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The coastal real estate market and genetic diversity of an important salt marsh plant

By Jeffrey Beauvais

Salt marshes are one of the most iconic ecosystems along the southeastern coast. These ecosystems, particularly the dominant plant Spartina alterniflora*, provide numerous services and benefits to the human communities that live around them, such as weakening the strength of severe storms and providing habitat for culturally and economically important species like shrimp and blue crabs. Despite their known importance, salt marshes are dwindling across the United States, and some estimates assert that half of all salt marsh in the United States have been destroyed. Accompanying this decline in salt marsh cover has been the loss of African-American owned land and the rapid growth of coastal regions around the country since the coastal tourism and real estate boom of the 1950s. This region has undergone rapid demographic, economic, and ecological transitions over the last sixty years and continues to do so. My research, focused on developing effective methods of salt marsh conservation, is even more critical as coastal populations are some of the fastest growing in the country and coastal economies continue to shift towards accommodating large-scale tourism.*

History of coastal development and landloss in the African-American community

In the years following the Civil War, former slaves and their descendants acquired their own land throughout the coastal southeast. Over the past 50 years, African-American communities have lost vast stretches of property in coastal areas, often being replaced by resort towns and luxury, by predominantly white communities. Several racially motivated practices, such as intentional overvaluation of African-American properties by county tax assessors to price out landowners, or developers exploiting vulnerabilities imposed by an archaic system of land transference known as heir's property, have contributed to the rapid loss of African-American community owned coastal land. To understand patterns of coastal development over the last half-century, as well as the trajectory of future development in Georgia and

Significance

- Rapidly growing coastal counties of Georgia and South Carolina are faced with increasing hardening of coastlines, threatening vital and fragile salt marsh habitat.
- Loss of genetic diversity from salt marshes may leave them more susceptible to future damage from climate change and sea level rise.
- Research into how infrastructure modifies wrack disturbances, and the genetic consequences of these altered disturbances is imperative to understand how coastal development affects marshes.
- Effective and equitable conservation of coastal ecosystems requires an examination of not just ecological but also legal, and social contexts that shape and are affected by coastal development.
- My research will attempt to weave together these seemingly unconnected topics to gain a holistic understanding of salt marsh conservation and guiding sustainable, just development.

South Carolina, it is crucial to identify how and why African-American families lost their land along the coast and how this is linked to large-scale development.

Ecological impacts of coastal development

I propose that understanding the process of land loss in African-American communities not only explains patterns of coastal development, but also provides ecological and conservation insights. Shoreline hardening, the process of building large, artificial structures directly into the marsh is widespread along the southeast coast and is associated with housing density and value. Hardening structures, which include seawalls, jetties, and docks, are intended to protect fragile coastal property and to provide amenities. However, coastal infrastructure has consistently been found to be ecologically damaging in numerous ways, from increasing erosion in areas to altering tidal flows within the marsh. An additional, overlooked consequence of these structures is the alteration of wrack deposition, a natural disturbance in the marsh. Wrack, dead *Spartina* stems formed from the annual dieback of *Spartina* in the winter, can form large, buoyant mats that are transported throughout the marsh by winds and currents. Large piles of wrack can smother and kill living vegetation, reducing the amount of *Spartina* in an area.

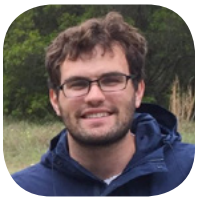
Although wrack is a natural part of salt marshes, coastal infrastructure interacts with wrack and may alter its role in the ecosystem. Wrack is typically washed out to sea or found in a relatively narrow band along the shore, where it is deposited by high tides. One visually striking impact of shoreline hardening structures, particularly docks, is the alteration of wrack distributions. Docks trap wrack along their length, causing wrack to pile up deeper into the marsh than is natural (Figure). Given the extraordinary length of some docks this can result in acres of marsh being smothered by wrack trapped by a single dock. In addition to increasing the area of marsh impacted by wrack, these structures may also modify other properties of wrack disturbances, such as increasing the duration and frequency of wrack deposition.

Docks trap wrack, causing it to pile up deeper into the marsh than is natural.

Altered wrack deposition could affect *Spartina* in several ways, including reducing the genetic diversity of *Spartina* populations. *Spartina* overwhelmingly relies on asexual reproduction to grow. Studies of *Spartina* genetic diversity have generally demonstrated high diversity despite this clonality, and several authors have suggested that natural wrack disturbances may act to maintain these high levels of diversity by killing adult stems, creating more favorable conditions for seeds to grow in. However, larger, more frequent, and longer-lasting wrack disturbances resulting from the presence of docks may convert a short-lived, potentially beneficial disturbance into a long-term stress on *Spartina*. By intensifying wrack disturbances, anthropogenic structures may accentuate the reliance of *Spartina* on asexual reproduction and kill rare genotypes, ultimately reducing the genetic diversity of the *Spartina* population.

Implications for Practice

My research focuses on how racially-biased real estate practices shape patterns of coastal development, the ecological consequences of this development for salt marsh resilience to sea level rise, and how these ecological and social processes affect human communities today.



Jeff Beauvais is an ICON student interested in the impacts of coastal development on the ecological integrity and genetic diversity of salt marshes. He is also interested in understanding how social vulnerability might facilitate coastal development, and how this process feeds back to affect local communities.

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The Integrative Conservation PhD Program (ICON) trains agile scientists to address 21st century socio-ecological challenges. ICON is currently a degree option in the Department of Anthropology, Department of Geography, Odum School of Ecology, and Warnell School of Forestry & Natural Resources.