South Atlantic Indicator Testing: 2015 - 2016

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SOUTH ATLANTIC
LANDSCAPE CONSERVATION COOPERATIVE

Blueprint 2.1 indicators tested

- Freshwater aquatic
  - Permeable surface
  - Riparian buffers
- Waterscapes
  - Network complexity
- Marine
  - Marine mammals

Indicator testing overview

- Indicators need to represent a wide range of organisms and ecosystem attributes.

- Testing the current spatial depictions of indicators against monitoring data for other components of the ecosystem helps ensure indicators are working as intended.

- Indicators typically fail testing for two reasons:
  1. There is a conceptual problem. For example, nest productivity of loggerhead sea turtles failed due to extensive species specific management in some areas. These turtles maintained high productivity in places where other beach species did poorly.
  2. There is a modeling problem. Indicators may be conceptually sound but do not have good enough spatial models available and perform poorly in testing.

- Indicators that fail testing are either improved or replaced by a new indicator.

Freshwater aquatic and waterscapes indicator testing

- Permeable surface
- Riparian buffers
- Network complexity

Test data 1: Further permeable surface testing

- Water quality sampling from 2,951 waterbodies throughout the NC part of the South Atlantic LCC

- Data collected from 2006 – 2010 and provided by NC DENR Division of Water Quality as part of the 2012 integrated reporting of water quality assessments

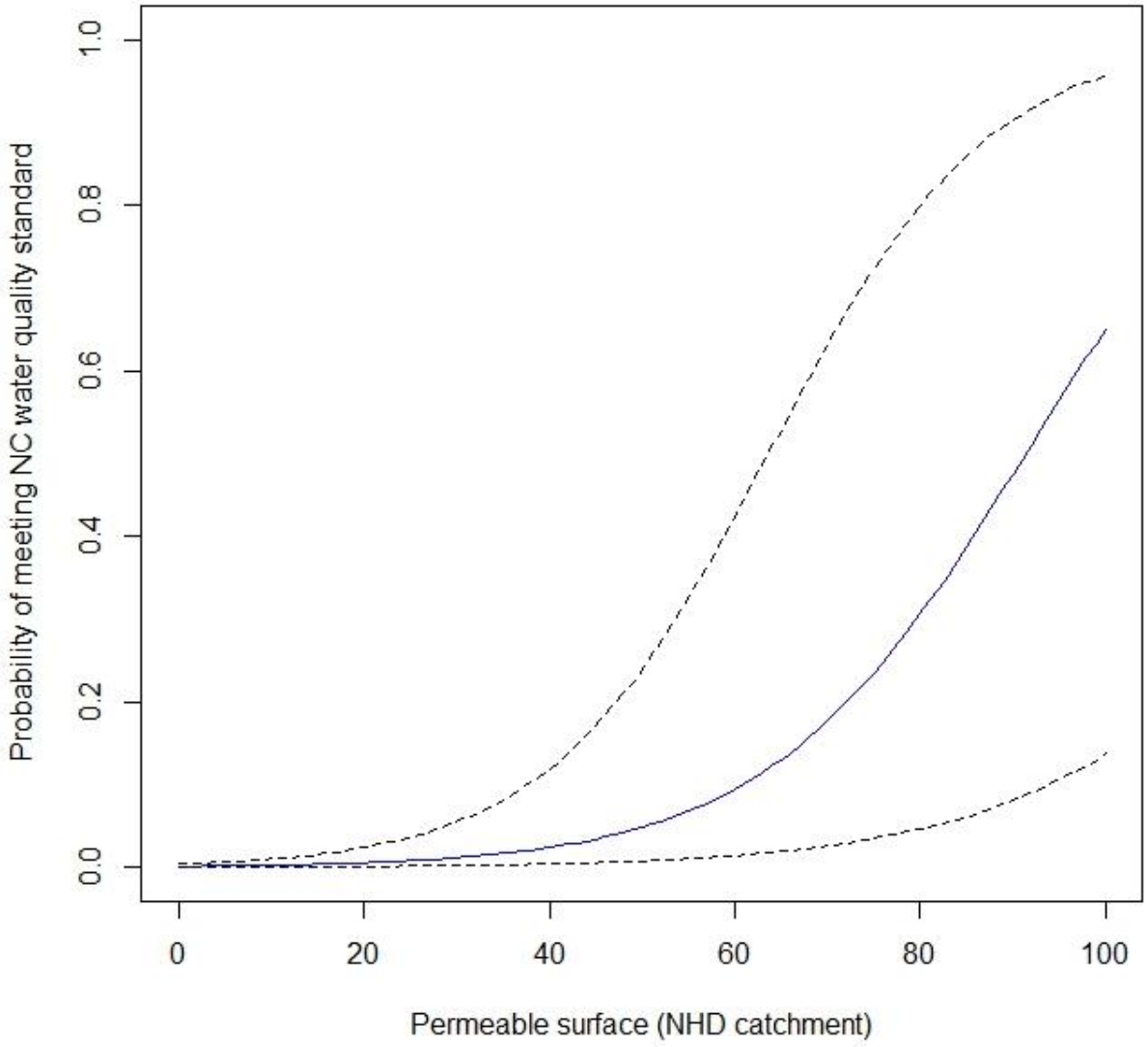
Permeable surface indicator testing methods

