

Brief coastal vulnerability assessment for the City of Fernandina Beach, conducted utilizing NOAA and UF GeoPlan tools.

# Vulnerability Assessment

City of Fernandina Beach

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Northeast Florida Regional Council

North Central Regional Planning Council

*Funded by Florida Department of Economic  
Opportunity*



# Vulnerability Assessment – City of Fernandina Beach

## Background

This project is working to promote the preparedness of Florida communities by increasing understanding of, access to, and utilization of a range of existing tools that provide additional information on the effects of climate change. Projected sea level rise impacts are another threat contributing to the vulnerability of Florida’s at-risk coastal resources.

In conjunction with DEO and NOAA office for Coastal Management, a partnership was developed throughout the state led by South Florida Regional Council, and the remaining 9 Regional Planning Councils (RPCs). The RPCs were paired up for their relative geographic locations to approach this project development. The Northeast Florida Regional Council was paired with the North Central Regional Planning Council. One purpose is to train the trainers that would disseminate the information and toolset usage through the communities and counties in the State. The project title reflects this goal: “Trainers and Tools: Building Coastal Flood Hazard Resiliency in Florida’s Regional Planning Council Communities.” Ultimately, each Council did a vulnerability assessment for one of their communities (North Central RPC worked with Cedar Key in Levy County) and they collaborated on a training of flood plain planners and managers on using the tools.

This report is a vulnerability assessment of Fernandina Beach that will investigate sea level rise impacts on:

- Transportation infrastructure
- Historic Resources
- Major Employment Centers (Mills, Port)

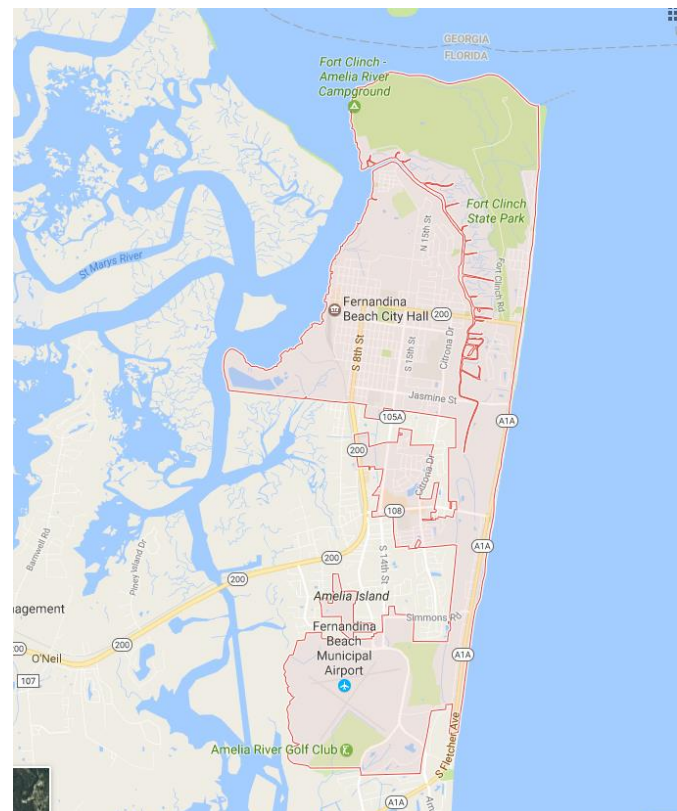
## Location

The City of Fernandina Beach is located in Nassau County, on Amelia Island. The City is located on a barrier island with the Amelia River on its west side and the Atlantic Ocean on its east.

## Socio-Economic Data\*

- 11,487 population
- 7,064 housing units
- \$45,954 median income

\*2010 Census data

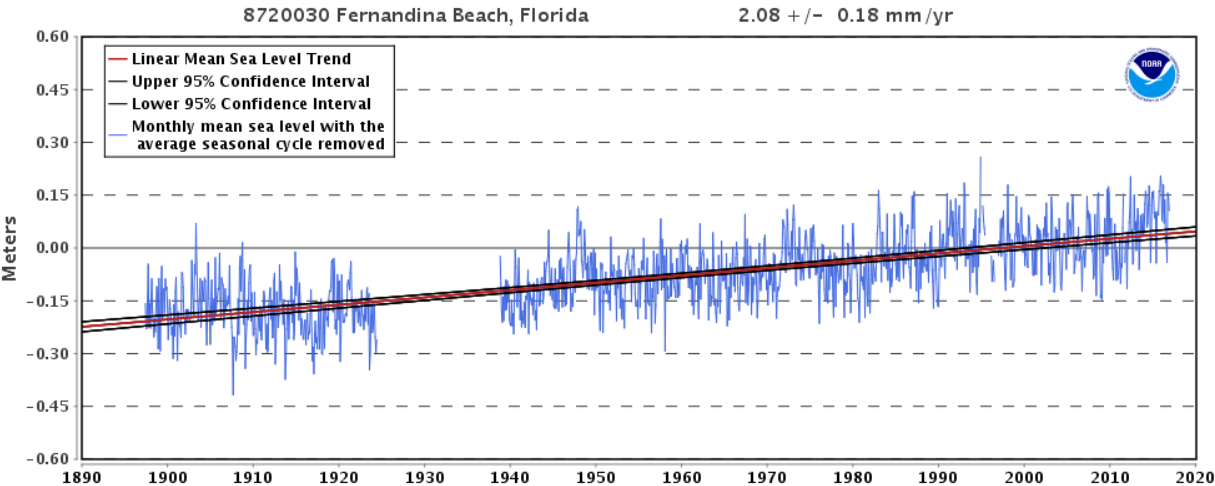


## Overall Perspective on Scenarios and Projections

In Northeast Florida, the conversation on climate change is ongoing. Whether or not there is belief in certain scenarios based on overall global warming or other manifestations of climate change, empirical measurements have indicated increases in sea level in the lower coterminous states. NOAA has tide gauges placed throughout the United States and a number of these have been in operation for a long enough period to use as a comparison ‘yardstick’ for recording sea level over time.

