

STUDENT MASTER

Mapping Mangroves

The black mangroves on Harbor Island, Texas are growing at the northern limit of their range. They can't survive any farther north because they are not adapted to the freezing temperatures that occur more frequently there. When the temperature drops below freezing, individual black mangrove trees may be damaged or killed. The longer the temperature remains below freezing, the more damage there is to the trees.

The black mangrove's range is also limited by water salinity and water depth. The mangroves grow in brackish or salty water, not in fresh water. They also cannot grow in water that is too deep because they need to get air to their roots. Temperature, salinity, and water depth all determine where the black mangroves can and cannot grow.

On Harbor Island, the percent of the land covered by mangroves changes over time. Sometimes, over a period of one to many years, the mangrove habitat expands. Other times, mangrove trees die and the area of the island covered by mangroves contract.

In this exercise, you will look at maps showing areas of Harbor Island covered by mangroves at four times (1930, 1979, 1995, and 2004). You will then examine information about prolonged freezing weather events in the Harbor Island area. From these data, you can answer the research question: "Is mangrove expansion and contraction correlated to changes in air temperature?" You will also follow-up with a hypothesis about future changes in mangrove habitat coverage on the island.

Procedure

1. Read the introduction to learn about the environmental conditions needed for black mangrove survival.
2. You have four maps of Harbor Island, each showing the extent of mangrove habitat in different years. First, compare the map from 1930 to the one from 1979. According to the maps, did the area covered by mangrove habitat expand or contract from 1930 to 1979? If it expanded, write "Expand" in the appropriate box in the data table. If the area contracted, write "Contract".
3. Now compare the maps from 1979 and 1995. What happened to the area covered by mangroves from 1979 to 1995? Did it expand or contract? Write your observation in the data table.
4. Lastly, compare the maps from 1995 and 2004. Write your observation in the data table.

Data Table

During the time period...	Did the mangrove range expand or contract?
1930 to 1979	
1979 to 1995	
1995 to 2004	

5. To look for possible explanations as to why the mangrove habitat may have contracted between 1979 and 1995, scientists examined the maximum and minimum air temperatures during that period, particularly for the winter months. To get an idea of what they found, examine the Winter Severity bar chart.

Additional Information

Scientists found that the temperature dropped well below freezing around Harbor Island for several days in the winter of 1983-1984. Although there are days when the average temperature was below freezing during other years, the "big freeze" in December 1983 was much more severe, with more consecutive days of freezing temperatures and no daytime "thaws." Scientists believe that the extended period of cold weather in December of 1983 caused individual

mangrove trees to be damaged or killed, and therefore caused the overall contraction of the mangrove habitat observed after 1979. Further damage was done by a smaller freeze event in the winter of 1989-1990. You can see both of these freeze events on the Winter Severity bar chart.