- Used “supporting” vs. “not supporting” aquatic uses for each waterbody
  - NC assigns a “best-intended use” for each waterbody, including aquatic life, recreation, fish consumption, water supply, and shellfish harvesting

- Tested against value of indicator pixel on top of monitoring point

- Compared using logistic regression in R

Permeable surface vs. water quality



Conclusions

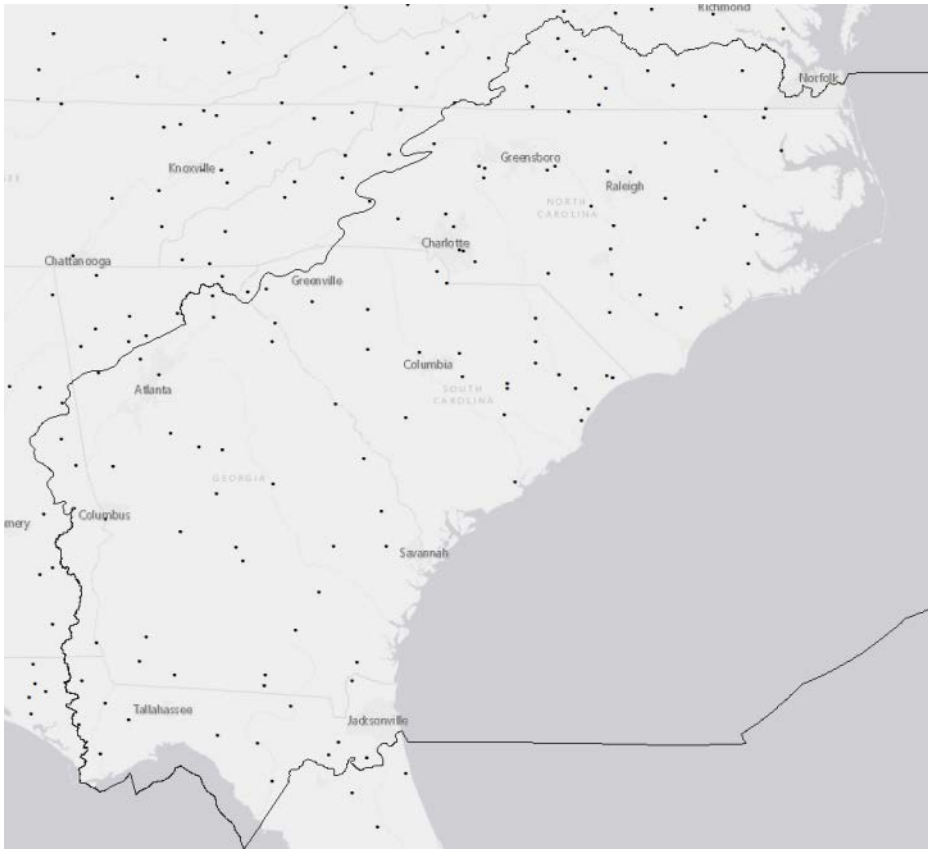
- Permeable surface worked relatively well in predicting “supporting” vs. “not supporting” aquatic uses for each waterbody.

- There is still significant variation not accounted for by this indicator.