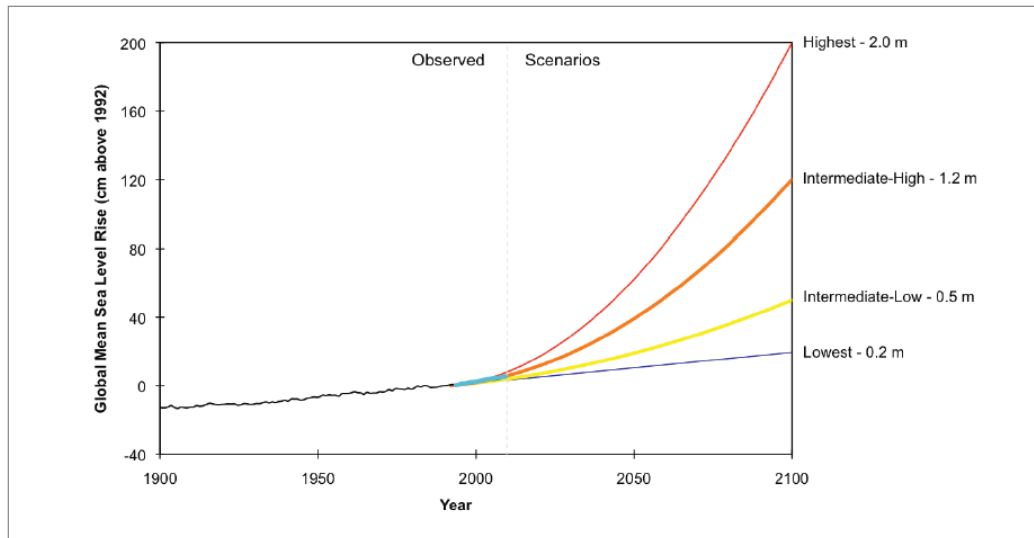
In the geographic area of this assessment, the Fernandina Beach gauge is the closest of such long-term NOAA placements. Because of this long-term recording of data, we have information going back before 1920. This data (Figure 1) shows us an upward trend, although shallow, but upward none-the-less. The mean sea level trend is 2.08 millimeters/year with a 95% confidence interval of +/- 0.18 mm/yr based on monthly mean sea level data from 1897 to 2015 which is equivalent to a change of 0.68 feet in 100 years.

