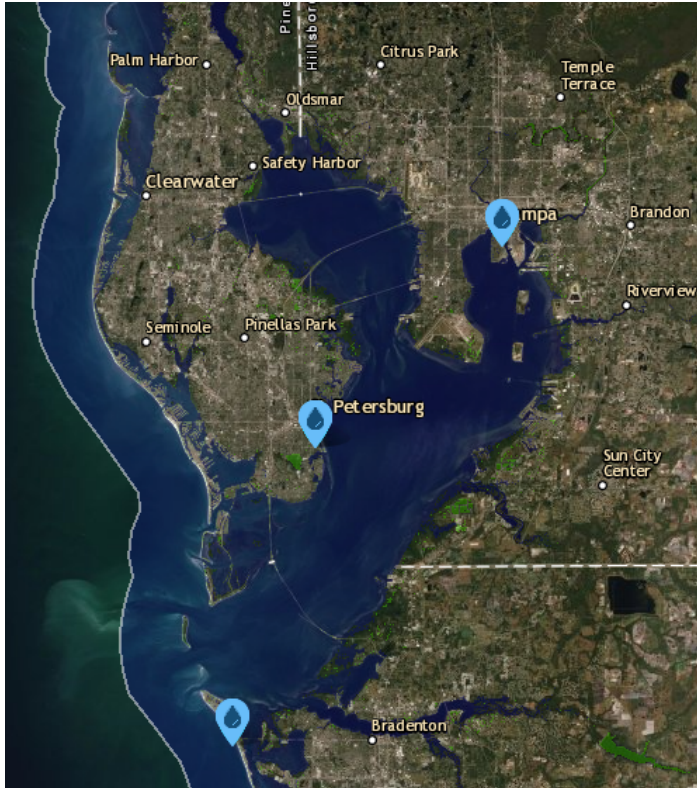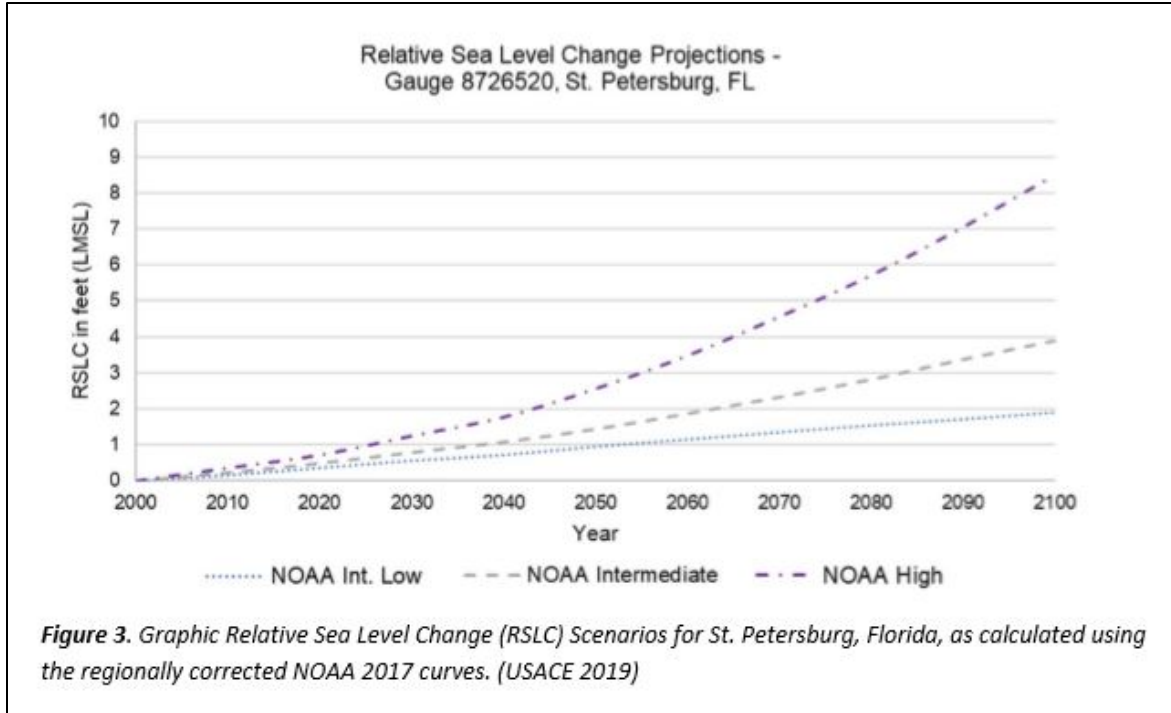# Sea Level Rise in Tampa Bay