- Given the lack of a clear threshold at 90% permeable, the results suggest use of this indicator in a continuous form is better that the previous bins of <90%, 90-95%, and >95% permeable.

Test data 2: EPA Rivers and Streams Assessment

- 2008/2009 sampling
- Fish and benthic insect indexes consistent across state lines

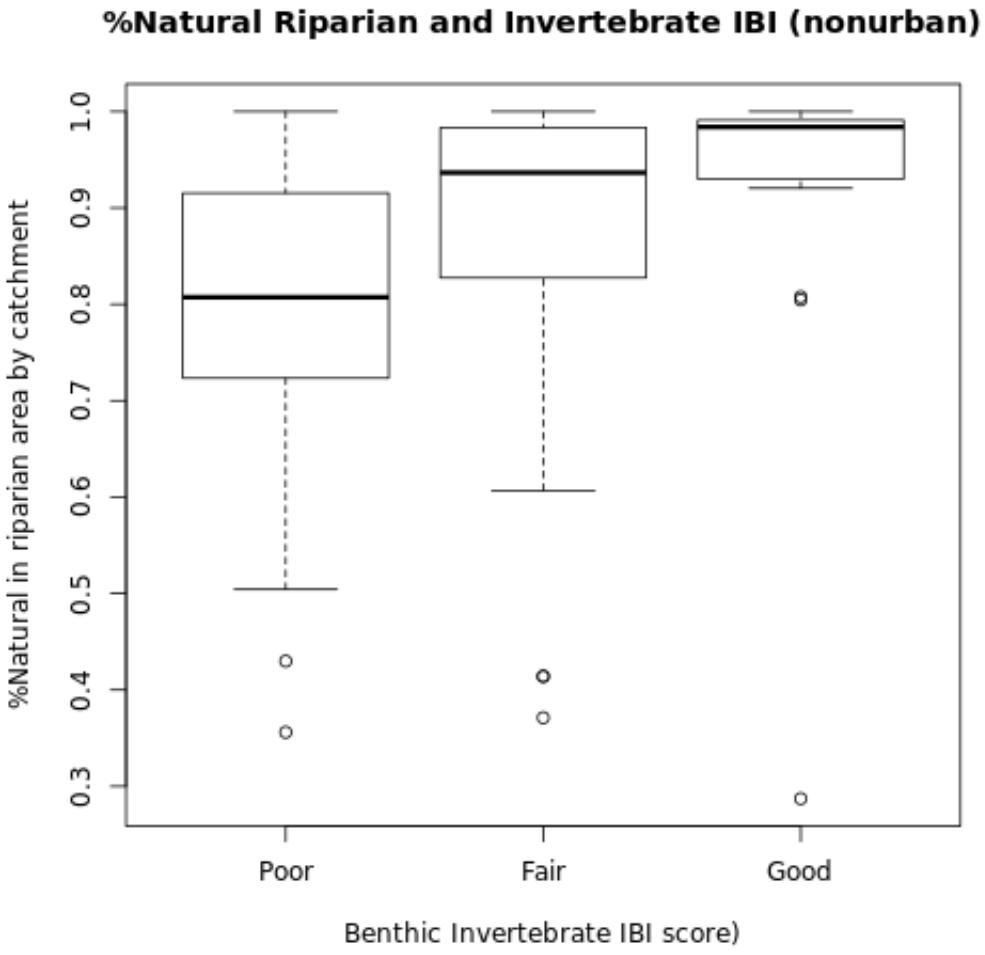


Riparian buffer indicator testing methods

- Used benthic multimetric index “BENT_MMI_COND” from sampling points
- Tested against value of indicator pixel on top of monitoring point
- Compared using boxplot in R
- Focused testing on nonurban areas. Impairment in these areas are less likely to be captured with the permeable surface indicator.

