

FLORIDA'S COASTAL ECONOMY & SEA LEVEL RISE

Kelly
Martin

TAKE HOME MESSAGE

Florida's economy is both directly and indirectly dependent on coastal resources and ecosystems. Six different ocean sector industries contributed 27.4 billion to Florida's GDP in 2004, including fisheries, tourism, and development. Tourism is a particularly important part of Florida's economy, and a significant percentage of tourists site beach/ocean activities as one of their top activities while visiting the state. Ecosystem services, goods or services that ecosystems generate, are another way that the coast and ocean contribute to Florida's economy, just in a less concrete way. These economic sectors and ecosystems services are all at risk due to sea level rise. Beach erosion, detrimental impacts on real estate value and potential loss of real estate, and the risk to fresh water are all of concern. Tightly interconnected coastal ecosystems and the natural resources and services they support are also at risk.

A COASTAL ECONOMY

In order to fully comprehend the impact that sea level rise could have on Florida's economy, it's important to understand the extent to which Florida's economy is directly or indirectly dependent on the coast and ocean. Some useful statistics:

- Ocean sector industries contributed 27.4 billion USD to Florida's 2004 GDP.



- Living Resources (hatcheries & aquaculture, fishing, seafood markets, seafood processing): 1 billion



- Construction: 681 million



- Transportation: 5.8 billion



- Minerals (limestone, sand & gravel, oil & gas): 115 million



- Ship & Boat Building & Repair: 1.2 billion

- Tourism & Recreation: 18.6 billion

- More than 2/3 of Florida's 20 million residents live in coastal counties.



- In 2016, the total impact of out-of-state visitor to Florida spending sustained \$88 billion in GDP, 1,435,341 jobs, and close to \$53 billion in corresponding wages.



- 87.3 million visitors in 2011, making Florida a top travel destination worldwide

- 40% of U.S. visitors reported beach and waterfront activities as one of their top activities

- Florida residents also rely heavily on the ocean and coastal resources



- #1 state in total number of anglers with 1.9 million resident anglers
- Over 440,000 jobs supported directly and indirectly by ocean resources

ECOSYSTEM SERVICES

There are many benefits that ocean and coastal ecosystems provide to Florida that are not often included in statistics such as GDP. These goods and services that ecosystems generate are collectively called ecosystem services. Some of these services are directly connected to monetized natural resources while others provide services that are more difficult to monetize. These services can be broken down into four categories:

PROVISIONING SERVICES

Services such as food, water, timber, and fiber

- More than 86.3 million pounds of fish and shellfish with a value of 170 million USD were commercially caught in Florida in 2008 - these species inhabit Florida's variety of coastal habitats
- The same fish support Florida's robust recreational fishing industry

REGULATING SERVICES

Services affecting climate, floods, disease, waste, and water quality

- Coastal ecosystems such as mangroves and coral reefs provide protection from waves and storm surge. In Florida, the value of this protection is estimated to be 11 billion USD each year

CULTURAL SERVICES

Services that provide recreational, aesthetic, and spiritual benefits

- More than 3 million people participated in bird-watching in Florida in 2006. Wildlife watchers spent more than \$3 billion
- Two studies estimated the economic value of a beach day in Florida to be between \$19 and \$74 per day

SUPPORTING SERVICES

Services such as soil formation, photosynthesis, and nutrient cycling

- Oceans provide vital cycling services, such as carbon cycling
- Florida is home to about 25% of the U.S.' wetlands and estuaries, which are vital habitat for organisms as well as important carbon sinks

WHAT THREAT DOES SEA LEVEL RISE POSE TO FLORIDA'S COASTAL ECONOMY AND ECOSYSTEM SERVICES?

BEACH EROSION

South Florida has been dealing with beach erosion since before climate change and sea level rise were of widespread concern. A beach nourishment project in the late 1970s restored Miami Beach and revived the local economy. However, in the 70s there was relatively accessible, local sand that could be used to carry out these projects. Today, sand is trucked in from greater distances at a **cost of \$70 per cubic yard and thousands of dump trucks needed to deliver all the sand necessary**. As sea level rise encroaches on South Florida's beaches and accelerates erosion, the tourism, local ecosystems, and wave protection that beaches support or provide are at risk. If the state tries to keep up with sea level rise through continued beach nourishment projects, the costs could be incredibly high and sand resources may be depleted.

REAL ESTATE

While many South Florida residents may joke about their inland homes becoming beachfront property thanks to sea level rise, the threat of rising waters is already having an impact on home values. **As "sunny day flooding" has become more frequent in Miami since the year 2000, houses in lower elevations have been gaining value at lower rates and selling for less than similar homes at higher elevation.** This trend has been found to be true across the nation in other studies. Since 2/3 of Florida's residents live in coastal counties and 2,500 people in Miami-Dade live less than a foot above sea level, this could have a negative impact on resident's homes and investments. **Another study found that Miami Beach is the most at-risk city in the entire U.S. with 2,600 homes at risk from sea level rise by 2030. The loss of 2,600 homes in Miami Beach would be a loss of 1.1 trillion USD in economic value, and \$16.9 million in annual property tax revenue.** And by 2045, the number could rise to 12,000 homes lost. As one researcher said, "it's a guaranteed total loss" with the only uncertainty being the exact timeline.

FRESH WATER

The threat of losing fresh water sources is certainly concerning for South Florida, and could also contribute to a reluctance to buy homes or develop in the area. It's difficult to find exact numbers on what costs will be associated with the threats to fresh water. However, with saltwater intrusion and increased flooding allowing sewage and chemicals to leech into water sources, action will need to be taken to either protect the area's existing water sources or to develop new ones. Both options are likely costly, including infrastructure built to protect or treat water sources, or desalination plants that could become necessary should fresh water sources be entirely compromised.

