Integrated Decision Support and Management Tools for Adaptive Public Health Practices: An Early Warning System for Swimming Beach and Shellfish Harvesting Waters

NORTH CAROLINA

SOUTH CAROLINA

GEORGIA

FLORIDA

U.S. Exclusive Economic Zone

GULF STREAM

LOOP CURRENT

LEJ3 Wave
LEJ3
ILM2 Wave
ILM2
ILM3
SUN2
SUN2 Wave
CAP2
WQ Station
FRP2
Greys Reef
Shell Point
APK
FHP
Clam Bayou
c12
c10
BCP
c13

Buoy or Coastal Station
High Frequency Radar

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SECOORA

SECOORA
Southeast Coastal Ocean Observing
Regional Association

IOOS
Integrated Ocean
Observing System

CODAR
OCEAN SENSORS

YSI
a xylem brand

Goal and Objectives

Goal

The ultimate **goal** of our work is to assist public health, beach management, and tourism officials in support of improved decision making.

Objectives

- Develop locally-relevant decision-support tools to support our goal; and,
- Demonstrate the geographic and thematic transferability of our approach to tool development.

Approach

Working with federal, state and local public health officials and water quality managers, a tool (app) was developed to do the following:

- Predict bacteria concentrations in swimming beach and shellfish harvesting waters
- Synthesize data from multiple data platforms (e.g. remote sensing, in situ) for the forecasting tools
- Use the EPA Virtual Beach and R toolboxes to generate predictive models
- Model performance and validation using BIC, R^2, Adj-R^2, ROC curves
- Automatically update the database where decision rules are applied to generate the forecasts
- Provide forecasts to local health officials; forecasts are displayed via the website and mobile app
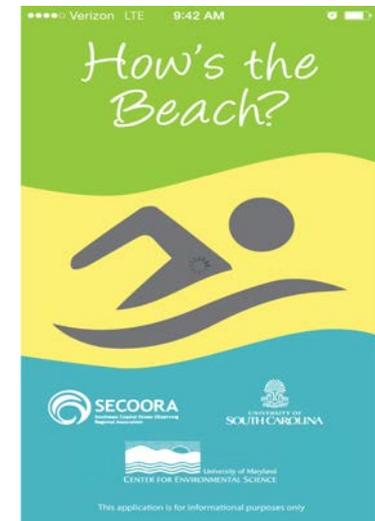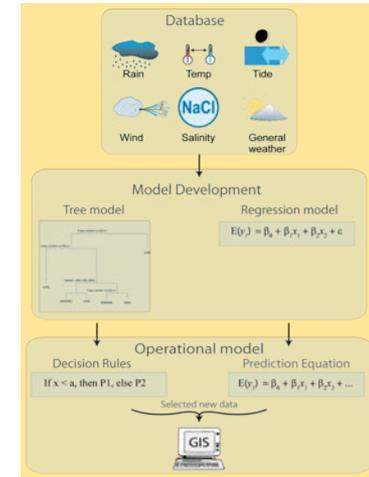
Accomplishments

- Working with the Charleston Waterkeeper and SCDHEC, we focus predictive modeling efforts on the Charleston Harbor watershed and adjacent swimming beaches and shellfish harvesting waters.
    - Historical datasets were culled from the USGS/SCDHEC, near real-time USGS/NOS gauges, sites, met stations, etc., and Nexrad rainfall data. These data were coupled with data collected by the monitoring efforts (*Enterococcus* concentrations) of the Charleston Waterkeeper to produce predictive models.
    - Near real-time data now feed directly in to 20 daily forecast models for 4 study areas in the Charleston Harbor area.
    - Completed an assessment of the impacts of changing land use and land-use practices on bacterial loadings to Shem Creek.

- Working with the NC Department of Environmental Quality. Focus predictive modeling efforts in Dare County, Outer Banks NC.
    - Due to a lack of long-term historical salinity data, using modeled salinity data from three models: HYCOM, Rutgers, and Copernicus.
    - A THREDDS server populated with long-term, high-resolution model output would be very useful for our modeling efforts.
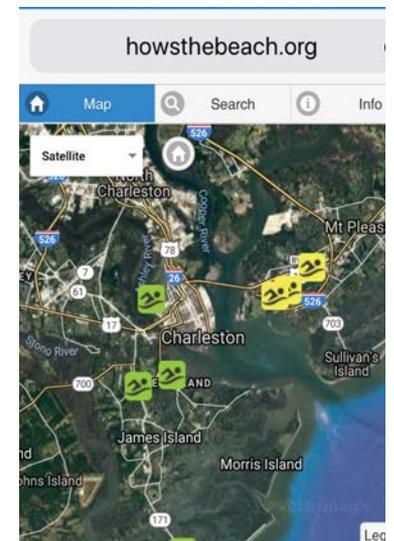
Impact

- End users include resource managers and public health officials in FDA, EPA, Interstate Shellfish Sanitation Commission, and in the states of MD, NC, SC and FL.

- Leverages resources, data, and skill sets available from state and local resource management and public health agencies, and NOAA's NWS, CCEHBR, NIDIS and NERRS, and EPA's Office of Water and Office of Environmental Justice.

- Stakeholders providing guidance, input, and review include resource managers, public health officials and representatives of potentially vulnerable populations:
  - Ad Hoc Water Quality Modeling Work Group,
  - Charleston Waterkeeper
  - Virtual Beach Advisory Committee
  - Midlands Rivers Coalition
  - Lowcountry Alliance for Model Communities
  - Virtual Beach Environmental Modeling Community
  - Swim Drink Fish Canada
  - SC Department of Health and Environmental Control
  - NC Department of Environmental Quality

Impact