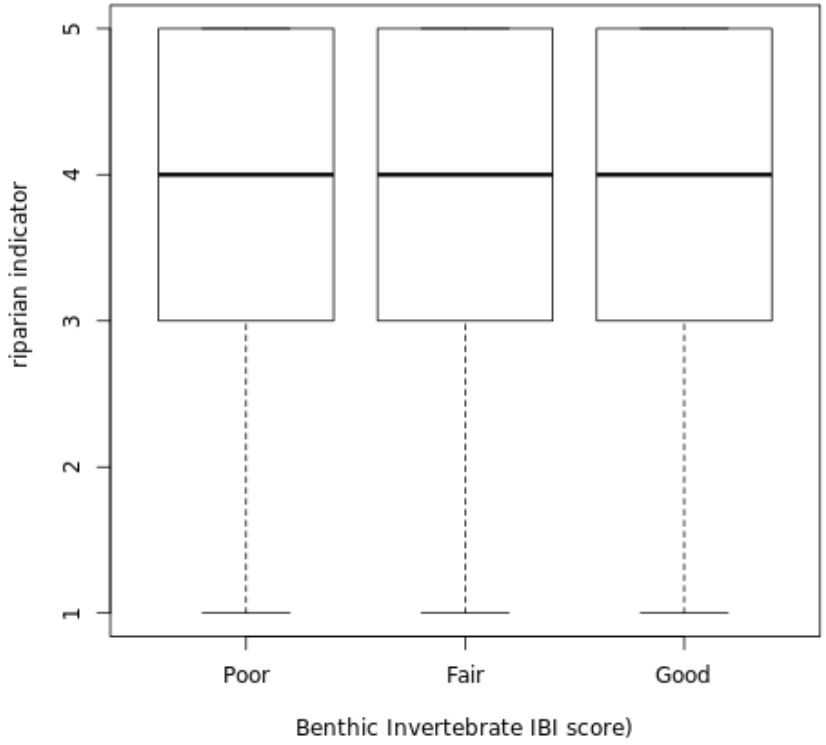
Riparian indicator vs. IBI samples

- % natural in active river area
- 111 nonurban sampling points
  - EPA 2008/2009 assessment
- Performed relatively well in testing

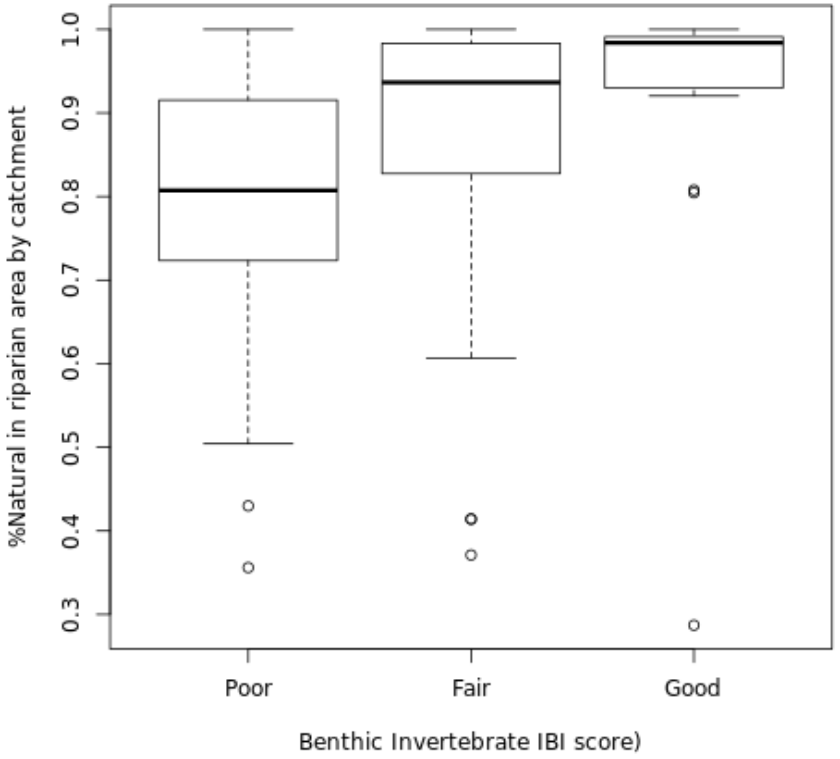


Indicator improvement from Blueprint 2.0 to 2.1

Blueprint 2.0 version – *Poor performance*



Blueprint 2.1 version – *Much better*



Conclusions

- Performed relatively well in testing, especially when compared to the version from Blueprint 2.0.