ECOSYSTEM IMPACTS



ESTUARIES

As ecosystems that are defined by their mix of salt and fresh water, sea level rise will force estuaries to migrate landward so they are not completely inundated by salt water. However in areas such as South Florida where there is significant coastal development, these ecosystems will experience "coastal squeeze" as their migration is limited by human development.



MANGROVES

Instead of being negatively impacted, mangrove ecosystems are expected to help fight back against erosion caused by sea level rise. Their complex root systems are incredibly effective at trapping sediment and preventing coastal erosion. Unfortunately, significant loss of mangrove ecosystems due to human development has been seen throughout South Florida. Lake Worth, an hour north of Miami, has seen an 87% decrease in mangrove habitat over the last 40 years.



SEA GRASS BEDS

Sea level rise will reduce light availability to sea grass beds as the water they inhabit becomes deeper, and due to increased turbidity from increased wave action. These factors will lead to sea grass bed loss. Like estuaries, sea grass beds could migrate landward, but in areas with dense coastal development this is likely not possible.



CORAL REEFS

Like sea grass beds, coral reefs also depend on the availability of light in order to grow. Research has shown that as sea levels rise, the increase in depth may outpace the ability of corals to grow toward the surface or migrate landward in order to maintain their access to sunlight. This would lead to loss of coral, the foundation of coral reef ecosystems.



CONNECTION OF COASTAL ECOSYSTEMS - WHY IT ALL MATTERS

While the impact of losing each of these habitats individually may not seem significant, the connection between all of these coastal ecosystems means the loss of one ecosystem can impact the health of all the others: mangroves and sea grasses provide nursery habitat for fish that eventually migrate to coral reefs; estuaries and mangroves play important roles in collecting sediment that could otherwise smother sea grasses and reefs; etc. The loss of the natural resources and ecosystem services associated with these ecosystems would impact many sectors of Florida's economy.

CITATIONS

CONTENT

1. The Economic Value of Florida's Ocean Resources. (2016, December 15). Retrieved from <https://www.nrdc.org/resources/economic-value-floridas-ocean-resources>
2. Tourism Economics LLC. (2016). *THE ECONOMIC IMPACT OF OUT-OF-STATE VISITORS IN FLORIDA*(Rep.). Visit Florida.
3. Florida coasts have grown in population, construction since last hurricanes. (2015, May 28). Retrieved February 12, 2019, from <https://www.staugustine.com/news/2015-05-27/florida-coasts-have-grown-population-construction-last-hurricanes>
4. Walton, J. (2018, October 25). Florida's Economy: The 6 Industries Driving GDP Growth. Retrieved February 12, 2019, from <https://www.investopedia.com/articles/investing/011316/floridas-economy-6-industries-driving-gdp-growth.asp>
5. Outdoor Recreation. (n.d.). Retrieved February 12, 2019, from <https://myfwc.com/conservation/value/outdoor-recreation/>
6. Florida Ocean Alliance. (2015). *HEALTHY OCEANS GENERATE JOBS FOR FLORIDA'S ECONOMY*(Rep.). Fort Lauderdale.
7. Palaima, A. (2012). Ecosystem Services. In *Ecology, Conservation, and Restoration of Tidal Marshes : The San Francisco Estuary*(p. 207). CA: University of California Press.
8. Yoshida, J., Udo, K., Takeda, Y., & Mano, A. (2014). Framework for proper beach nourishment as an adaptation to beach erosion due to sea level rise. *Journal of Coastal Research*,70, 467-472. doi:10.2112/si70-079.1
9. Gonzalez, E. S. (2018, August 02). A new Rx for what ails South Florida's beaches. Retrieved February 12, 2019, from <https://news.fiu.edu/2018/08/a-new-rx-for-what-ails-south-floridas-beaches/124864>
10. Borchert, S. M., Osland, M. J., Enwright, N. M., & Griffith, K. T. (2018). Coastal wetland adaptation to sea level rise: Quantifying potential for landward migration and coastal squeeze. *Journal of Applied Ecology*,55(6), 2876-2887. doi:10.1111/1365-2664.13169
11. Mangroves help protect against sea level rise. (2015, July 23). Retrieved February 12, 2019, from <https://www.sciencedaily.com/releases/2015/07/150723083855.htm>
12. Florida's Mangroves. (n.d.). Retrieved February 12, 2019, from <https://floridadep.gov/fco/fco/content/floridas-mangroves>
13. Davis, T. R., Harasti, D., Smith, S. D., & Kelaher, B. P. (2016). Using modelling to predict impacts of sea level rise and increased turbidity on seagrass distributions in estuarine embayments. *Estuarine, Coastal and Shelf Science*,181, 294-301. doi:10.1016/j.ecss.2016.09.005
12. Kuffner, I. B. (2018, June 13). Sea-level rise could overwhelm coral reefs. Retrieved February 12, 2019, from <https://www.nature.com/articles/d41586-018-04879-7>
13. Harris, A. (2018, April 26). The risk of sea level rise is chipping away at Miami home values, new research shows. Retrieved February 12, 2019, from <https://www.miamiherald.com/real-estate/article209611439.html>
14. Ward, J. (2018, July 10). How global warming will impact Miami real estate by 2030. Retrieved February 12, 2019, from <https://miamiagentmagazine.com/2018/07/10/global-warming-will-impact-miami-real-estate-2030/>
15. Flavelle, C. (2018, April 29). Miami Will Be Underwater Soon. Its Drinking Water Could Go First. Retrieved February 12, 2019, from <https://www.bloomberg.com/news/features/2018-08-29/miami-s-other-water-problem>