Rapid Ecosystem and Coastscape Evolution of South Florida in response to Sea Level Rise, Hurricane Events, and Human Stresses

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The low-lying southwestern Florida coast in Everglades National Park is presently undergoing dramatic changes in response to initial global-warming-induced sea level rise. This area provides an important illustration of the style, timing, and rates of changes that can be anticipated elsewhere in the coming century. In this time of accelerated global change, understanding landscape-scale evolution is fundamental to successful short- and long-term management of the coastal zone.

The Present: The 23 cm relative rise in sea level in south Florida over the past 70 years has caused erosion, inundation, and dissipation of coastal barriers and drastically modified coastal wetlands. Destabilization of coastal mangrove communities has resulted in significant transgression, including: storm erosion of mangrove coastlines, storm-initiated loss within mangrove forests, and landward expansion of the red, black and white mangrove ecotones. Some responses are caused by day-to-day and winter-storm processes acting at progressively higher relative sea levels, but the most dramatic and widespread steps of coastal evolution are initiated by catastrophic hurricanes.

The Future: Predictive maps of future changes in south Florida's coastal and freshwater wetlands based on a moderate scenario of a 60 cm relative sea level rise for the next 100 years, show six major changes: 1) inundation of emergent topography decreasing the confining influences on interior Everglades flow; 2) formation of a major new outlet for Everglades drainage; 3) rapid erosion of both the coastal margins and the interior of the broad coastal mangrove wetlands of southwest and southeast Florida; 4) saline intrusion well into the lower Everglades of southwest, south and southeast Florida with associated collapse of extensive freshwater marsh and eventual intrusion of saline wetlands; 5) evolution of large areas of mangrove, transitional and freshwater wetland to marine and brackish ponds and lagoons; and 6) dramatically higher of turbidity and nutrient levels throughout the broader coastal zone of south Florida.