

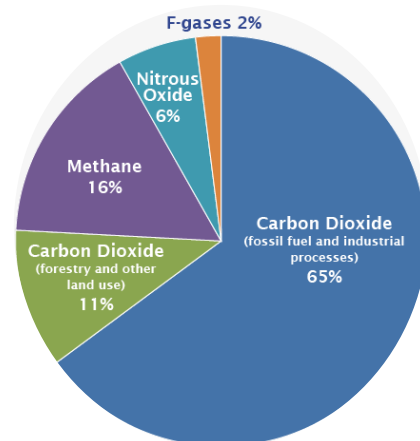


Sea levels are rising.

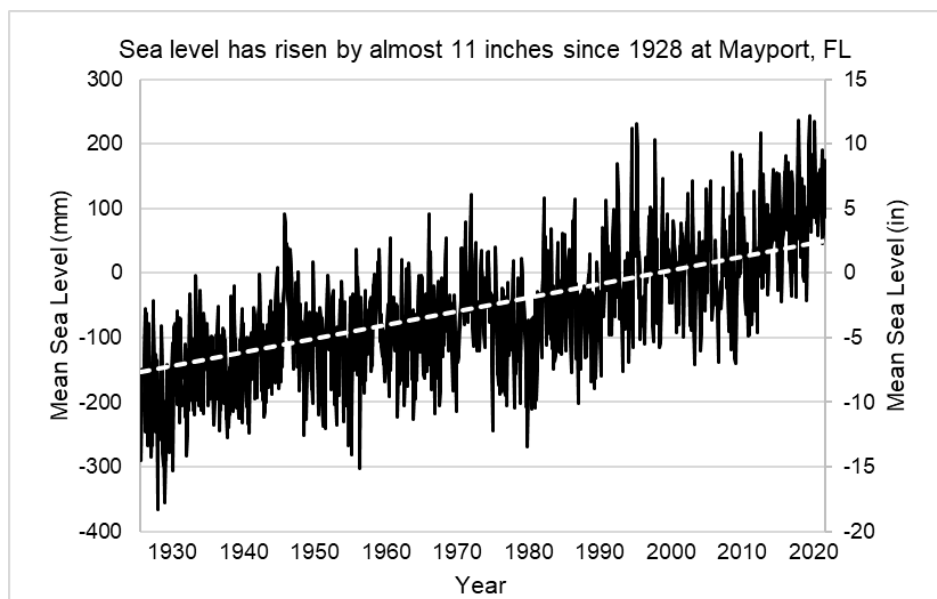
Two phenomena related to climate change contribute to accelerated global sea level rise:

- Thermal expansion: global atmospheric and ocean temperatures are rising, and water expands as it absorbs heat
- Ice melt: melting glaciers and ice sheets increase freshwater runoff into oceans

Greenhouse gases trap heat in our atmosphere resulting in rising ocean temperatures. Sources of greenhouse gases include the use of fossil fuels such as coal, oil, and natural gas to power our societies, which releases carbon dioxide and methane into the atmosphere; methane sources also include emissions from landfills and agriculture.



Greenhouse Gas Emissions by Gas



Since 1928, sea level has risen by almost 11 inches at Castillo de San Marcos and Fort Matanzas based on data from the Mayport, FL tide gauge, which is operated by the National Oceanic and Atmospheric Administration (NOAA). Sea level could rise by as much as 6.07 feet by 2100.

What is the future of sea level rise at Castillo de San Marcos and Fort Matanzas?

NOAA Projections ¹	2050	2100
Intermediate Low	+0.89 ft	+1.77 ft
Intermediate	+1.41 ft	+3.77 ft
Intermediate High	+1.97 ft	+6.07 ft

This table shows projected sea level heights at the monuments compared to today's mean sea level. These projections were developed by NOAA in 2017 based on different climate change scenarios. Projections are a way of visualizing a range of possible futures. They can aid in park planning by helping managers determine which resources are most threatened by sea level rise.



From left to right, these images show Castillo de San Marcos at current sea level and with six feet of sea level rise and Fort Matanzas at current sea level and with six feet of sea level rise.



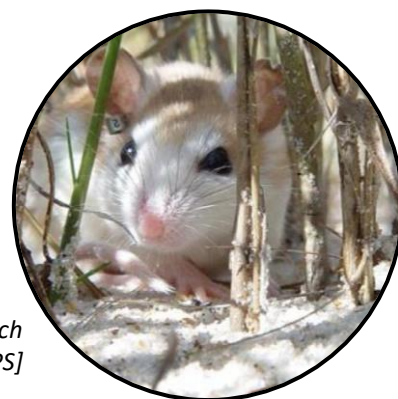
How is sea level rise impacting Castillo de San Marcos and Fort Matanzas?

Castillo de San Marcos and Fort Matanzas are located near low-lying coastal areas and erodible shorelines, so rising sea levels and increased storm surge can have big impacts on these parks. Increases in erosion, saltwater intrusion, and high-tide flooding at these parks causes challenges for both cultural and natural resources. The forts are important historic sites because they represent some of the oldest masonry forts in the US, built during Spanish colonization of Florida, and are built of a unique stone called coquina. Additionally, Fort Matanzas features frequently-visited natural resources such as beaches and dunes and recreational trails through coastal hammock forest and a salt marsh, which could all be impacted by sea level rise.

- An increased risk of higher storm surge and flooding events threatens visitor safety and the continued operation of the parks. For example, many boardwalks at Fort Matanzas, as well as the ferry docks that allow visitors to see Rattlesnake Island and visit Fort Matanzas itself, were closed for months due to damage from hurricanes Matthew and Irma in 2016 and 2017.
- Rising sea levels will also impact the natural resources of Fort Matanzas. For example, 100-500 feet of the Atlantic dune system has been washed away since 2014 by increased wave action related to higher sea levels, although much of the dune system remains intact for now. Many animals rely on the dunes for habitat, such as the Anastasia Island beach mouse, which is an endangered and endemic species that lives in the dune system.



A boardwalk ramp at Fort Matanzas washed out by Hurricane Matthew in 2016 [NPS].



The Anastasia Island beach mouse [NPS]



Water crashes over the sea wall and floods the park lawn during a high tide at Castillo de San Marcos on November 13, 2019 [NPS].



Waves combined with higher sea levels have eroded parts of the primary sand dunes at Fort Matanzas [NPS].

What can you do to help?

- Reduce your carbon footprint: power down electronics or reduce your thermostat. Go to carbonfootprint.com to calculate your carbon footprint and find ways to make changes.
- Volunteer with organizations working to protect coastal habitats that provide natural defenses against sea level rise.
- Support climate mitigation and adaptation policies. Contact your representatives in Congress to let them know you care.
- Visit coastal areas and support the parks and communities that are taking actions to prepare for sea level rise.

Additional Resources

1. <https://coast.noaa.gov/slr/>: A NOAA SLR viewer tool to access local sea level rise projections at tide gauges and visualize sea level rise scenarios (2017).
2. <https://tidesandcurrents.noaa.gov/>: Access water levels, tide predictions, and other conditions along coasts.
3. [NOAA Coastal Flood Exposure Mapper](#): A tool to visualize coastal hazards as well as societal, infrastructure, and ecosystems exposure to those hazards
4. [Castillo de San Marcos and Fort Matanzas Sea Level and Storm Trends](#): A 2015 sea level rise report for Castillo de San Marcos and Fort Matanzas.

Note: The sea level rise projections, storm surge projections, and other information presented here are for general educational and awareness purposes only. They should not be used for site-specific analysis, navigation, permitting, or legally binding activities.