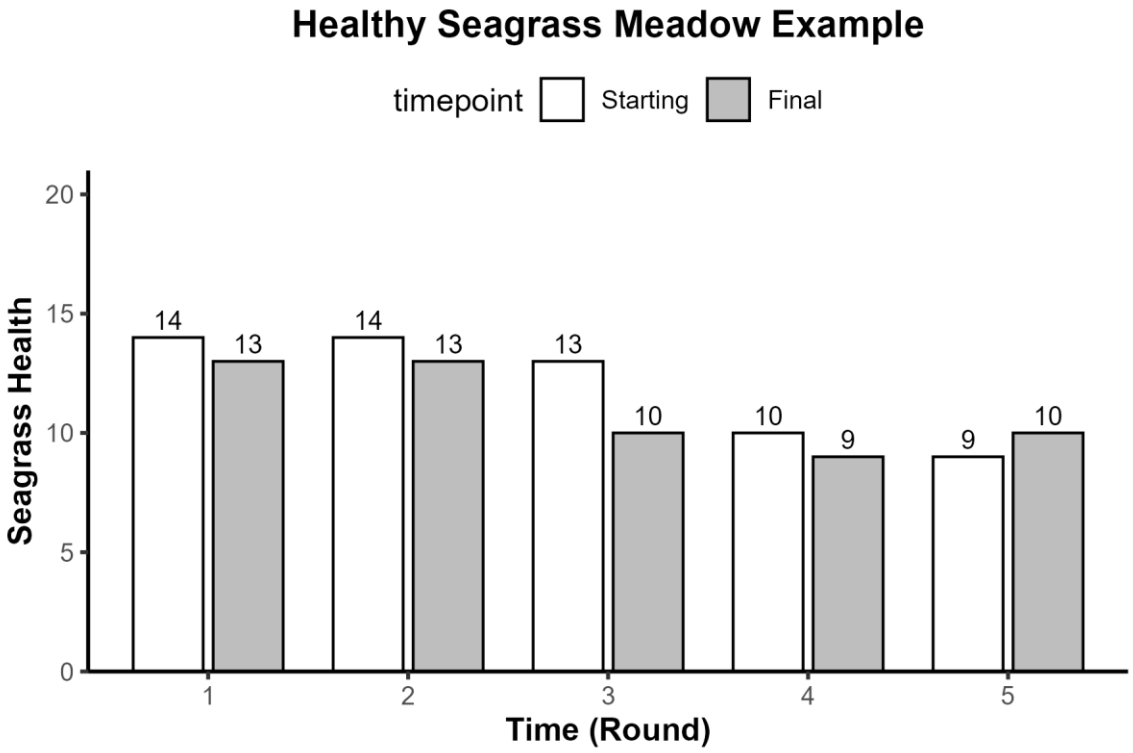
Names: Answer Key

Graphing Worksheet

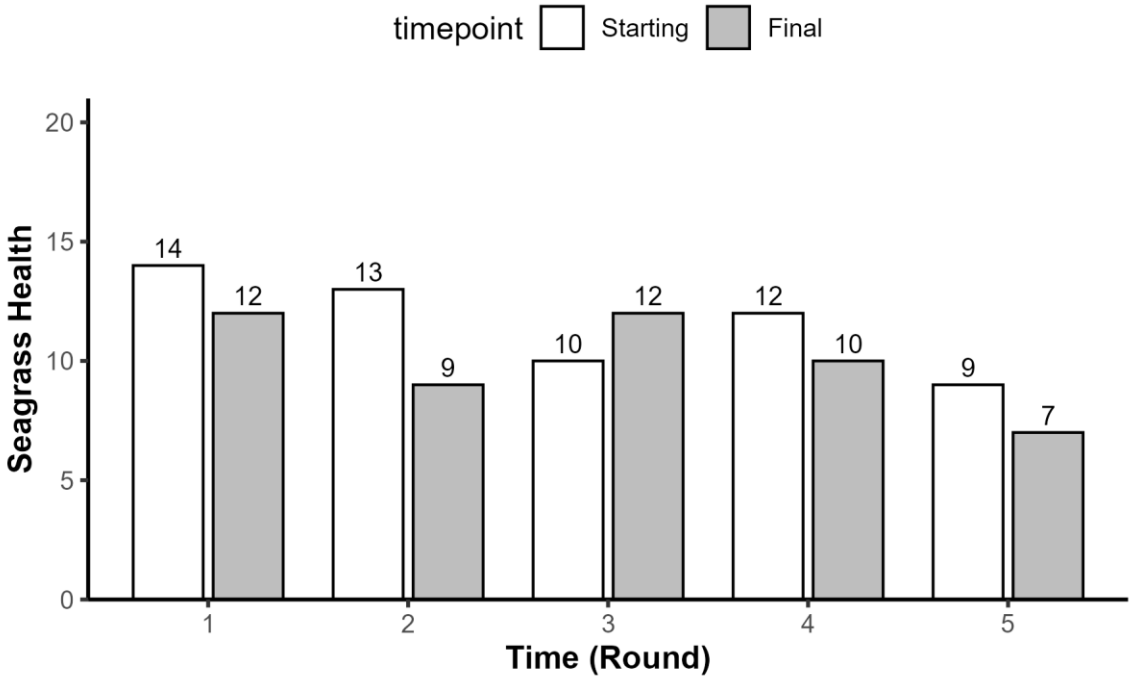
Congratulations on completing the data collection phase of your research! Now you get to analyze your results and draw conclusions. These conclusions will help scientists better understand pollution in local, coastal ecosystems. Sharing that knowledge helps policymakers and community members implement evidence-based solutions!

