

Name: _____

Date: _____

Impact of Sea Level Rise on Hyde County's Swamp Sparrows

Task: With the sea level rising, it is important to define how species will be impacted based on their habitat use. The research that we are compiling today will help inform management decisions in the future.

Research Area: Data collection from this research occurred at four sites in Hyde County, North Carolina. These sites surround Swanquarter and Lake Mattamuskeet National Wildlife Refuges. We will utilize the data collected at one site for today's lab that we referred to as "Fantellas or E2."

To begin, navigate to the interactive ArcGIS Map: <https://arcg.is/mmLKf0>.

On the left-hand side of your screen, you will see that there are different "layers" that you can turn on and off by simply clicking on them. Each layer corresponds to the intermediate sea level rise prediction for a different year (2025, 2050, and 2100). You will also see a layer that has the location data for the Swamp Sparrows over the course of this study – when this layer is on you will see several points in two different colors. Each point corresponds to a known location of a Swamp Sparrow; the colors correspond to the subspecies (Coastal Plain subspecies in blue, Inland subspecies in red). If you turn all these layers off, you will just be able to see the base imagery! This is a good start to look at because it shows you the type of habitat that is available and what it looks like from the view of a satellite!

- 1. Please describe the different types of habitats at this study site with only the base imagery showing (all other layers off!) For example: what type of habitat takes up the most space in this general area, what takes up the least?**

The different types of habitat are listed in this table below (and can be found on subsequent pages within this worksheet). This area is dominated by irregularly flooded marsh and portions of undeveloped dry land – a lot of these areas are agricultural areas. The area that takes up the least amount of habitat are tidal flats. This might be difficult to see, so if students are struggling with the teacher can advise them to toggle between the base imagery layer and the 2022 habitat layer.

Undeveloped Dry Land (UDDL)	1
Developed Dry Land (DDL)	2
Transitional Salt Marsh (TSM)	7
Tidal Flat (TF)	8
Regularly Flooded Marsh (RFM)	11
Estuarine Open Water (OW)	17
Irregularly Flooded Marsh (IFM)	20

2. Based on what we have discussed about Swamp Sparrows, is this currently a quality habitat for this species? Why or why not?

Yes! As we have discussed, Swamp Sparrows rely on high marsh vegetation for food and shelter. This area is dominated by this habitat, so we would expect to see Swamp Sparrows in this area.

3. Based on what we have discussed today regarding sea level rise, make a hypothesis about what you expect to happen to Swamp Sparrow habitat in years 2025, 2050, and 2100.

If sea level rise continues to occur in this area, then this area will become increasingly inundated and there will be less irregularly flooded marsh for Swamp Sparrows.

If sea level rise continues to occur in this area, then the irregularly flooded marsh will migrate backwards until it hits a hardened structure (road) and then it will start to squeeze.

These are just two examples that students may provide: the main takeaways that the teacher should address is that this area is likely to be impacted by sea level rise and hardened structures.

Today, we will break up our data by the two main subspecies, inland (INSS) and Coastal Plain (CPSS).

4. Why is it important to distinguish between the two subspecies when analyzing habitat data for the Swamp Sparrow?

It is important to distinguish between the two subspecies because the Coastal Plain Swamp Sparrow (CPSS) has more narrow habitat requirements than the two inland subspecies (INSS). As such, the CPSS is listed as a species of the highest conservation concern by the Atlantic Coast Joint Venture. Because the two subspecies have different conservation statuses, we might expect them to be impacted differently by sea level rise.

Over the course of three winter seasons (2008-2010), we tracked 11 Swamp Sparrows at the study site we will be analyzing today. To determine how their possible change in habitat due to sea level rise will affect individuals, we will look at the proportion of relocations in areas that are no longer livable in years 2025, 2050, and 2100 at the intermediate level of sea level rise prediction (1.2 m by 2100). Based on research in this case study, we have determined that Swamp Sparrows are able to live in undeveloped dry land and high marsh (irregularly flooded marsh) areas.

