

Participatory Mapping of Cultural Ecosystem Services Impacted by Coastal Squeeze

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Almost half of the areas valued as cultural resources are threatened by urbanization, sea level rise or both, compared to only a third of the island as a whole.

An Island Squeezed By Pressures from Sea Level Rise & Urban Expansion

Johns Island, SC is the fourth-largest island on the US east coast.

- Located in Charleston County.
- Low-elevation (<5m).
- Surrounded by large expanses of tidal marsh and forested wetlands.
- Primarily settled by black Americans post Civil War.
- Historical significance to the 20th century civil rights movement.
- **Rapid population growth and development** is changing the demographics and rural nature of the island.

Long term residents are looking for solutions to protect the island's threatened cultural and natural resources.



Identifying Important Natural- & Cultural-Resources on Johns Island

Participatory Mapping Workshops

What's Important on Johns Island and Why?
 • valued sites and landscapes • history and landscape legacy • key actors

Resource Type	Questions Asked
Beauty	Where are the prettiest or most beautiful locations on Johns Island? What parts of Johns Island have the prettiest landscapes or scenery?
Community	Where do you go to spend time with your friends, family, or community? Where are the places that allow for social interaction and relationship building?
Gathering	Where on Johns Island do people gather natural materials, like fruits or berries?
Heritage	Where are the places that have important history and that link to your cultural heritage?
Hunting/Fish	Where on Johns Island can you go to hunt or fish?
Leisure	Where are the places on Johns Island that you find leisure or recreation opportunities?
Sense of Place	Where do you feel most 'at home' on Johns Island? What places produce a feeling of belonging and familiarity?

"The trees on the roads...because trees meet each other over the top...it's beautiful...like you are in a tunnel. But they are trying to widen the roads because they just can't handle the traffic anymore."

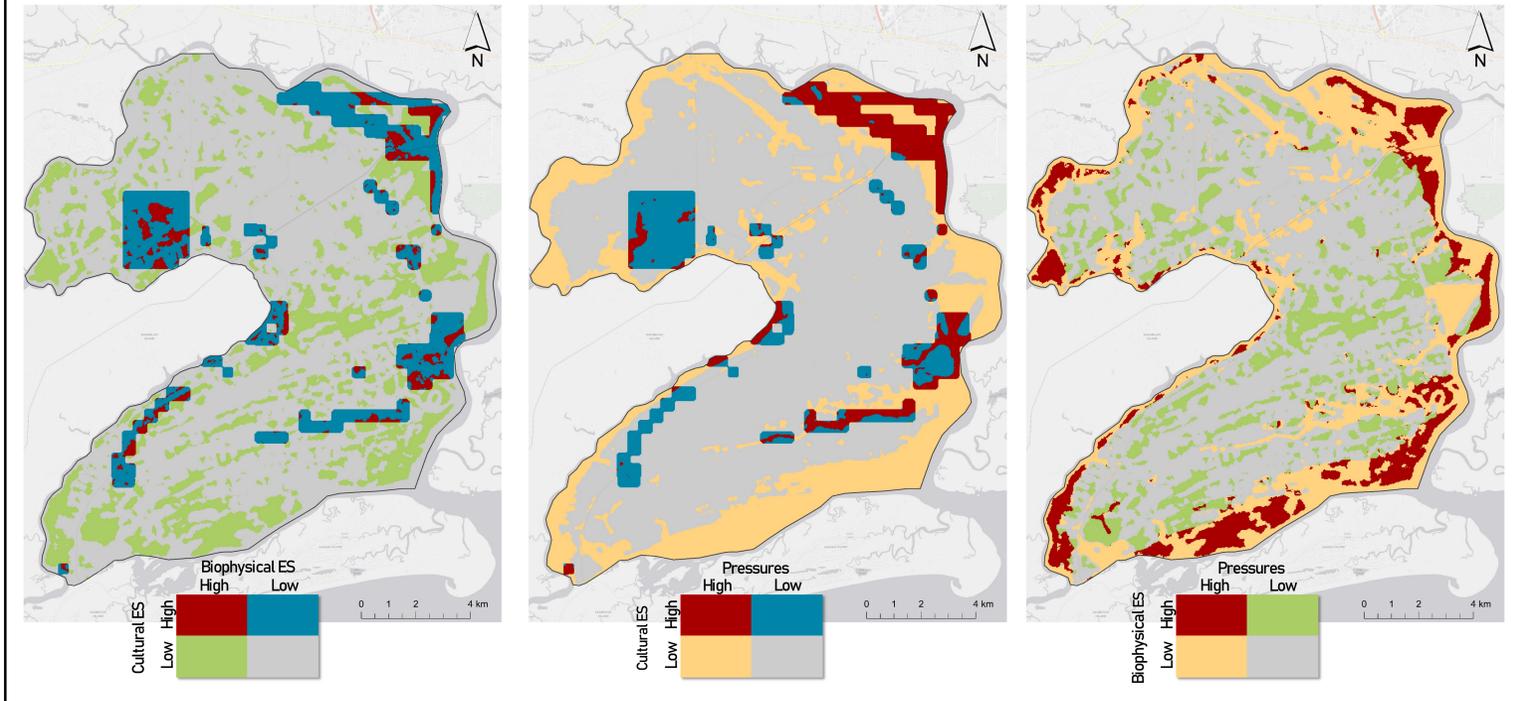
The 'rural nature' of Johns Island is important for cultural heritage, but difficult for stakeholders to map.