Use your data for starting and final seagrass health from each round to make a double-bar graph of Seagrass Health over Time. Starting health is the very first row of the Data Collection Worksheet. Final health is the very last row of the Data Collection Worksheet.

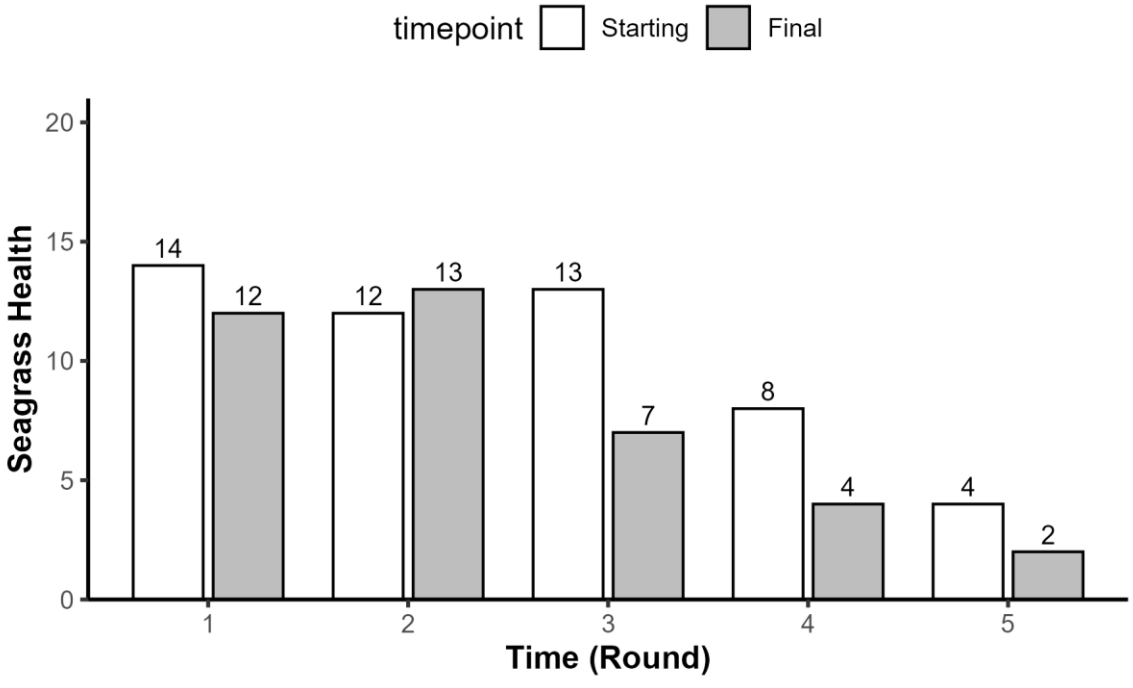
Graphs will look different depending on the outcome of each team's game. Below are example graphs for a healthy (≥ 12), unhealthy (7-12), and collapsed (≤ 7) seagrass meadow outcome. The "healthy" plot below is based off the data in the Data Collection Worksheet Answer Key.