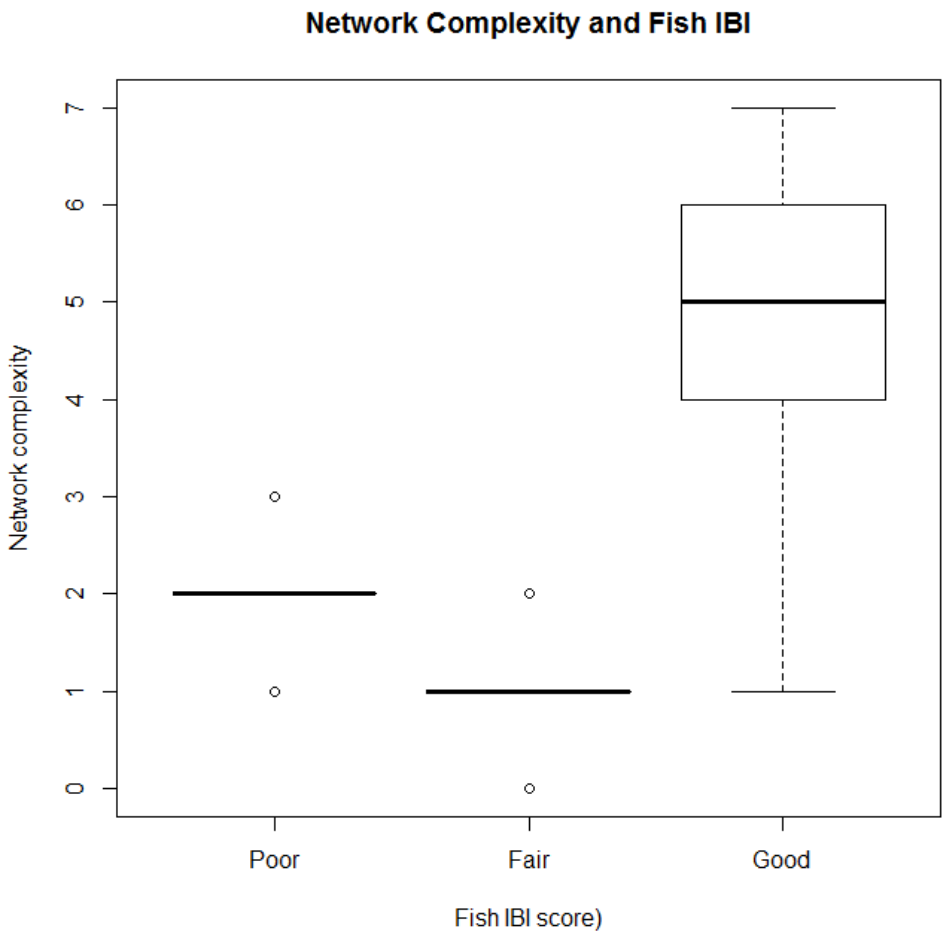
- There is still significant variation not accounted for by this indicator.

Network complexity indicator testing methods

- Used fish multimetric index “FISH_MMI_RF_COND” from sampling points
- Tested against value of indicator pixel on top of monitoring point
- Compared using boxplot in R

Network complexity vs. Fish IBI samples

- # of connected stream classes
- 168 sampling points
  - EPA 2008/2009 assessment
- Performed relatively well in distinguishing between “Good” and “Fair” or “Poor”



Conclusions

- This indicator performed relatively well in distinguishing between “Good” and “Fair” or “Poor” classes of the Fish IBI.

- There is still significant variation not accounted for by this indicator.

Methods to test all three indicators combined

- Test data 1 (NC Water Quality) – Logistic regression models in R with permeable surface, riparian buffer, and network complexity

- Test data 2 (EPA Rivers and Streams) – Boxplots in R with pairwise comparisons of permeable surface, riparian buffer, and network complexity indicators and Benthic and Fish IBI

Conclusions

- Test data 1 (NC Water Quality) – Only permeable surface alone was a significant predictor of water quality attainment. Most water quality attainment failures were due to harmful bacteria or chemical contaminants.

- Test data 2 (EPA Rivers and Streams) – Only riparian buffers was a significant predictor of Benthic IBI, and only network complexity was a significant predictor of Fish IBI.