Questions

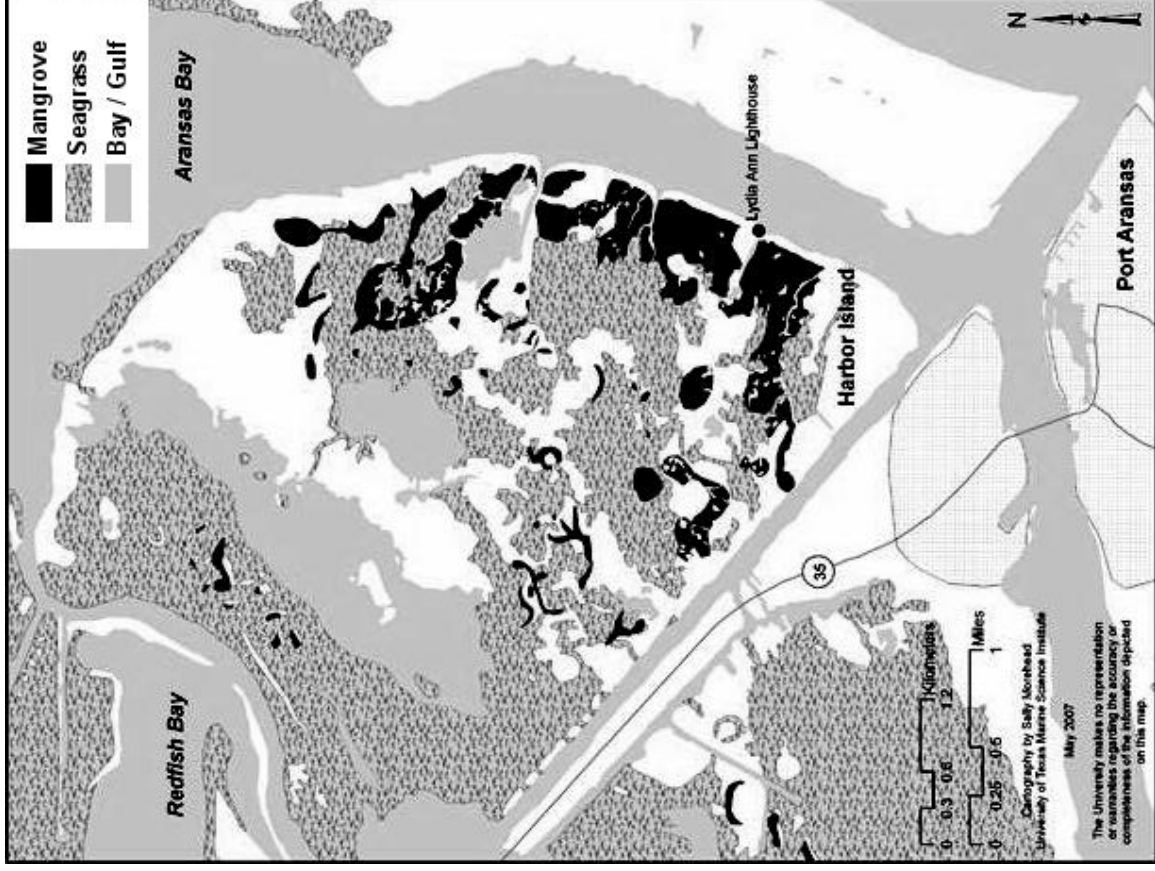
- Q1. Based on what you have learned about the black mangrove's tolerances and adaptations, what do you think could have caused the habitat to contract or expand?
- Q2. If you could look at additional historical records of the mangrove habitat at Harbor Island, when else would you expect there to have been post-freeze contraction in the mangrove habitat area?

Climate Extension

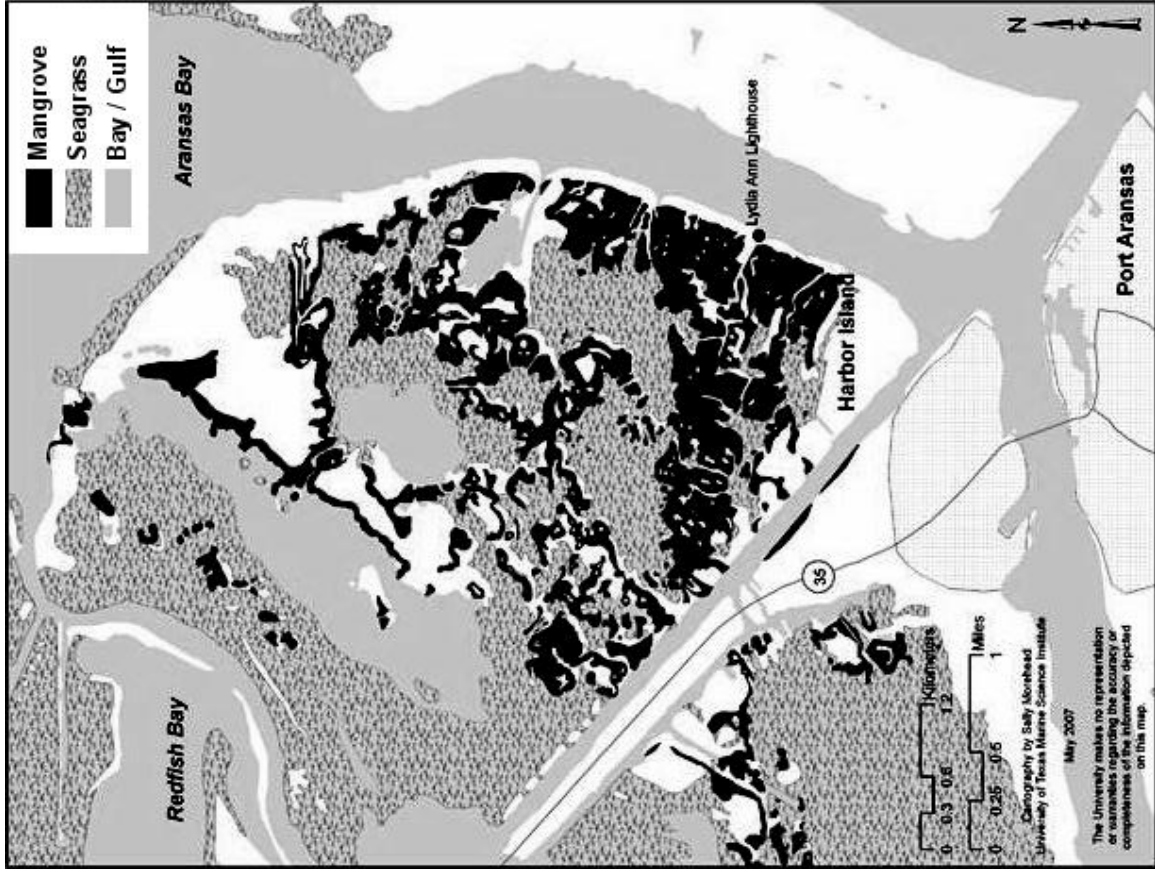
- Q3. Earth's climate is changing. In Texas, scientists expect increasingly warmer weather, with fewer days of freezing temperatures. Based on the patterns of change you saw in the earlier maps, use the colored pencils and the blank map of the Harbor Island area to show what you think the mangrove area in Harbor Island might look like in 2030. Remember to put a color key somewhere on your map (i.e., show what color you used to show mangrove habitat).
- Q4. What happens to animals that live in a habitat when that habitat expands? What happens when that habitat contracts or disappears?
- Q5. In the study of climate change impacts, why is it important to conduct collect data over many years through long term research and monitoring projects?