Unhealthy Seagrass Meadow Example



Collapsed Seagrass Meadow Example



Questions:

1) Define a feedback loop and describe what can happen to a seagrass meadow when it enters one.

A feedback loop is a cycle where a change causes effects that make the change even stronger. Pollution entering the seagrass meadow makes it less healthy. When the meadow enters a positive feedback loop it makes it harder for the meadow to be healthy, especially if more microplastic pollution continues to be added.

2) Is your final meadow healthy (≥ 12), unhealthy (7-12), or collapsed (≤ 7)? Keep this answer in mind for questions 3 and 4.

This will vary by team.

3) *a.* What is the impact of microplastic on the blades? Support your answer using data from the game. *b.* Green sea turtles are found along the coast of Virginia and commonly eat seagrass blades. How might the final state of your meadow affect them? Support your answer using data from the game

For 3a the takeaway is that microplastics can harm seagrass growth when present in high amounts on the blades by blocking sunlight needed for photosynthesis. 3b goes further into the ecosystem impacts of microplastic contamination with the idea that turtles are herbivores who rely on seagrass blades; in unhealthy or collapsed meadows there may not be enough food, so turtle health will decline. In healthy meadows students could say turtle health will be unchanged, or decline if they eat blades during a season (round) with high microplastics on the blades. Those microplastics could get into the turtles (trophic transfer) and potentially cause harm. This also applies to unhealthy and collapsed meadows if the remaining seagrass is contaminated with microplastics.

4) *a.* What is the impact of microplastic in the sediment? Support your answer using data from the game. *b.* Skates (commonly called rays) live in seagrass meadows and forage for prey in the

sediment. They eat crabs, worms, and other bottom-dwelling animals. How might the final state of your meadow affect them (*hint: biomagnification*)?

Similar to the question above, but focusing on reduced seagrass growth due to microplastics in the sediment. This is less straight-forward, as the microplastics could inhibit nutrient uptake in seagrass roots directly, or harm sediment-dwelling organisms/bacteria that help keep seagrass healthy indirectly. The takeaway for 4b is that skates rely on animals living in the sediment who are explosed to microplastics that accumulate there. In unhealthy or collapsed meadows the prey organisms may not survive; there may not be enough food, so skate health will decline. In healthy meadows students could say skate health will be unchanged, or decline if they eat prey during a season (round) with high microplastics in the sediment. Those microplastics could get into the skate (trophic transfer) and potentially cause harm (biomagnification). This also applies to unhealthy and collapsed meadows if there is a high microplastic load in the sediment. Students should make the connection that microplastics in the sediment and on the blades can have similar effects depending on the organism you are focusing on.

5) How did management decisions impact seagrass health? Which were most helpful in maintaining seagrass health? Can you think of any other management decisions that were not presented as options that you have seen in your community?

Lots of possible answers. The goal is for students to weigh the costs and benefits of the management decisions in the game and try to connect that to real life. For example, students could point out that some management decisions have short-term impacts while others have delayed or long-term impacts, and these have different cost/benefits. Students can also discuss the challenges of guarding against the role of chance from the event cards or rolling the die for microplastics.