Figure 1: Sea Level Rise Measurements at Fernandina Beach Tide Gauge

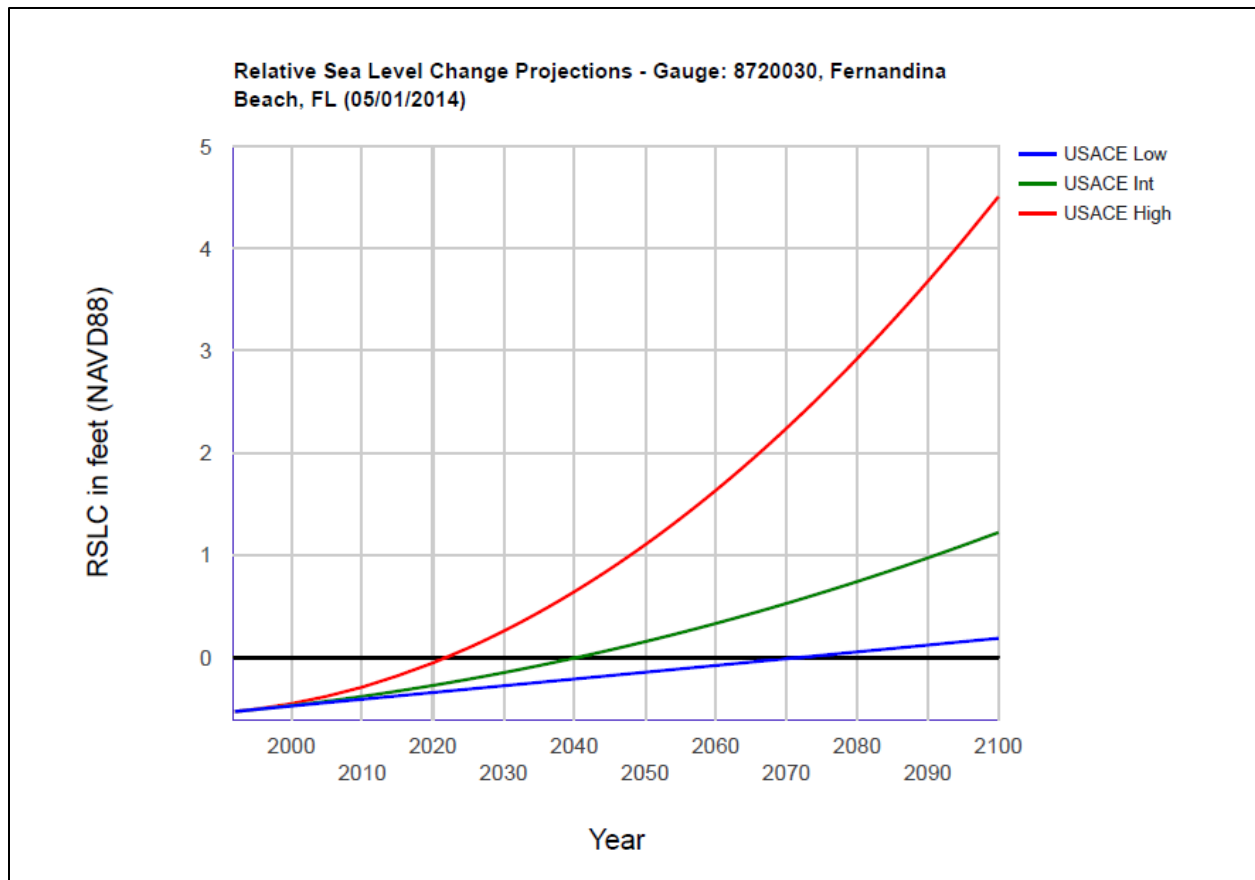


Beyond 2016, we know that the level will rise, but by how much is subject for much debate. Within the scientific community, there are a number of theories and scenarios. In North America, there are three generally recognized scenarios; Intergovernmental Panel on Climate Change, NOAA Coastal Services (Figure 2 below), and U.S. Army Corps of Engineers (Figure 3 below).

**Figure 2: NOAA Sea Level Rise Projection**



**Figure 3: U.S. Army Corps of Engineers Sea Level Rise Projections**





## Regional Assumptions

The Northeast Florida Region, as a part of the work of the Public Private Regional Resiliency (P2R2) Committee of the Northeast Florida Regional Council has adopted regional assumptions for Sea Level Rise. These are:

- 1 to 3 feet by 2060
- 3 to 6 feet by 2110

## Assessment Tools

### 1. Coastal Flood Exposure Mapper

This online tool was developed by the NOAA Coastal Services and has a multi-layered approach to depicting flood exposure. This is the description of the background for developing the tool:

*In recent years, with many universities and states developing risk and vulnerability assessments, our agency updated its approach to focus more on community engagement and less on a prescribed way to conduct an assessment. We developed the Coastal Flood Exposure Mapper to help communities' kick-start conversations about coastal risks. The mapper enables users to explore maps that show people, places, and natural resources exposed to coastal flood hazards and create a collection of maps to share and communicate about flood exposure.*

### 2. Sketch Planning Tool

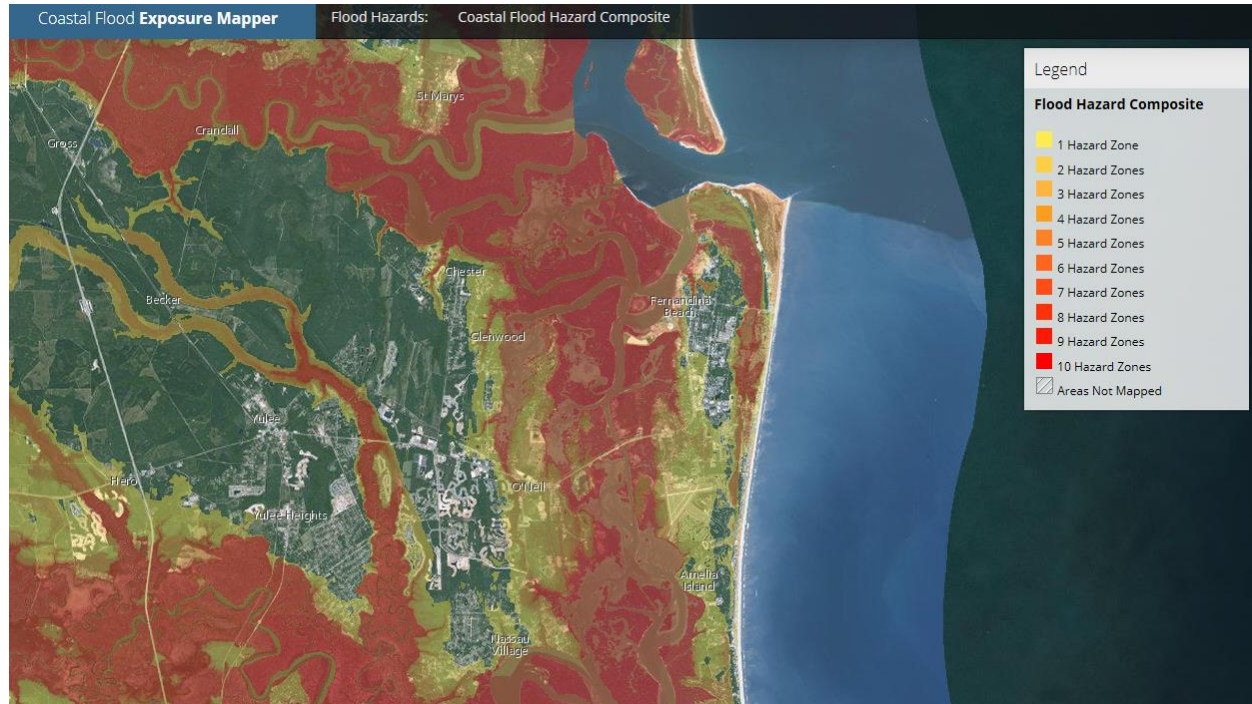
The University of Florida GeoPlan Sea Level Scenario Sketch Planning Tool was developed with funding from the Florida Department of Transportation Office of Policy Planning. The purpose of the tool is to facilitate the identification of transportation infrastructure potentially at risk from projected sea level changes. The tool visualizes various sea level scenarios at future time periods in an effort to inform transportation planners and highlight infrastructure for potential avoidance, minimization, or mitigation.

## Flood Hazard Assessment

The maps below illustrate how the Flood Exposure mapper can give snapshots of pre-selected variables and community risks with flood potential. All flood threats can be explored, including inland rain flooding (FEMA FIRM). Using this tool is a rather simple and quick way to understand the possible risks involved with flooding and increase risk awareness for coastal areas around the state and country.

The first map (Figure 4) is a composite index, which depicts all flood hazards on one map. Flood hazards include: storm surge, sea level rise, flooding (based on FEMA Flood Zones), and shallow coastal flooding.