STUDENT MASTER

Harbor Island Mangroves, 1930

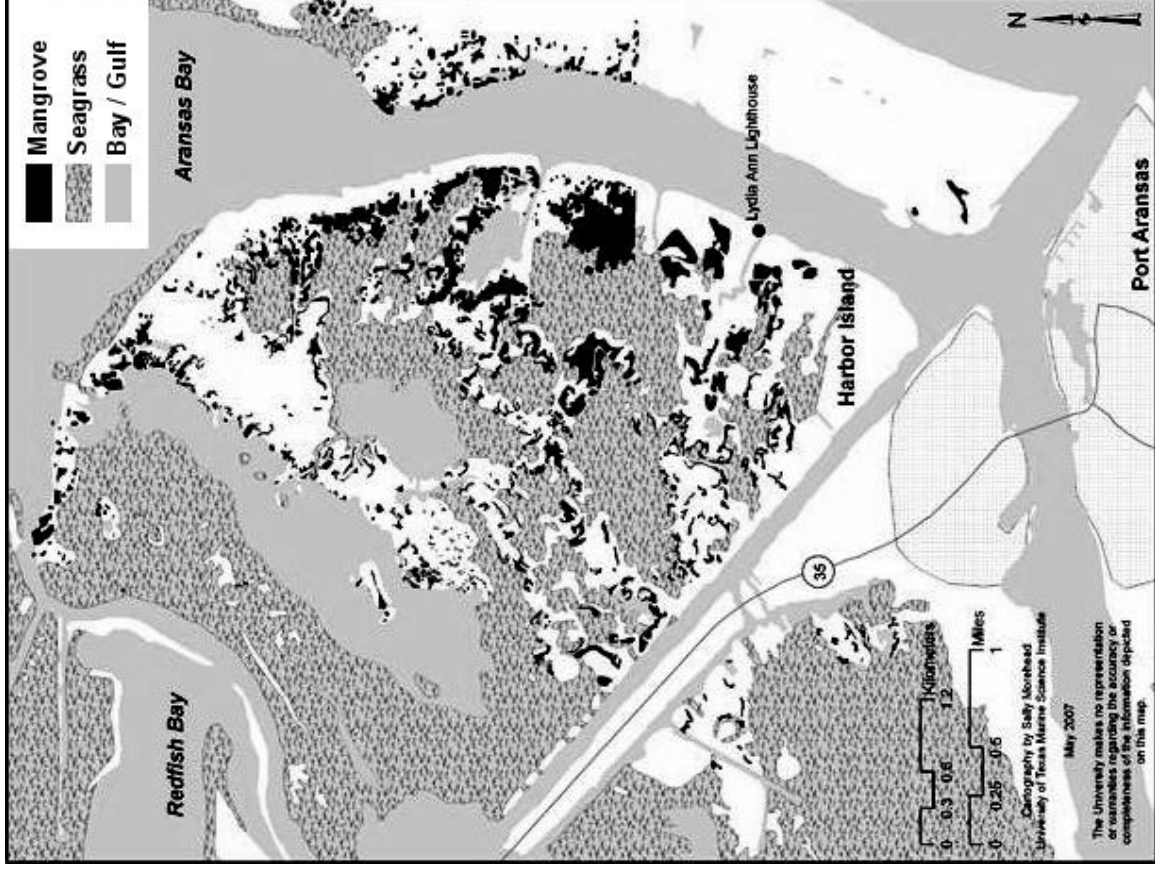


Harbor Island Mangroves, 1979

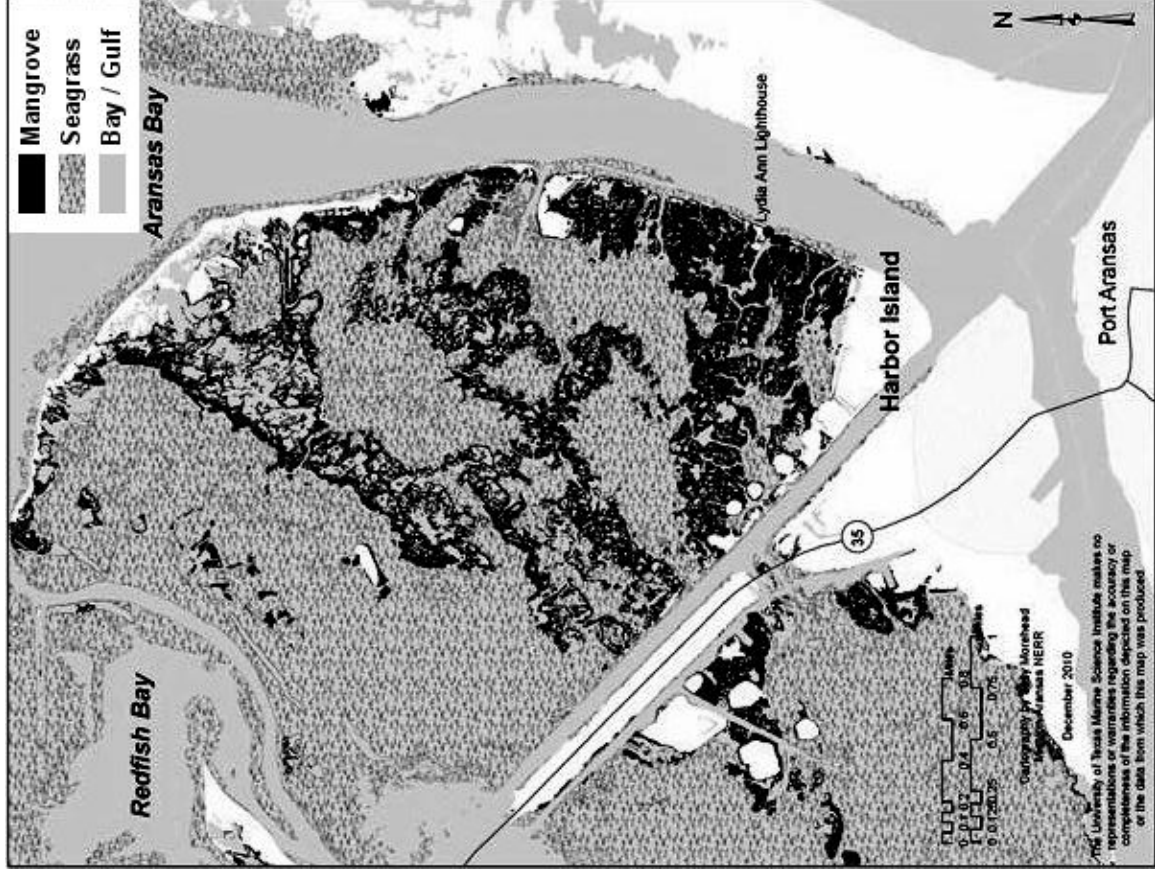


STUDENT MASTER

Harbor Island Mangroves, 1995

