

Dramatic Changes within Coastal Wetlands of the Ten Thousand Islands as a Consequence of Sea-level Rise: Lessons for Estero Bay

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The entirety of Florida's southwest coast, including Lee and Collier Counties, is experiencing incipient geomorphic and ecosystem effects in response to accelerated sea-level rise. Those effects have been well documented for the Ten Thousand Islands (TTI), less so for Estero Bay. Nonetheless, the TTI serve as an appropriate exemplar for likely response in Estero. A modest sea-level rise (SLR) rate was responsible for the progradation of our coast, through the development of barrier and interior bay islands, over the last 3500 years of the late Holocene. During this interval, the rates of sedimentation on oyster reefs and through longshore deposition exceeded SLR, enabling the formation of barrier islands and the TTI geomorphology (i.e., emergent oyster reefs that succeed into mangrove-forested islands). Currently, our SLR rate exceeds sedimentation, potentially resulting in the degradation of this geomorphology. Outer islands within the TTI have lost significant areas and have experienced a transgression of their seaward margins, indicating the geomorphic change has begun. Effects on coastal wetlands from accelerated SLR are more pronounced. An extensive red mangrove and buttonwood expansion into interior brackish and freshwater wetlands throughout Collier County has been documented. Additionally, graminoid marshes located landward of the basinal mangrove forests in the TTI are experiencing grassland die-offs due to salinity stress, which is causing the decomposition of peatlands and the deflation of the marsh surface (a phenomenon called "pocking"). Surface elevations in these regions have dropped as much as 30 centimeters, and brackish subtidal ponds are replacing the salt marsh ecosystem. Ponds are merging to create incipient backwater bays.

These patterns reinforce the importance of available natural buffer acreage landward of current tidal influence for the migration of tidal wetlands. Without this accommodation space, the ecosystem and coastal fortification services of mangrove forests will be lost. Little graminoid marsh exists along Estero Bay's fringe, so the influence of pocking on tidal wetland loss is less critical. Nonetheless, salt marshes should be monitored for any geomorphic change. Finally, the impact accelerated SLR is likely to have on Estero's barrier islands, and all barrier islands along the southwest coast of Florida, should be investigated through some rigorous monitoring program and the potential long-term effects predicated and anticipated from a managerial perspective.