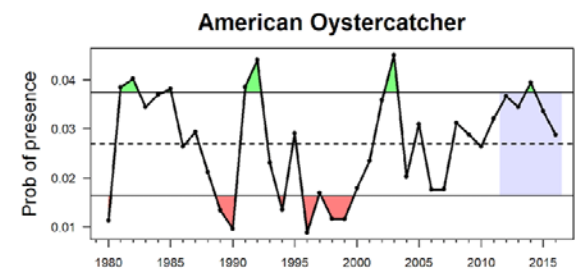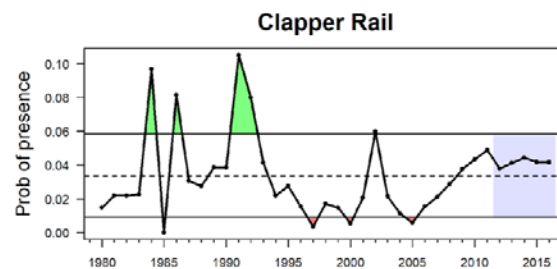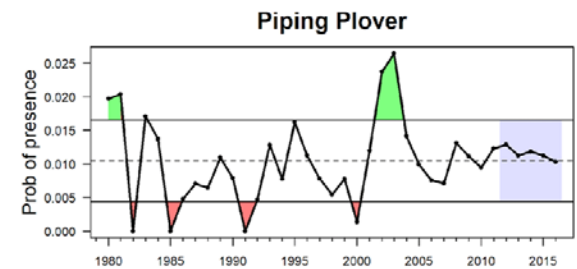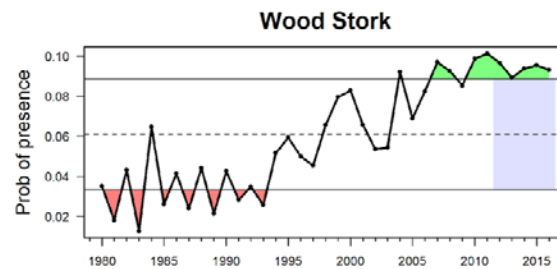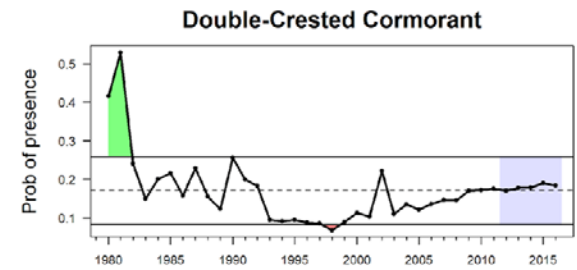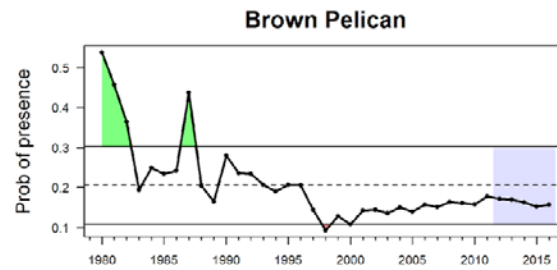
Example: Fisheries and Human Dimensions

- Biomass of economically important species (Stock assessments)
- Recruitment of economically important species (Stock assessments)
- Commercial landings and revenue (NOAA Fisheries)
- Recreational landings and effort (Marine Recreational Fishing Program—MRIP)
- Overfishing status (NOAA Fisheries)
- Human population (American Comm. Survey, Natl Census Bureau)
- Population density (American Comm. Survey, Natl Census Bureau)
- Coastal urban land use (NOS C-CAP)
- Total ocean economy (NOAA Fisheries)
- Social connectedness (NOAA Fisheries)
- Commercial and recreational fishing engagement (NOAA Fisheries)