Background:

Most people are aware that rising sea level is a serious threat to people in coastal areas. Low - lying areas will have more frequent flooding, and some could be submerged entirely. Rising sea level threatens the houses, buildings, and infrastructure of cities located along coastlines. Besides flooding dry land, rising salt water pollutes freshwater supplies and can destroy freshwater ecosystems. Coastal wetlands, like mangrove forests and salt marshes, play a large role in mitigating impacts from sea level rise, such as minimizing tidal flooding, reducing wave action at the shoreline, and filtering pollutants. What many people aren't aware of, is that these same coastal ecosystems are also at risk due to rising waters.

Watch this video for a quick sea level rise overview!!

Instructions:

- Click on the following link or type it into your web browser: https://coast.noaa.gov/slr/
- Select **"Get Started"**
- In the top right corner you will see this toolbar
- **Select the circle** which will read "toggle layer opacity" and **set the opacity to 50%** - This will allow you to better see all the layers on the map
- **Zoom in** on the Tampa Bay area (shown in the picture above)

The **NOAA sea level rise simulator** allows us to visualize what would happen in different scenarios. Different scientific models predict different degrees of relative sea level rise. Relative sea level rise is the height of the ocean rising relative to the land at a particular location. Remember that sea level is not constant everywhere, sea level is affected by ocean currents and other natural cycles so sea level rise will more prevalent in some areas over others. Which is why it's important to look at local models when determining what actions need to be taken locally. The graph below shows **3 different scenarios** based on 3 different NOAA models in the St. Petersburg area. One model predicts a low degree of sea level change (best-case scenario), one an intermediate, and one a high degree of sea level change (worst-case scenario). Remember, models are not perfect predictions, but they can help experts determine the best management actions to take.

Figure 3. Graphic Relative Sea Level Change (RSLC) Scenarios for St. Petersburg, Florida, as calculated using the regionally corrected NOAA 2017 curves. (USACE 2019)

Using the graph above, answer the following questions:

1. In 2050, in St. Petersburg, how many feet above current sea level does the "NOAA High" model predict the ocean will be_____ What about the "NOAA Intermediate" model? _____and the "NOAA Int-low" model? _____

   2050 is only 30 years from now. Where do you see yourselves in 30 years?

2. What about the year 2100? High_____ Intermediate_____ Low_____

3. List two things you can do at home to help change the path for the future in hopes that the "NOAA Int. Low" model will be the reality in 2100, rather than "NOAA High".

Part I. Sea Level Rise

Now let's get started using the sea-level rise viewer.