Figure 4: Flood Hazard Composite Map

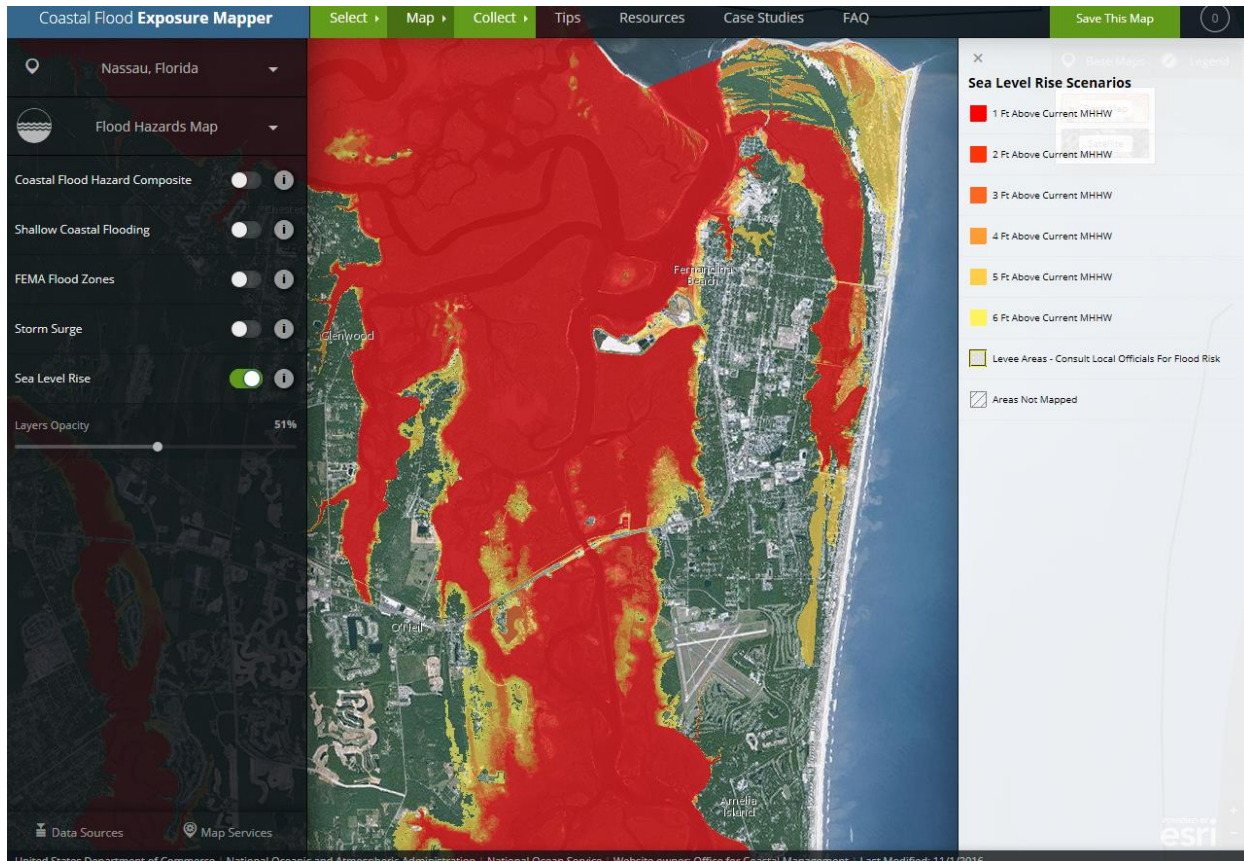


The map below (Figure 5) illustrates sea level rise. According to the tool, the map illustrates “how sea level rise scenarios of 0 to 6 feet, which represent a rise in water above the average of the highest high tides (called mean higher high water, or MHHW) for hydrologically connected areas.



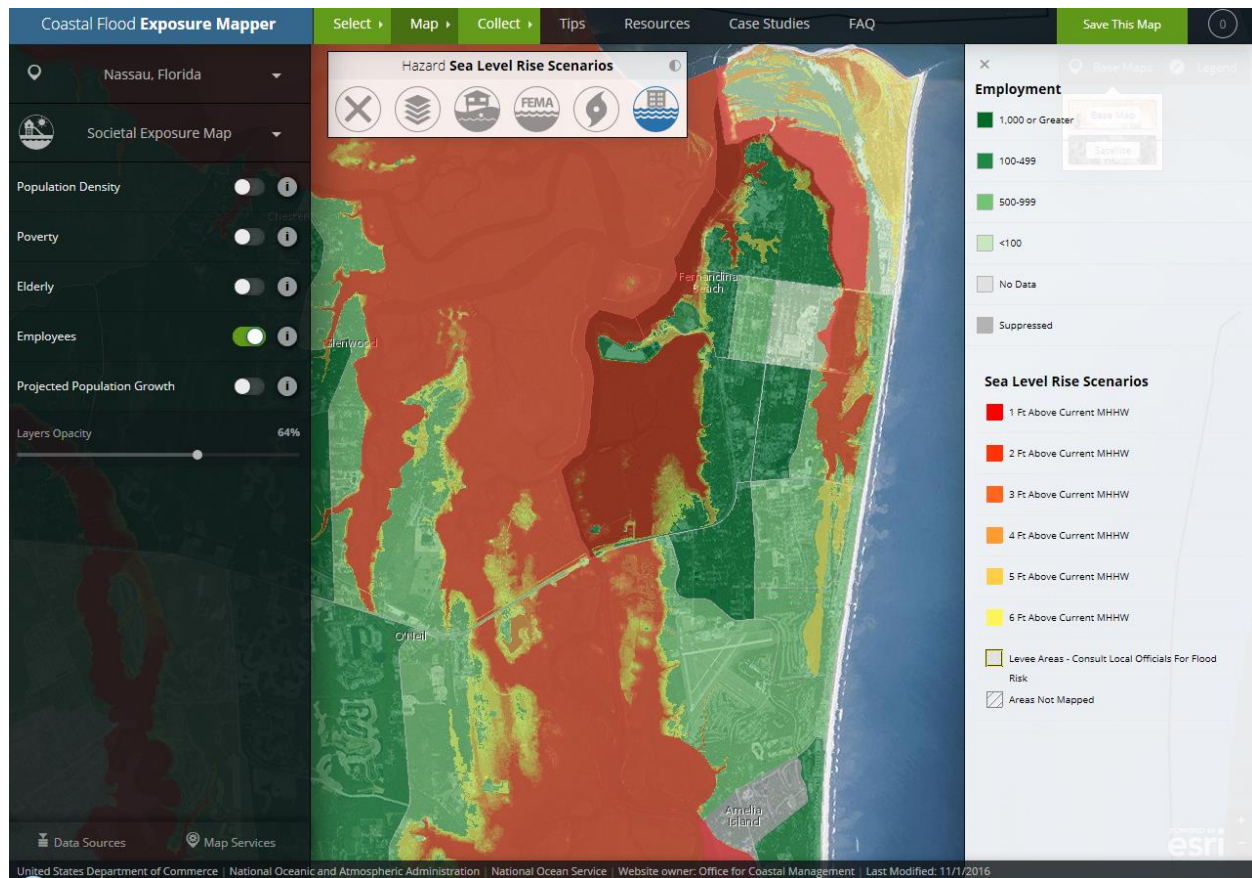
Areas that are lower in elevation will be exposed to flooding from sea level rise first and are represented by the darkest red.” There are no time horizons associated with the varying levels of sea level rise.