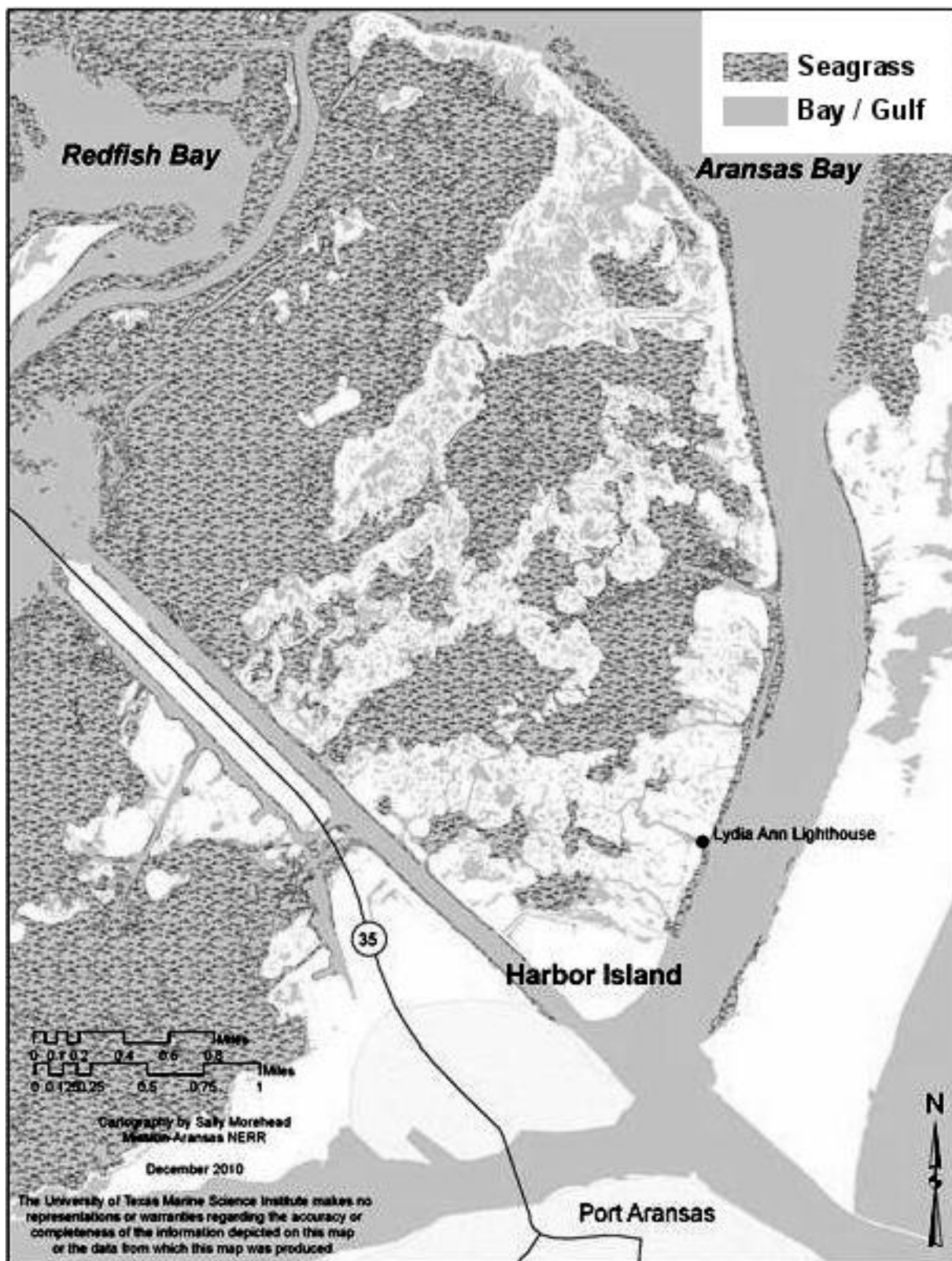


Harbor Island Mangroves, 2004



STUDENT MASTER

Blank Map of Harbor Island



STUDENT MASTER

Winter Severity, 1950 to 2004, Harbor Island