- The **left sidebar** on the screen should be on **"Sea level rise"**
- **Click on the "i"** information icon at the bottom of the left sidebar to read about this map layer.
  Your screen should look like this →
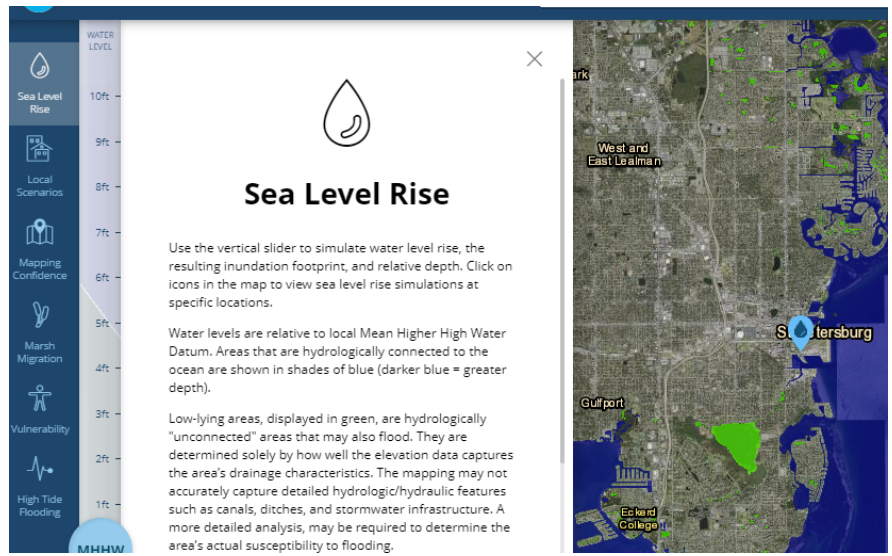
The NOAA Low (*best-case*) model predicts the sea level will rise 2ft by 2100. Use the slide-bar on the left side of the screen to see what would happen if the sea level would rise to 2ft (**move the slider from current to 2ft**). Blue on the map indicate areas under water. Light blue on the map represents shallower water while dark blue represents deeper water.

1. What towns/areas of the Tampa Bay area are underwater (**turned blue**) after only 2 ft of sea level rise?

2. Why might those areas be the first to flood?
   (****Check out this topographic map for help answering this question. The legend on the right of the map shows an array of colors that represent a range of elevations*)

- **Click on "High Tide Flooding"** on the far-left sidebar. This area shows where there is CURRENTLY flooding during super high tides, such as in tropical storms and hurricanes.

3. What do you expect to happen to area that currently floods at high tide (area in red) if the sea level rose 2 ft? Do you expect new areas to flood?

4. Even if a city isn't under water with 2 ft of sea level rise, how might the consequential tidal flooding affect a city's infrastructure? *Consider the connected systems in a city like stormwater, sewage, drinking water, etc.*

5. What are some actions city leaders and environmental agencies could take to help prevent these issues?

6. How do the BGIC program participants help to mitigate, or minimize impacts of sea level rise, such as tidal flooding and shoreline erosion?

- **Click back on the "Sea Level Rise"** icon.
- **Zoom in** on one of the river basins of the Tampa Bay watershed. Manatee River is a good option but feel free to find a river near your home.
- **Bring the slider all the way back down (current)**

7. Raise slider again to see how 2ft sea level rise affects the river? Any riverine islands (*islands surrounded by river*)? The land or marsh in the riparian area? *Riparian area is the land on the edge of a body of water.*

Take some time to explore: Was your home affected by 2ft of sea level rise? What about your school? Explore how different towns and neighborhoods in our area are affected. Zoom out! What parts of the U.S. are most impacted by 2 ft of relative sea level rise?

- Now **slide the slider to 8 ft,** the worst-case 2100 scenario prediction from NOAA models (*model actually calls for 8.5 ft but slider won't allow it).*

8. Are there new areas/towns underwater now?

- **Zoom in** to the same river you looked at before

9. Describe what has happened to the river and riparian area around it?

Take some time to explore: Was your home affected by 8.5 ft of sea level rise? What about your school? Explore how different towns and neighborhoods in our area are affected. What major U.S. cities are underwater with just 6 ft of sea level rise?

