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DATA Nugget

Seagrass survival in a super salty lagoon

Featured scientists: Kyle Capistrant-Fossa (he/him) & Ken Dunton (he/him) from the University of Texas at Austin

Research Background:

Seagrasses are a group of plants that can live completely submerged underwater. They grow in the salty waters along coastal areas. Seagrasses are important because they provide a lot of benefits for other species. Like land plants, seagrasses use sunlight and carbon dioxide to grow and produce oxygen in a process called photosynthesis. The oxygen is then used by other organisms, such as animals, for respiration. Other organisms use seagrasses for food and habitat. Seagrass roots hold sediments in place, creating a more stable ocean bottom. In addition, the presence of seagrasses in coastal areas slows down waves and absorbs some of the energy, protecting shorelines.

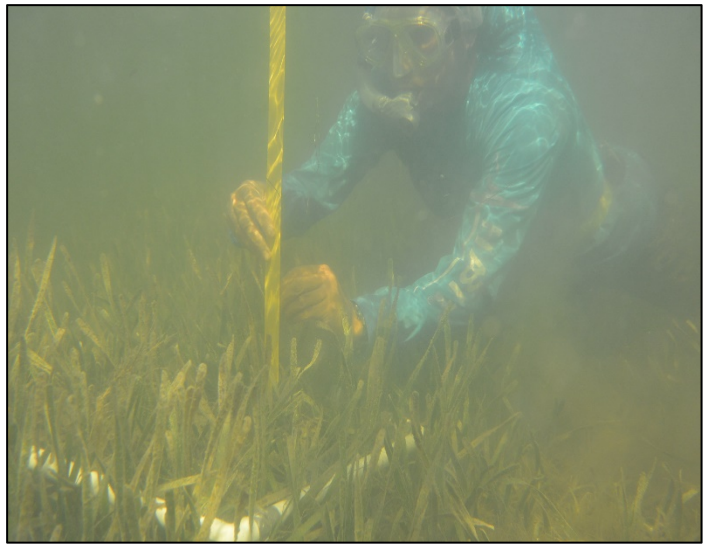
Manatee grass (*Syringodium filiforme*)

Unfortunately, seagrasses are disappearing worldwide. Some reasons include damage from boats, disease, environmental changes, and storms. Seagrasses are sensitive to changes in their environment because they have particular conditions that they prefer. Temperature and light levels control how fast the plants can grow while salinity levels can limit their growth. Therefore, it is important to understand how these conditions are changing so that we can predict how seagrass communities might change as well.

Ken is a plant ecologist who has been monitoring seagrasses in southern Texas for over 30 years! Because of his long-term monitoring of the seagrasses in this area, Ken noticed that some seagrass species seemed to be in decline. Kyle started working with Ken during graduate school and wanted to understand more about what environmental conditions might have caused these changes.

Texas has more seagrasses than almost any other state, and most of these plants are found in a place called Laguna Madre. During his yearly seagrass monitoring, Ken noticed that from 2012 – 2014 one of the common seagrasses, called **manatee grass**, died at many locations across Laguna Madre. Since then, the seagrass has grown back in some places, but not others. Kyle thought this would be an opportunity to look back at the long-term dataset that Ken has been collecting to see if there are any trends in environmental conditions in years with seagrass declines.

Each year, Ken, Kyle, and other scientists follow the same research protocols to collect data to monitor Laguna Madre meadows. Seagrass sampling takes place 2 – 4 times a year, even in winter! To find the manatee grass density, scientists dig out a 78.5 cm^2 circular section (10 cm diameter) of the seagrass bed while snorkeling. They then bring samples back to the lab and count the number of seagrasses. While they are in the field, they also measure environmental conditions, like water temperature and salinity. A sensor is left in the meadow that continuously measures the amount of light that reaches the depth of the seagrass.



A researcher in Ken's Lab measures seagrasses underwater using a mask, snorkel, and white PVC quadrat.

Kyle used data from this long-term monitoring to investigate his question about how environmental conditions may have impacted manatee grass. For each variable, he calculated the average across the sampling dates to obtain one value for that year. He wanted to compare manatee grass density with salinity, water temperature, and light levels that reach manatee grass. He thought there could be trends in environmental conditions in the years that manatee grass had low or high densities.

<u>Scientific Question</u>: How do Laguna Madre manatee grass densities change over time? Are there changes in environmental conditions that relate to manatee grass growth or decline?

Name____________________

Scientific Data:

Use the data below to calculate averages and to answer the scientific question:

Year	Average manatee grass density (plants / m^2)	Average temperature (°C)	Average salinity	Average bottom light (# photons/m^2/s)
2008	1444	24	37	301
2009	2307	25	46	461
2010	2803	24	28	441
2011	2762	22	38	462
2012	2057	25	49	258
2013	944	24	53	280
2014	60	24	42	311
2015	0	25	37	347
2016	0	26	38	258
2017	0	24	43	338
2018	0	25	38	405

Note: Seagrass sampling is conducted 2-4 times a year. The data have been averaged by year across all sampling events.

What data will you graph to answer the question?

