

Name: _____



Will Hudson River wetlands change?

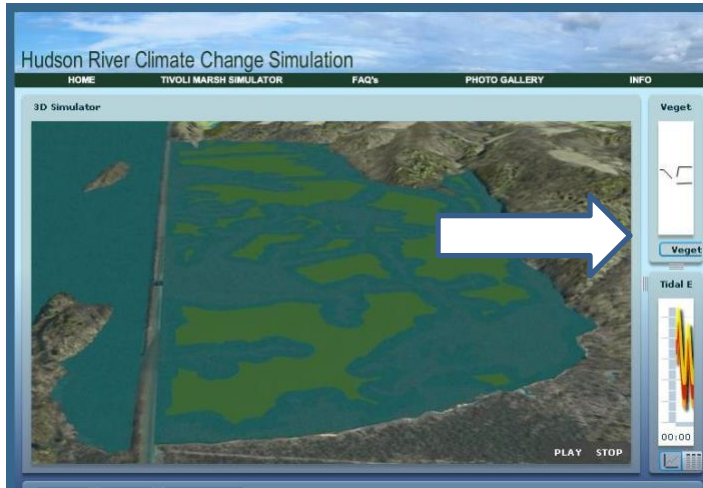
Go to: <https://wri.cals.cornell.edu/hudson-river-estuary/climate-change-hudson-river-estuary/resources-resilience/flooding-and-sea-level-rise-mappers/>

1. Click on "Tivoli Marsh Simulator. To what date in the future can this model show (look at the years on the bottom right hand corner)? 2080
2. Click on the Temperature tab in the upper right. Compare the temperature for different years. How many degrees (F) change will there be in:
2020? 2 F
2050? 4.5 F
2080? 6 F
3. Click on the CO2 Emissions tab. Then answer the questions.
 - a. What will be the total amount of CO2 released in 2020? 13 gigatons of carbon
 - b. In which year is there a decrease from the previous year's emissions?
2080
 - c. Why do you think there might be a decrease in emissions?
Reductions in carbon dioxide emissions
4. Click on the Vegetation Tab. On the pie chart, you can roll over each of the three types of vegetation for a description of each. In the section for Vegetation, turn all the years off. Then:
 - a. Click on the 2009 tab (blue). Which of these three vegetation classes is the most common? BV SV x GV
 - b. Click on the 2020 tab (orange). Which of these three vegetation classes is the most common? BV SV x GV
 - c. Click on the 2050 tab (red). Which of these three vegetation classes is the

most common? x BV _____ SV _____ GV

- d. Click on the 2080 tab (yellow). Which of these vegetation classes is the most common? x BV _____ SV _____ GV

Now, return to the main screen where you can see all three pieces of the simulation: the Tidal Elevation, the graphs of CO₂/Temperature, and the 3D Simulator. You can make the different parts of the page larger and smaller by clicking and dragging on the small bars between the sections (look next to the arrows in the picture below).



5. Turn off all the years except for 2009 (under the Tidal Elevations Graph). Press “Play” on the 3D simulator. Using the visual and the graph, answer the following:
 - a. When does the lowest tide occur? 10:15 and 10:30
 - b. The highest tide? 2:45

6. Click on “2080”. How are the tides in 2080 different than those in 2009? The tides in 2080 are higher than the tides in 2009

7. How much higher is the high tide in 2080 than in 2009? You can get these data by clicking on the table icon at the bottom left hand side of the graph area. 0.533376 meters higher

8. Turn all the years on. Underneath the pie chart, you can click on buttons for CO₂ emissions and temperature.
 - a) In what year are CO₂ emissions the highest? 2050
 - b) In what year is the temperature the highest? 2080

9. According to this model, what is the reason for the change in the tides between 2009 and 2080?

The rising level of CO₂ emissions causes the temperature to rise, causing glacial ice to melt, which then causes the tidal elevation to increase.

10. How does the vegetation in the marsh change between 2009 and 2080?

In 2009 Graminoid is the dominant vegetation accounting for 70.13% of all vegetation, however in 2080 Broadleaf is the dominant vegetation accounting for 86.95% of all vegetation.

11. The Hudson River accumulates sediment at a rate of 0.05-0.29 cm/year.

Is this sediment accumulation enough to keep the marsh from flooding at high tide in 2080? Why or why not?

No. In the year 2080 the highest high tide reading is about 0.5m higher. Even if you assume the highest rate of sediment accumulation every year (0.29cm./y.), it would still take 172 years for the marsh to accumulate enough sediment not to flood at high tide.

12. What type of vegetation will almost disappear by 2080? Based on what you've learned, what impact do you think this will have on the ecosystem?

Graminoid vegetation. The marsh may become less diverse, and less nitrate will be removed from the Hudson River by the marsh plants.