NOAA FISHERIES

Example: Coastal Urbanization
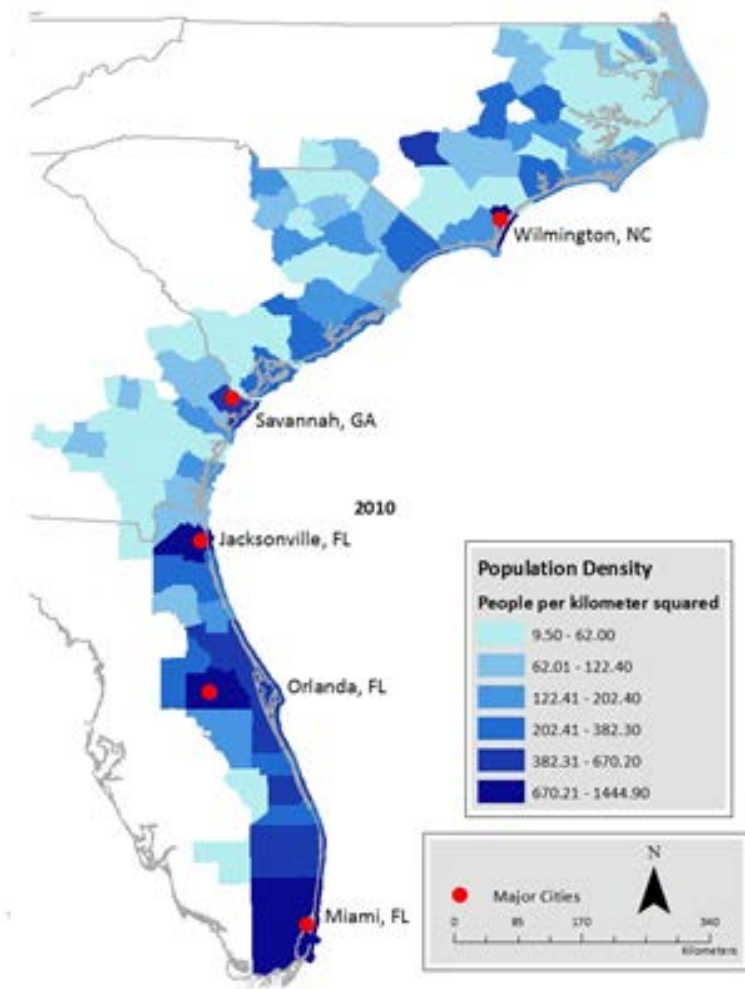
Square miles of land converted to developed areas by county in the South Atlantic (1996-2010)
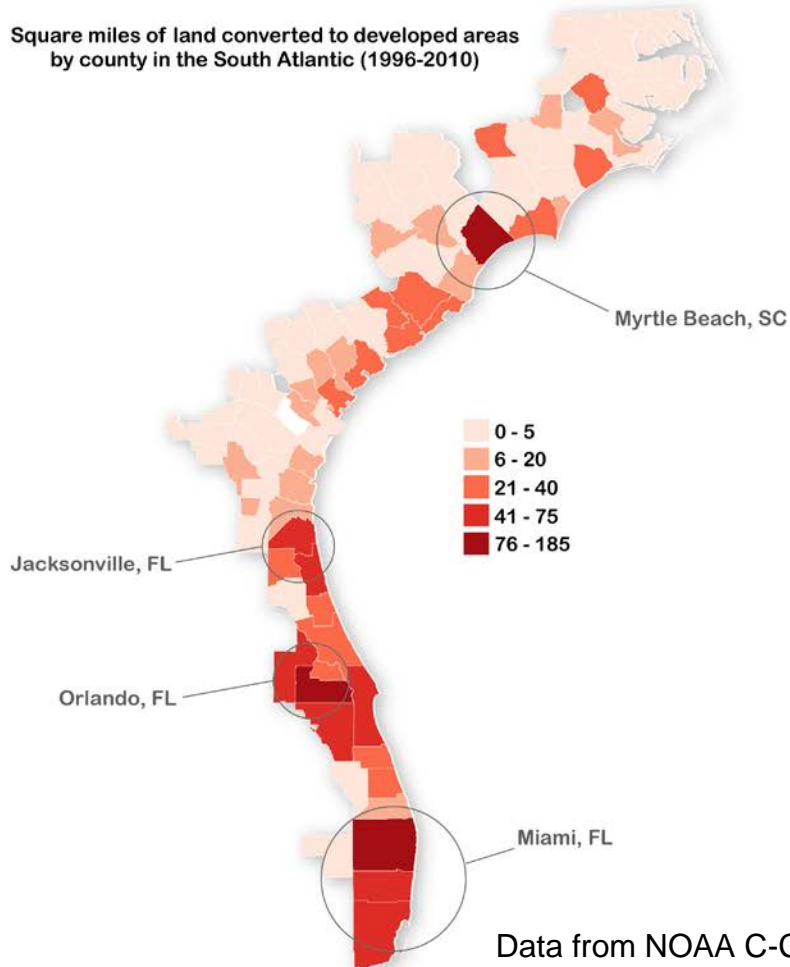
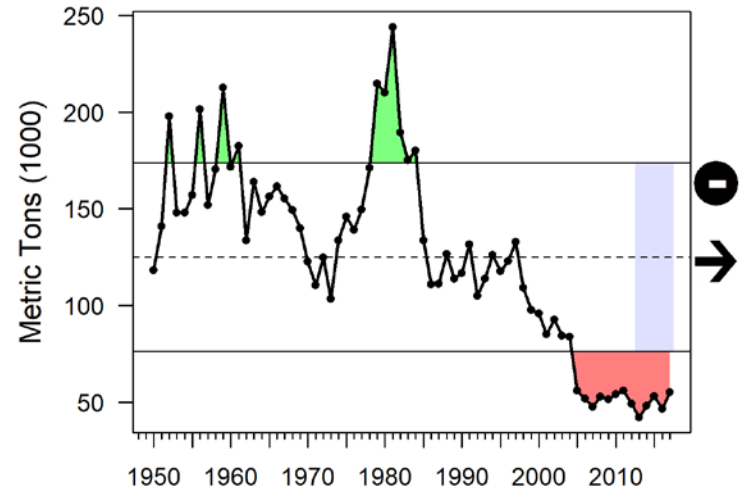Data from NOAA C-CAP program
(S. Regan, NOS)