Please fill out the following tables: Count the number of relocations in each habitat. Please note: Some of these relocations are on the border between two types of habitats, so treat the answers provided below as estimates (give or take 5 relocations).

Using the interactive map: After you click on the link above, you may need to zoom in to see the first layers show up! First click on the middle icon “Show contents of the map” on the top-left portion of your screen - this will allow you to toggle between the different layers, each layer represents a different sea level rise scenario labeled by year. The final layer is labeled Outreach Fantellas and contains the individual locations for each individual; it is currently labeled as Coastal Plain Swamp Sparrow (CPSS) and Inland Swamp Sparrow (INSS) - if you click on the legend icon (to the right of the previous icon, you will be able to see the corresponding colors. The goal of the following activity is to determine what types of habitats these sparrows will be in as sea level rise affects this area. To count the number of relocations, you will need to zoom into the map (either by scrolling in using your mousepad or clicking on the “+” icon in the top-left portion of the map. I would recommend zooming in until the layer disappears and then going back once “click” or “scroll” as this will give you the layer in the highest detail. You will need to move through the map to ensure that you are counting all relocations - to do this simply click and drag your map to move it in a different direction. When you are done counting the relocations for a particular year, navigate back towards the “Show contents of the map” icon and click on the left-hand box to the next year (make sure there is a check mark). You will be able to verify that you did this step correctly as the map will change! Finally, for more information on each relocation, feel free to click on the individual point!

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Sea Level Rise_2025

Subspecies	UDDL	DDL	TF	TSM	RFM	IFM	OW
CPSS	3	0	0	0	0	29	0
INSS	4	3	0	0	0	49	0

Subspecies	Livable	Non-livable
CPSS	32	0

INSS	53	3
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5. What percentage of relocations are in non-livable areas in 2025?

96.5%

6. If we assume that all relocations were in livable habitat at the time of data collection, what is the percent habitat loss?

3.5%

Sea Level Rise_2050

Subspecies	UDDL	DDL	TF	TSM	RFM	IFM	OW
CPSS	3	0	0	0	14	15	0
INSS	4	1	0	3	16	32	0

Subspecies	Livable	Non-livable
CPSS	18	14
INSS	36	20

7. What percentage of relocations are in non-livable areas in 2050?

61.4%

8. Using the habitat data from the 2025 scenario, what is the percent habitat loss from 2025 to 2050?

96.5% - 61.4% = 35.1%

Sea Level Rise_2100

Subspecies	UDDL	DDL	TF	TSM	RFM	IFM	OW
CPSS	0	0	11	3	6	12	0
INSS	0	0	34	3	7	12	0

Subspecies	Livable	Non-livable
CPSS	12	20
INSS	12	44

9. What percentage of relocations are in non-livable areas in 2100?

27.3%

10. Using the habitat data from the 2050 scenario, what is the percent habitat loss from 2050 to 2100?

61.4% - 27.3% = 34.1%

11. Describe the overall change in habitat that Swamp Sparrows will experience in each scenario.

Swamp Sparrows progressively lost more habitat as time went on. There were very similar losses in habitat between 2025 to 2050 and again from 2050 to 2100.

12. What subspecies, CPSS or INSS, appears to be at a higher risk of habitat loss in each scenario?

Both subspecies are at a high risk of habitat loss; there is a higher percentage of INSS individuals confined to non livable areas by 2100 than there are for CPSS.

13. Based on the results you found today, how would you guide management to conserve the existing land? Do you think marsh migration is a possibility in this area? Why or why not?

The student may provide any of the management strategies that were discussed in this lesson plan (thin layer deposition, REEF balls, etc). Marsh migration is possible in this area up until they hit a hardened structure which is usually a road. There are also pathways for water for irrigation that may pose a threat to the potential of marsh migration at this study site.