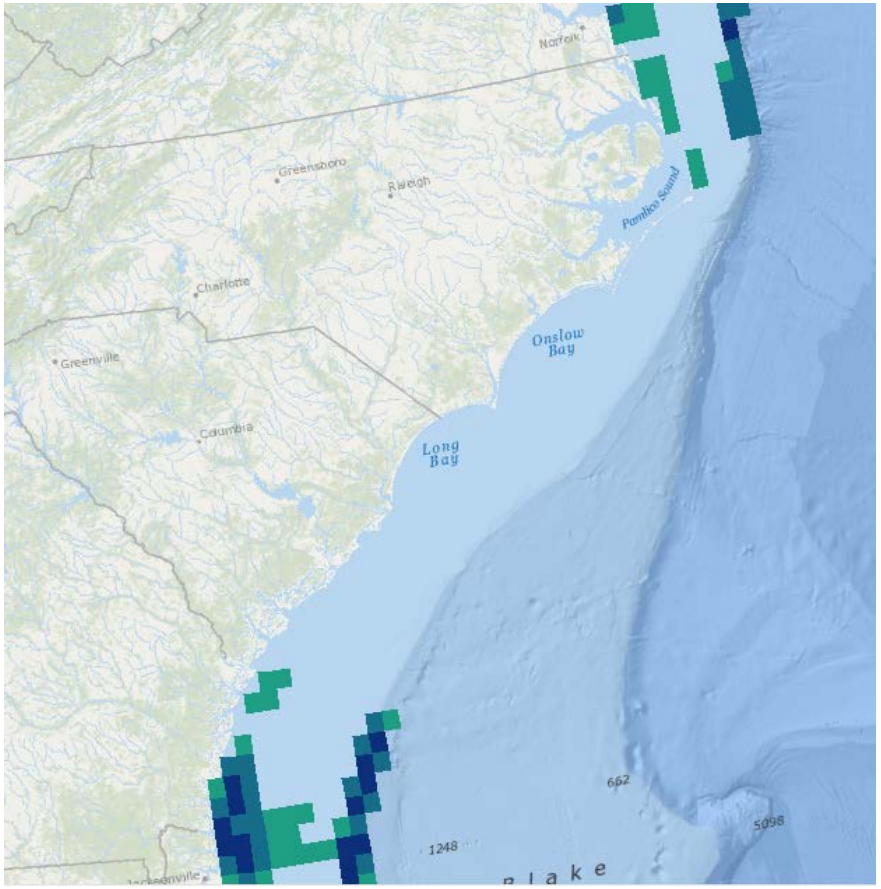
- Each indicator appears to be predicting a different component of ecosystem integrity. None of these indicators should be removed as none appear to be redundant and all are performing as intended.

Marine Indicator testing

- Marine mammals

Test data 1: Sea turtle sightings per unit effort

- Sightings per unit effort for all sea turtle species from 1998 - 2005
- Data from US Navy as summarized in the South Atlantic Marine Bight Assessment
- Used only the 3 highest density classes for each season
- Map on right shows highest density classes for each season combined (darker is higher)