Part II. Sea Level Rise and Wetlands

- **Select the "Marsh Migration" icon** on the far-left sidebar. This layer shows you where different types of wetlands are located and how they will change with sea level rise. The orange, dark green and light purple indicate freshwater wetlands. The dark purples are brackish or salt water marsh.
- To see what each color means, **select the legend toggle in the top right corner**

- **Reset the slider to current sea level**

A. Wetland Loss

- **Zoom in on "Sawgrass Lake Park"** in St. Petersburg – google maps can help if you don't know where it is
- Your page should look like this:
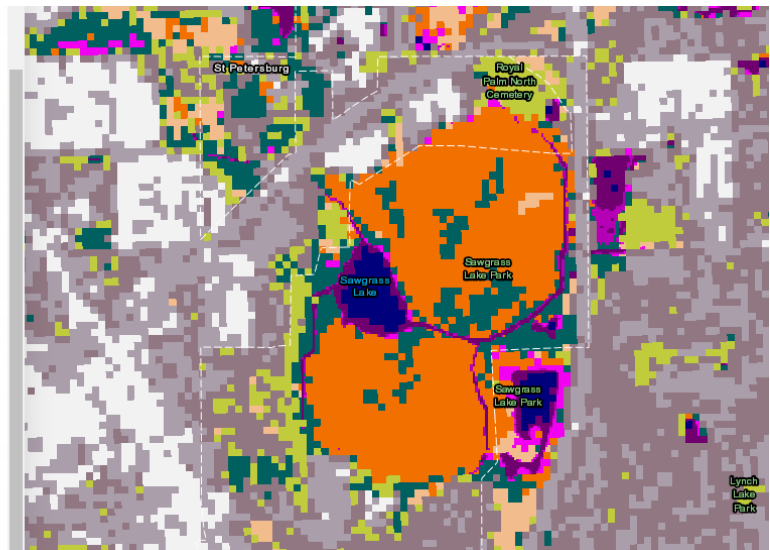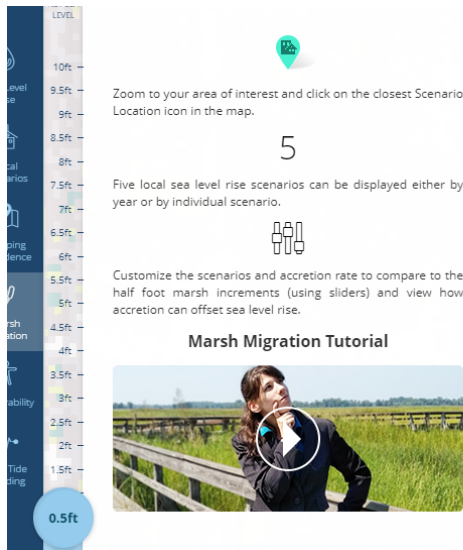
- Now **use the slider** to change the relative sea level rise to **8.5 ft.**

10. What happens as you go from current to 8.5 ft (worst-case scenario)? Do you lose or gain freshwater wetlands?

11. What are some consequences of losing freshwater wetlands? *Consider what freshwater wetlands provide for both humans and wildlife?*

B. Marsh Migration

Background:

In the **Bay Grasses in Classes Program**, students grow, care for, and transplant wetland plants in saltwater and brackish water habitats. Saltwater marshes are characterized by salt tolerant plants that live between the low and high tidal zones. Some plants thrive in very low elevation and are regularly covered with water, while some like to live in higher elevation and are only occasionally flooded with tidal waters. Marsh plants can't be constantly flooded with water or the plants will drown. For that reason, rising sea level threatens these beneficial ecosystems.

These at-risk ecosystems can help protect coastal communities from sea level rise. Marsh plants have dense root systems that help stabilize the shoreline to reduce erosion. The presence of marsh plants alters the soil making it spongy, and absorbent. This mucky soil absorbs wave energy from storms and reduces flooding.

Governments and non-governmental agencies are relying on computer models to determine how to best protect or restore these tidal marshes in the future. One restoration method is to allow the marsh to grow and move gradually inland as sea level rises, this process is called **marsh migration**.