Figure 5: Sea Level Rise Map



Additionally, the Coastal Flood Exposure Mapper also depicts ‘Societal Exposure’, which includes population density, poverty, elderly populations, employees and projected population growth. The map below (Figure 6) depicts one of those factors, employment.

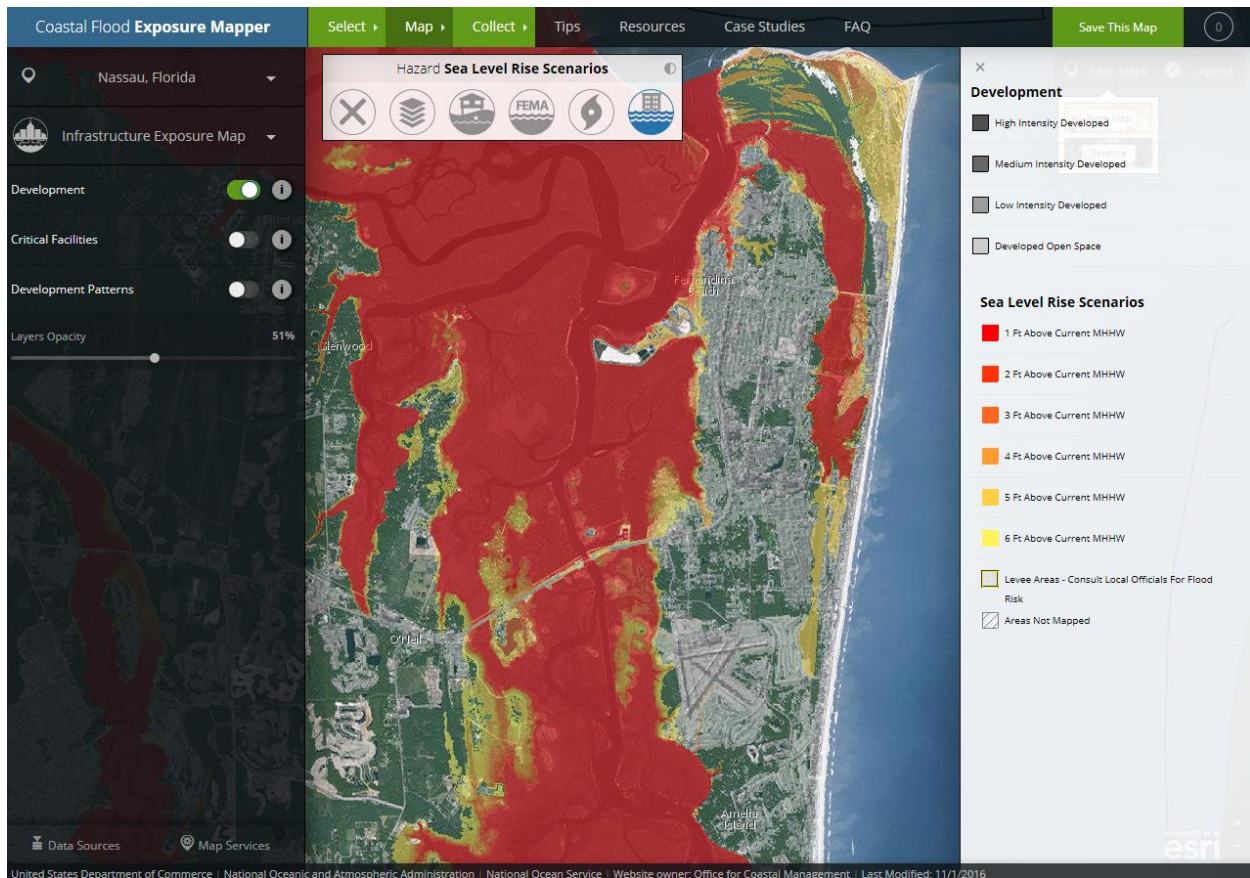
Figure 6: Employment Population with Sea Level Rise Map



Finally, this tool has the ability to illustrate 'Infrastructure Exposure', which includes development, critical facilities and development patterns. The map below (Figure 7) depicts one of those factors, current development.



