The 2015 Coastal and Estuarine Research Federation (CERF) 23rd Biennial Conference - Grand challenges in Coastal and Estuarine Science – November 8-12, 2015
http://www.erf.org/cerf2015

Carbon storage and coastal protection: A look at the impacts of mangrove range expansion in Florida

CL Doughty[1], JA Langley[1], WS Walker[2], IC Feller[3], R Schaub[4], & SK.Chapman[1]

[1]*Villanova University,*
[2]*Woods Hole Research Center,*
[3]*Smithsonian Environmental Research Center,*
[4]*InoMedic Health Applications Inc. at the NASA Kennedy Space Center*

Abstract

Mangrove range expansion along the coast of eastern Florida is expected to continue in the absence of severe freeze events, yet the full range of ecological consequences of this rapid climate-driven shift has yet to be explored. A transition from predominantly herbaceous salt marsh species to arboraceous mangroves, two vegetation types with inherently different structural properties, may have significant impacts to ecosystem properties and services, such as carbon (C) storage and coastal protection. We used a unique combination of field-based vegetation assessments and a chronology of remote sensing-derived land cover maps to quantify changes in mangrove extent and C storage from 2003 to 2010 in a 567-km2 wildlife refuge in the mangrove-salt marsh ecotone. In addition, we investigated coastal protection in ecotonal salt marshes and mangroves using the Natural Capital Project's Integrated Valuation of Environmental Services and Tradeoffs (InVEST) model for Coastal Protection, which was parameterized using field-based vegetation assessments from the study area. We found that ecotonal mangroves stored twice as much C on a per area basis as salt marsh, and that over a 7-yr period mangrove cover increased by 69% and wetland C storage increased by 22% in the wildlife refuge. Coastal protection models indicate that mangroves provide greater erosion prevention and wave attenuation over significantly smaller habitat sizes. On a per area basis, ecosystem value of coastal protection was found to be 49% greater in mangrove habitats. As evidenced by C storage and coastal protection, mangrove range expansion has the potential to significantly alter ecosystem properties, which could lead to changes in overall ecosystem service value. In all, our findings suggest that increasing mangrove cover may uptake C in coastal wetlands, while also rendering them more resilient to a future of climate change.