Instructions:

- **Reset slider to Current**
- **Zoom out** on the map to the **Tampa Bay Area** again. The dark purple is saltwater marsh.
  Notice there is a lot of saltwater marsh near Feather Sound and the bridges in Pinellas county, and a lot on the east side of the bay in Hillsborough and Manatee county.
- **Raise the slide bar** up to **2 ft**

  1. What do you observe?

- Now **raise it** up to the **8.5 ft**?

  2. What happens to the saltwater marsh in our area as you rise it to 8.5ft?

- Let's **zoom in** to take a closer look at Cockroach Bay Aquatic Preserve near the Hillsborough and Manatee county border. **Reset slider to current**. Your Map should look like this:
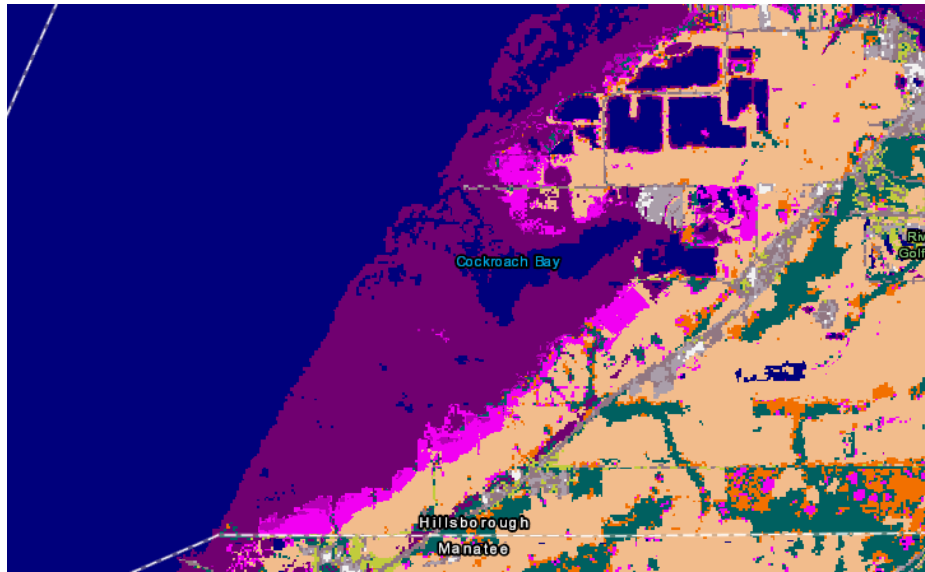
- **Raise the slider** up to **8.5 ft.**
   1. What happens to the saltwater marsh (darkest purple) as you raise your slider up?

   2. Is there any new marsh where there wasn't before? *This is marsh migration. When marsh "migrates" or moves inland because the water level rises.*

   3. At what ft. of sea level rise do you notice most of the marsh has disappeared as you slide up the slide bar (2ft, 3ft, 4ft…. 9ft?) _____

- Below are pictures of 2 proposed Smooth Cordgrass (*Spartina alterniflora*) plantings for BGIC students. The red line indicates where students would plant the saltwater marsh plants.

The eastern shoreline of "MacDill Airforce Base"

Shoreline at "Rock Ponds Ecosystem Restoration Area"

4. Looking at the first picture at MacDill Airforce Base, do you think the saltwater marsh will be able to migrate inland when the sea level rises? Why or why not?

5. Answer the same question for Rock Ponds Ecosystem Restoration Area?

6. If you were planning a native planting project, where would you propose the BGIC students transplant their plants (assuming they only had enough for one site). Why?

7. What are some other factors that habitat restoration scientists might need to consider when making decisions like that? *Hint: What if you lived on MacDill AFB? What if endangered species lived at Rock Ponds? Which planting would cost more money?*

8. When sea level rises, if saltwater marshes can't migrate, we will lose these beneficial ecosystems. If scientists want to increase the chances of successful marsh migration in the future, what actions can they take now?