- Increasing urbanization throughout the South Atlantic coastal counties (18-23% per decade)
- Popn growth of NC, SC, GA, and FL each within upper 25th percentile for all states

NOAA FISHERIES
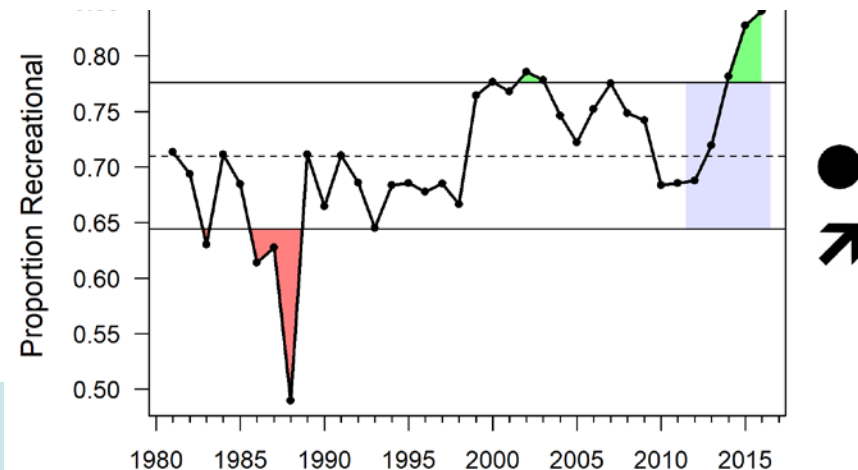
Example: Fishery Indicators

Increasingly recreationally dominated fisheries

Commercial Landings

**Proportion Landing from Recreational Sector
(for federally managed species)**

Shertzer et al. (2019)

NOAA FISHERIES

Next Steps

- Goal: draft report completed in 2019

- Review and feedback in 2020
  - ➤ Southeast Fisheries Science Center (SEFSC)
  - ➤ South Atlantic Fishery Management Council (SAFMC)
  - ➤ NMFS National ESR working group
  - ➤ Other partners (SECART, SECOORA, state agencies)

- Survey of scientific and stakeholder community to refine indicator selection

- Website development to house report and data

- Contacts: kevin.craig@noaa.gov, todd.kellison@noaa.gov

NOAA FISHERIES

The End