Figure 7: Current development with Sea Level Rise



## Vulnerable Assets

Utilizing the UF Sea Level Sketch Planning Tool, sea level rise scenarios were assessed for the City of Fernandina Beach. Based on community input from a public meeting held on January 23, 2017 to introduce the community to the tools, the map series below illustrates the US Army Corps of Engineers

(USACE) medium projection rate curves for the years 2040 through 2100. Using this projection, there is very little sea level rise projected for the next 100 years. It is projected that in 2060 the City will experience seven (7) inches of sea level rise in some areas of the City. By 2080, the projection is for 12 inches and in 2100, 18 inches.

**Figure 8: Sea Level Rise Scenario – 2040**

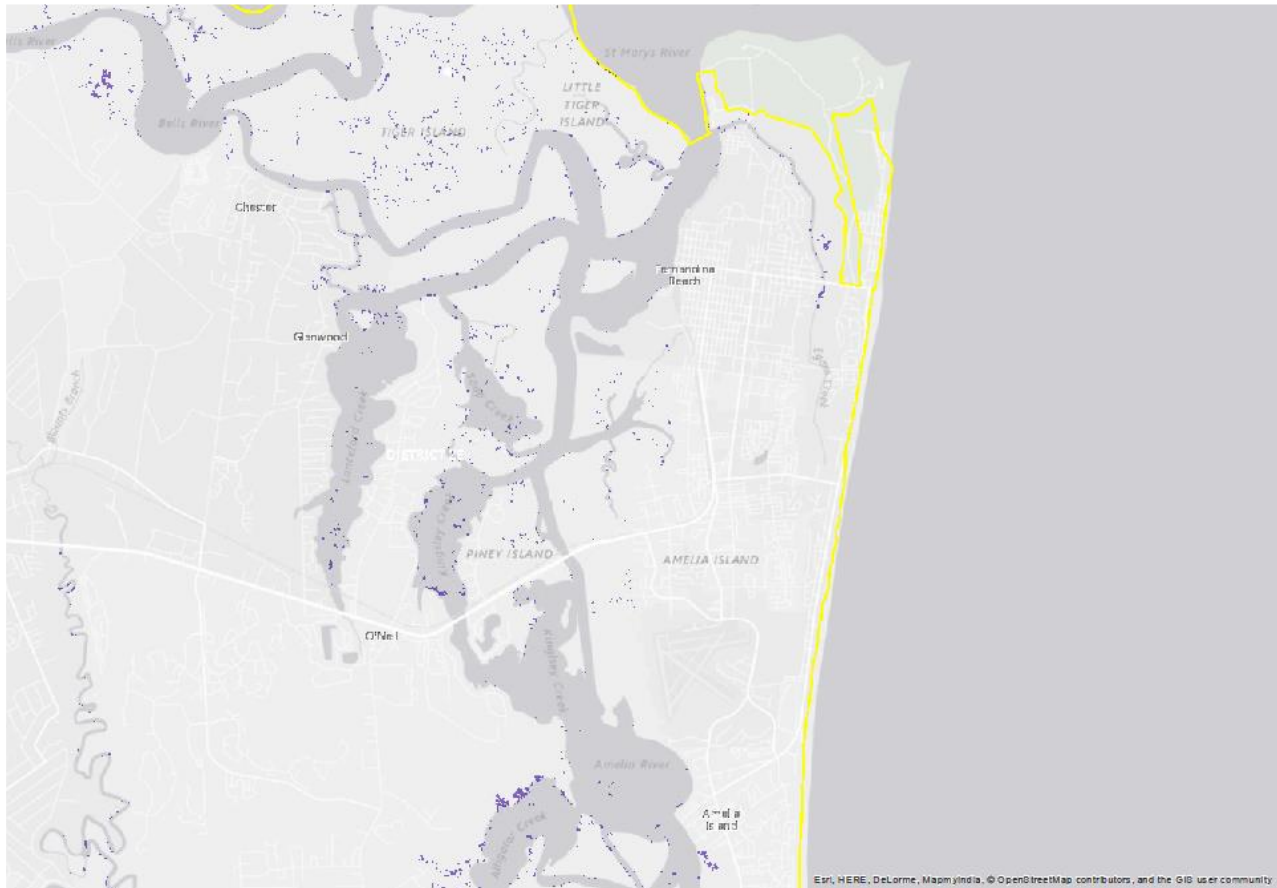


Figure 9: Sea Level Rise Scenario – 2060

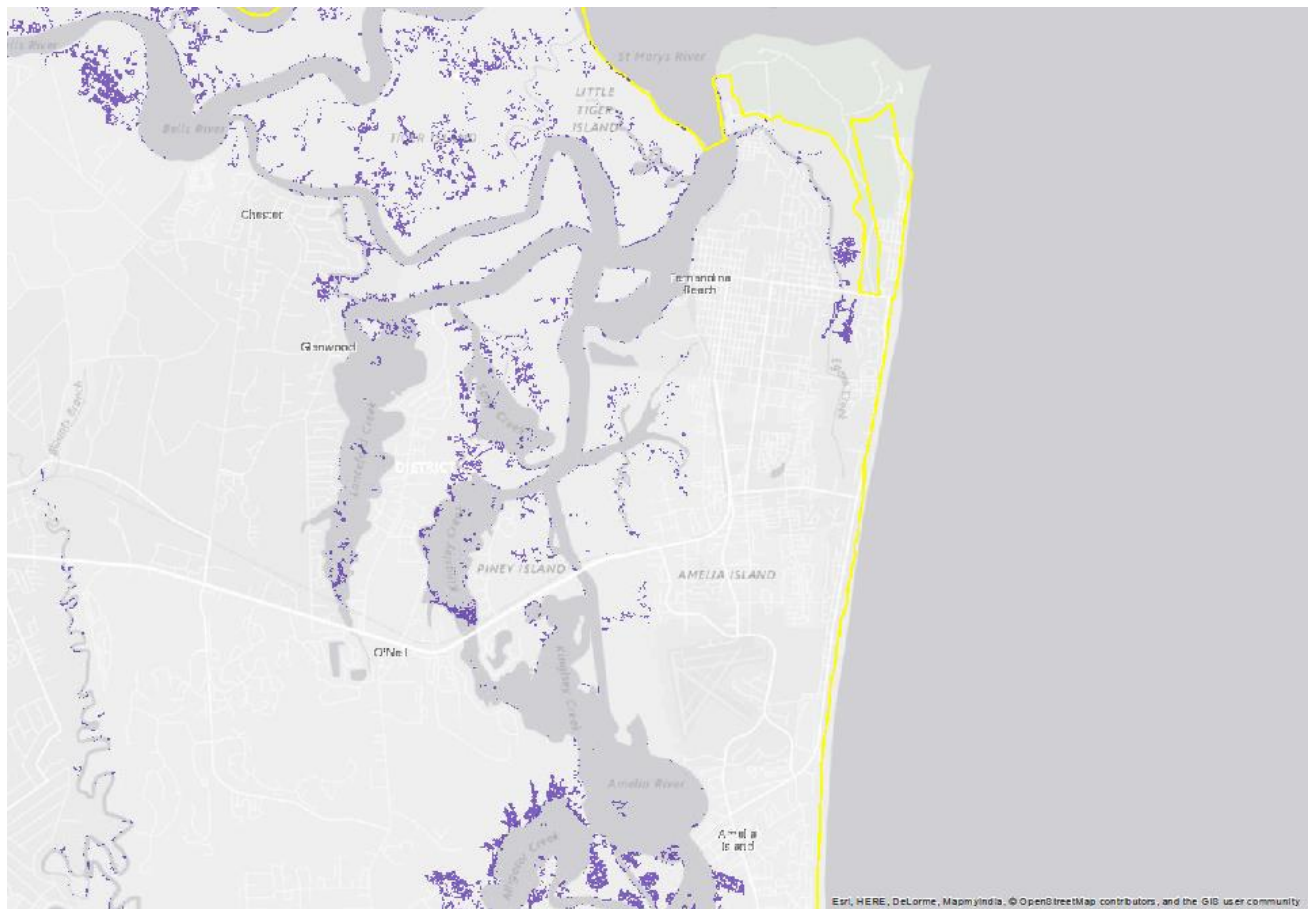
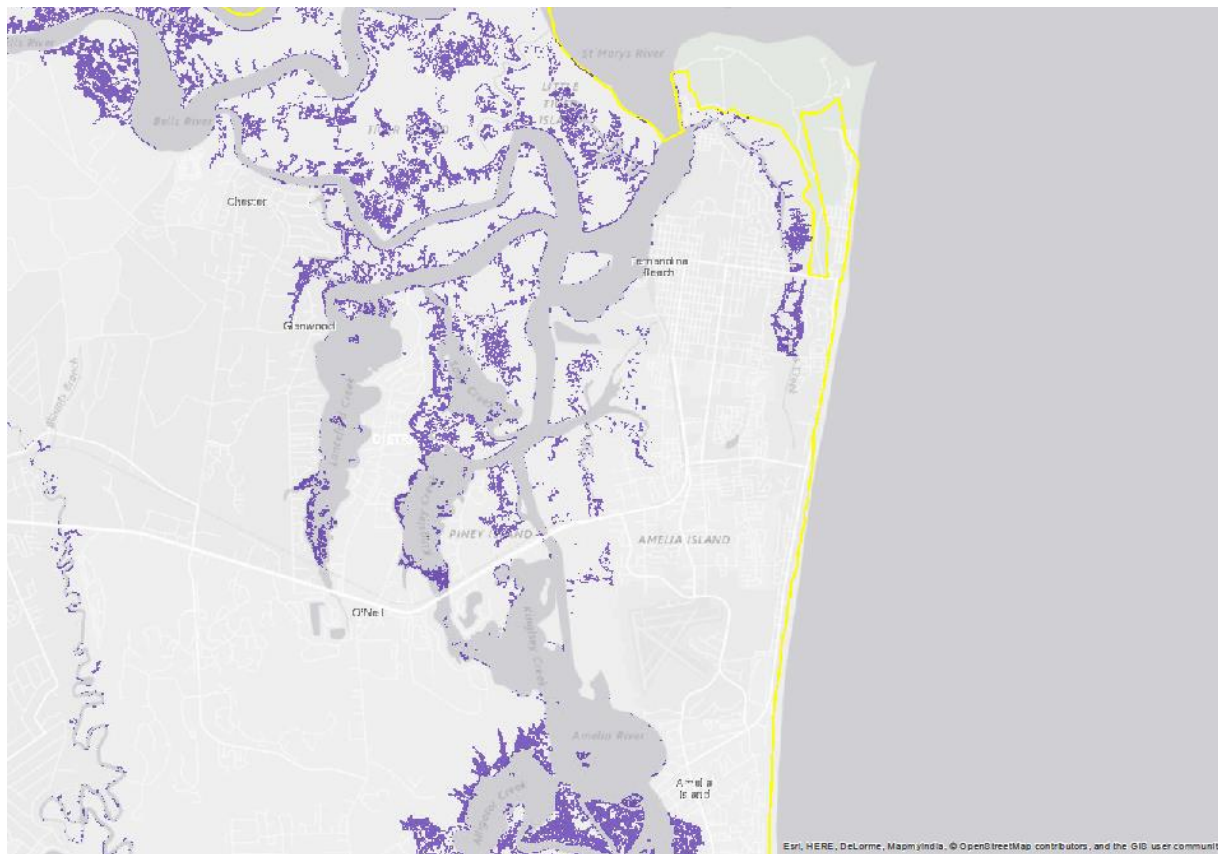
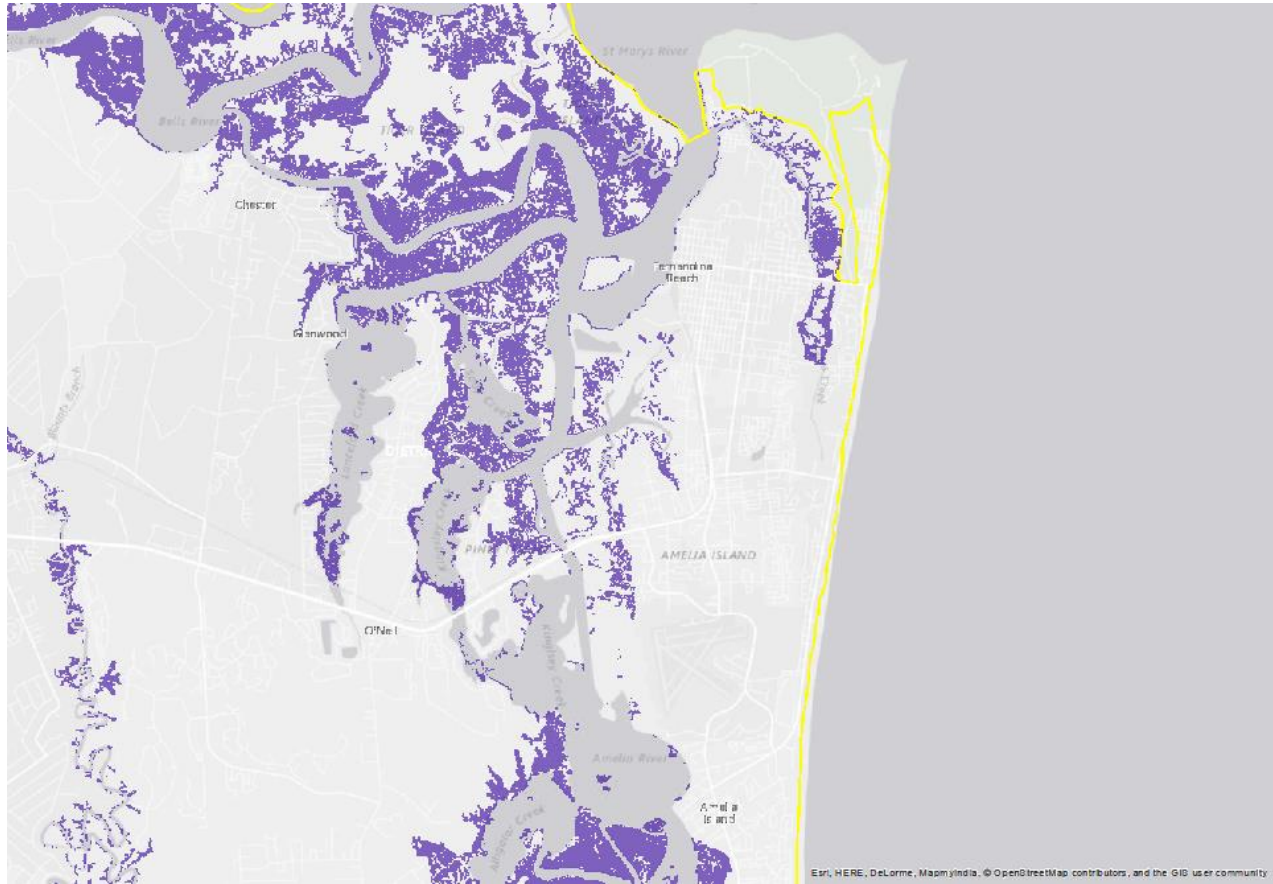