Independent variable(s): ____

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Dependent variable(s): ____

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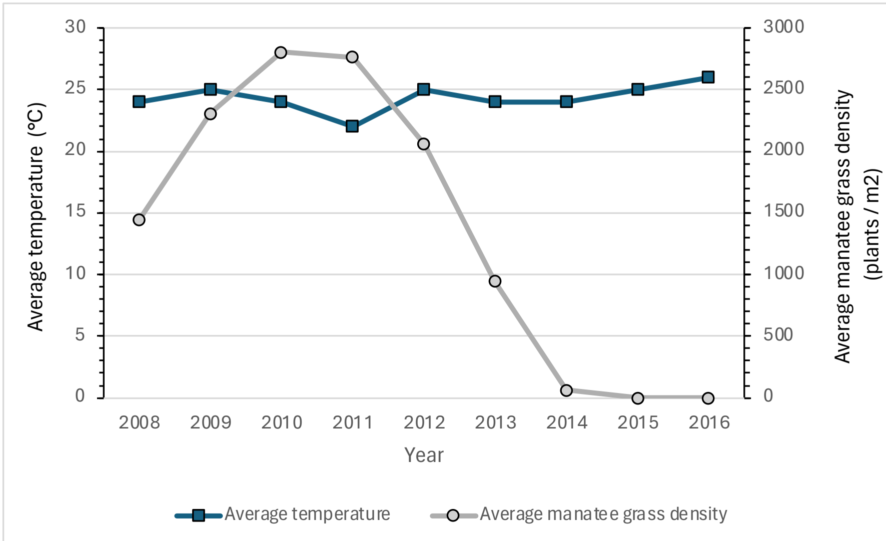
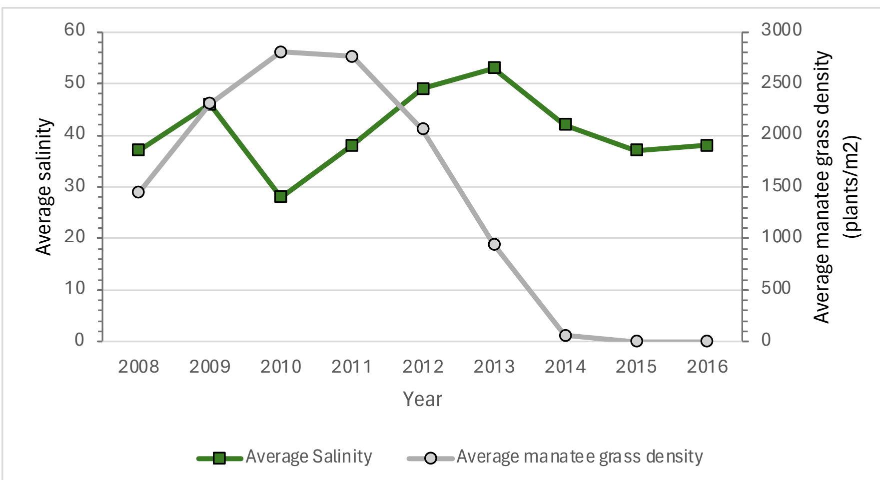
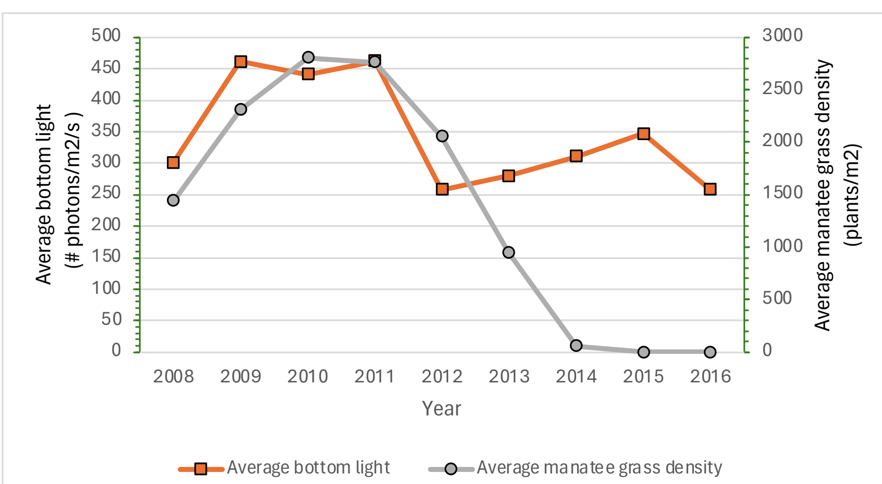
Name___________________

__Below are graphs of the data__: Identify any changes, trends, or differences you see in your graph. Draw arrows pointing out what you see, and write one sentence describing what you see next to each arrow.







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Interpret the data:

Make a claim that answers the scientific question - how do Laguna Madre manatee grass densities change over time? Are there changes in environmental conditions that relate to manatee grass growth or decline?

What evidence was used to write your claim? Reference specific parts of the table or graph.

Explain your reasoning and why the evidence supports your claim. Connect the data back to what you learned about the environmental conditions seagrasses need to grow.

Name____________________

Your next steps as a scientist:

Science is an ongoing process. What new question(s) should be investigated to build on Kyle and Ken's research? How do your questions build on the research that has already been done?

What future data should be collected to answer your question?

Independent variable(s): ____

Dependent variable(s): ____

For each variable, explain why you included it and how it could be measured.

What hypothesis are you testing in your experiment? A hypothesis is a proposed explanation for an observation, which can then be tested with experimentation or other types of studies.