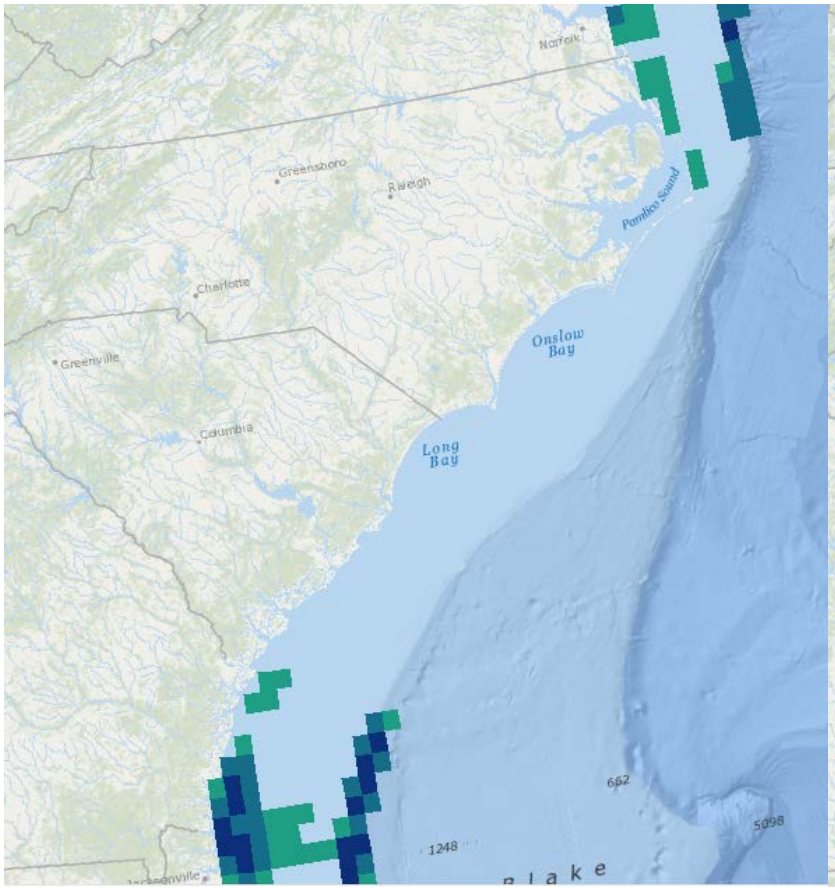


Marine mammal testing methods

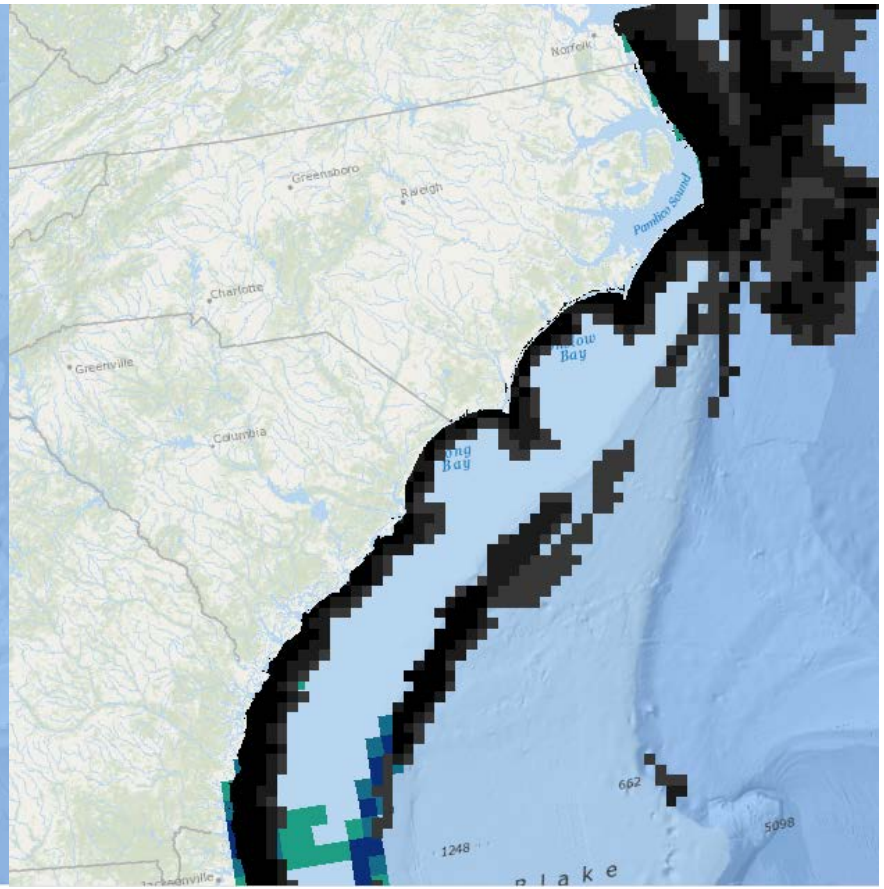
- Simple overlay in ArcGIS to look for areas of spatial overlap

Marine mammal indicator vs Sea turtle data

Sea turtle data



Top 30% marine mammal over sea turtle data



Conclusions

- Performed relatively well in all areas except for a region off the coast of Georgia and North Florida. This is an area with a known issue in the marine mammal indicator related to the Right Whale model. An improvement to that model is expected in 2016/2017.

- This indicator should be retested after the upcoming improvements to the marine mammal indicator.