Figure 10: Sea Level Rise Scenario – 2080





**Figure 11: Sea Level Rise Scenario – 2100**



Throughout the timeframe assessed, 2040 to 2100, under the USACE medium projection rate curve, the only transportation related asset determined to be vulnerable is the Port of Fernandina. This would include the asset site itself, access to the site, or the area surrounding the property.

<b><i>Port of Fernandina</i></b>	
<i>Year</i>	<i>Acres inundated by Sea Level Rise</i>
2040	0.0
2060	0.25
2080	0.48
2100	0.86





## Other Considerations

With the minimal impacts of sea level rise illustrated in the maps above, with the exception of some projected inundation of the Port property, there is no significant infrastructure threatened. In addition, the historic resources that the City is known for are not affected by sea level rise in and of itself. However, the City is still vulnerable to flood based hazards. Flooding and storm surge still present a very significant threat to the City and its assets. Sea level rise will exacerbate these flood related hazards in the future.

While many of the impacts are to natural areas, it must be noted that inundation of such areas removes their barrier and absorption functions, providing less protection to lands at higher elevations. It is recommended that the projected level of sea level rise examined here be used to assess investment in infrastructure in every case, with the use of the high projections not addressed in this review for infrastructure that is deemed very costly, with a very long lifespan, or in an area that is more vulnerable than others based on the loss of land to sea level rise in the future or other considerations. The community may consider using the Northeast Florida Infrastructure Resilience Planning Checklist located at [http://www.rcinef.org/Infrastructure\\_Checklist\\_Form.pdf](http://www.rcinef.org/Infrastructure_Checklist_Form.pdf) as a place to start.