Researchers combine remote sensing technologies for highly detailed look at coastal change

August 9 2012

Shifting sands and tides make it difficult to measure accurately the amount of beach that's available for recreation, development and conservation, but a team of University of Georgia researchers has combined several remote sensing technologies with historical data to create coastal maps with an unsurpassed level of accuracy.

In a study published in the August issue of the journal *Tourism Management*, they apply their technique to Georgia's Jekyll Island and unveil a new website that allows developers, conservationists and tourists access to maps and data on beach availability, tidal ranges and erosion.

"Policymakers, coastal managers and conservationists can use this information to help make more informed decisions about managing coastal resources," said lead author Byungyun Yang, a recent graduate of the geography doctoral program and current research associate at the UGA Center for Remote Sensing and Mapping Science, part of the Franklin College of Arts and Sciences. "Tourists can easily access the same data with their computers or smartphones to help plan their trip to the beach."

Beach area is typically measured using the same costly and time-consuming land-based survey techniques that are used to plan roads, subdivisions and other projects. The UGA researchers' technique, on the other hand, combines LiDAR (light detection and ranging) data with

high-resolution satellite imagery to provide an exceptional level of detail and accuracy. By shooting hundreds of thousands of pulses of light at a surface and then measuring the time it takes for the reflected light to be detected by a sensor, LiDAR provides three-dimensional elevation data with a level of accuracy that is six inches in diameter, or about the size of a grapefruit. High-resolution satellite images similar to those available through Google Earth provide two-dimensional images with a pixel size of approximately three feet by three feet, allowing the researchers to discern coastal features such as sand dunes.

By combining the sources of remote sensing data with historical shoreline maps dating to 1857, the scientists created detailed maps that precisely delineate the boundary between the ocean and the land. Historical tidal data were used to create models of how Jekyll Island would fare under various calculations of sea-level rise and under tropical storm and hurricane storm surge conditions.

"With this high-resolution data, we can model which areas are going to flood with much greater accuracy," said study co-author Tommy Jordan, associate director of CRMS. "We can see things like small indentations and the spaces between the dunes and simulate where the water would go."

The researchers note that the island has changed significantly over the past 155 years. In a pattern common in barrier islands, its northern portions have eroded while its beach area in the southern region has increased.

CRMS director, study co-author and geography professor Marguerite Madden noted that balancing the interests of tourism, conservation and development can be challenging, but said that access to high-quality data can help ensure that stakeholders make well-informed decisions.

"Now all of the interested parties—developers, land managers, the Jekyll Island Authority, the state and the people who enjoy and live on the island—have access to the same maps, images and other data," Madden said.

More information: To access the Jekyll Island beach availability website, see maestro.crms.uga.edu/BeachAvailability/

Provided by University of Georgia