Coastal Squeeze & Ecosystem Services

(A) A cultural ecosystem services (CES) is positioned between a largely rural area on the landward side and the sea. At t_0 , current sea level does not negatively affect the CES.

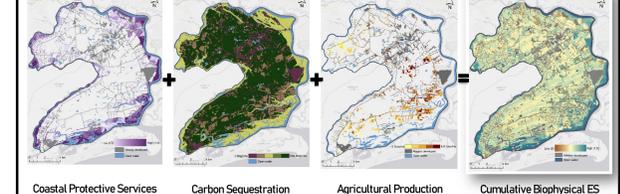
(B) At t_1 , sea level rises against a 'fixed' landward boundary, shrinking the area available for coastal processes to occur; this process has been described as "coastal squeeze".

(C) The landward boundary is dynamic, not 'fixed', as coastal development results in landward encroachment into areas providing CES. Accounting for both the dynamics of sea level rise and urban growth more accurately portrays the process of coastal squeeze.



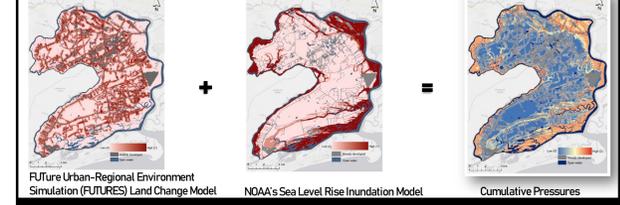
Mapping Regulating- & Provisioning-Ecosystem Services (Biophysical ES)

We used the Integrated Valuation of Ecosystem Services and Trade-offs (InVEST) models to quantify biophysical ecosystem services.



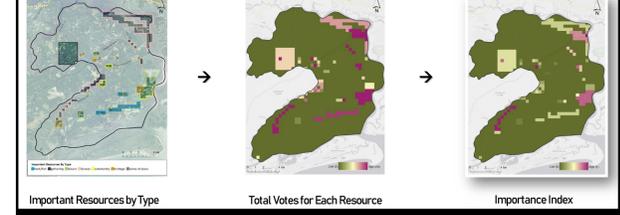
Mapping Urban Expansion & Sea Level Rise (Pressures)

We used a dynamic land change model and sea level rise inundation models through 2060 to model pressures on ES.



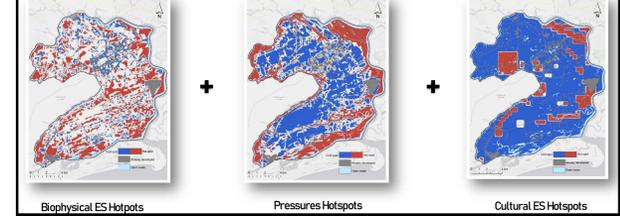
Mapping Cultural Resources (CES)

An index was calculated for the resources by assigning values to the rankings: 'most important' (3), 'very important' (2), 'important' (1) and multiplying by the counts.



Identifying Hotspots of High Value

We used Getis-Ord Gi* to map spatial autocorrelation and retained statistically significant clusters of high (hotspot) or low (coldspot) values for both ES types and pressures.



Co-identifying Threats to Resources & Opportunities for Conservation

By incorporating group values in addition to individual values for CES, valuing CES other than recreation services, and leveraging the strengths of geospatial modeling, participatory mapping can be used to move beyond traditional methods of CES valuation.

- Gives the same consideration to CES as other more easily and commonly mapped, ecosystem services.
- Provides a spatially-explicit assessment of synergies and mismatches between biophysical ES and locally-relevant cultural resources.
- Delivers a decision support tool critical to the success of any forward-looking and equitable planning or adaptation policies.