Island at Capacity

Read population data to investigate limits on growth

BIO.5.6 "Analyze and interpret population data to define limiting factors, both density-dependent and density-independent. Use graphical representations (growth curves) to illustrate the carrying capacity within ecosystems."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline two pressures that grow stronger as rabbit density rises, box an event that can affect rabbits at any density, and circle three table counts that suggest the population is leveling off.

Rabbits on a Coastal Island

1 On a small coastal island, researchers count rabbits each autumn. The rabbits eat grasses and dig burrows in dry soil. When few rabbits live there, each one can usually find enough food and shelter. As numbers rise, rabbits may compete for the same grass and burrow sites. Their growth rate can slow even if no predator arrives.

2 The table records the island counts before any major storms. A population can rise quickly when resources are plentiful, then fluctuate near a level the habitat can support over time. That level is called carrying capacity. A growth curve made from yearly counts can reveal a steep early climb followed by a flatter section rather than a perfectly straight line.

AUTUMN RABBIT COUNTS

Year	Rabbits counted
2019	40
2020	88
2021	144
2022	152
2023	149

3 Crowding can also spread infections more easily because animals meet more often. Such pressures grow stronger as population density increases. By contrast, a storm surge can flood burrows whether the island holds forty rabbits or many more. If seawater leaves dry land unusable for years, both the number surviving the storm and the habitat's future carrying capacity could change.

2 ANSWER WITH EVIDENCE

Use the passage

1. How does the change in rabbit numbers from 2019 to 2021 compare with the change from 2021 to 2023? Use counts from the table.

2. Estimate the island's carrying capacity before a major storm. Which counts support your estimate?

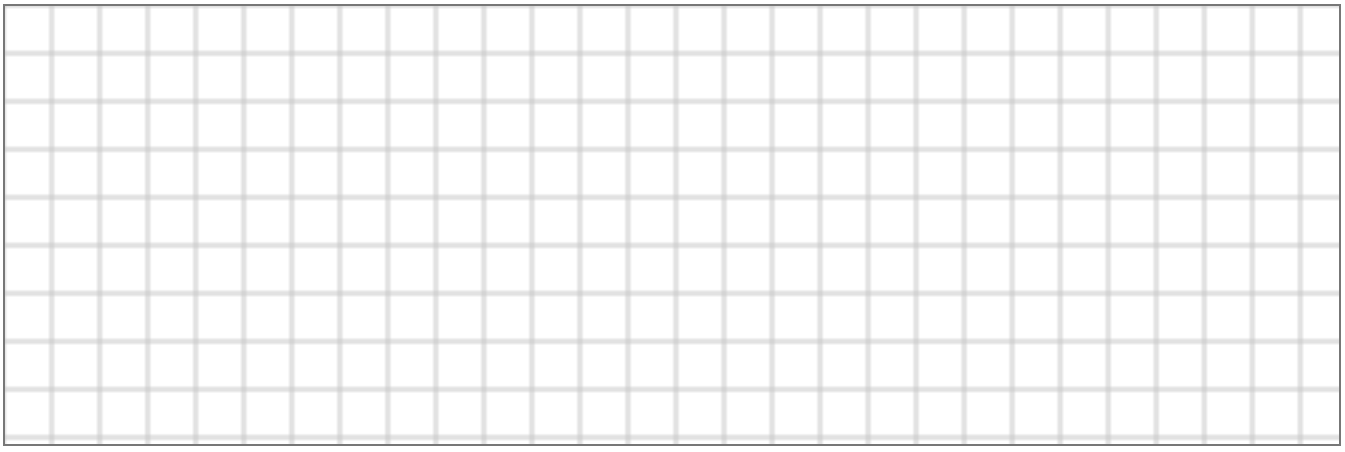
3. As the population rose from 2019 to 2022, which pressure described in the passage would likely grow stronger? Explain how rabbit density affects it.

4. If a storm surge leaves dry land unusable for years, is it a density-dependent or density-independent event? How would the growth curve's plateau likely change?

3 YOUR TURN

Your own words

On the grid, graph the five counts in the table, then sketch one possible curve for 2024 to 2026 if a 2024 storm surge makes half the dry ground unusable for years. Label the original and projected carrying-capacity levels, then write two sentences explaining why the storm's effect is density-independent and how a density-dependent pressure could shape your projected curve.



Island at Capacity

PART 1 · READ AND MARK

Underline two pressures that grow stronger as rabbit density rises, box an event that can affect rabbits at any density, and circle three table counts that suggest the population is leveling off. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	How does the change in rabbit numbers from 2019 to 2021 compare with the change from 2021 to 2023? Use counts from the table.	**The count rose from 40 to 144 between 2019 and 2021, an increase of 104. From 2021 to 2023, it stayed close to 150, ending at 149.**
2	Estimate the island's carrying capacity before a major storm. Which counts support your estimate?	**About 150 rabbits. The counts of 144, 152, and 149 from 2021 to 2023 cluster near that level.**
3	As the population rose from 2019 to 2022, which pressure described in the passage would likely grow stronger? Explain how rabbit density affects it.	**Competition for grass or burrow sites would likely grow stronger because more rabbits would use the same resources. Increased infection spread is also acceptable because rabbits would meet more often.**
4	If a storm surge leaves dry land unusable for years, is it a density-dependent or density-independent event? How would the growth curve's plateau likely change?	**It is density-independent because it can flood burrows at any rabbit density. The plateau would likely shift downward because less usable land could support fewer rabbits.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

Graph: years 2019 to 2026 on the horizontal axis and rabbit counts on the vertical axis. Plot (2019, 40), (2020, 88), (2021, 144), (2022, 152), (2023, 149), then project (2024, 110), (2025, 80), and (2026, 76). Label the original carrying capacity about 150 and the projected carrying capacity about 75. The storm can flood burrows even when there are few rabbits, so its effect is density-independent. With less dry land, competition for burrows can intensify, and the population may level off near 75.

Accept other plausible projected counts and lower carrying-capacity levels if the graph shows a clear post-storm change. Students should distinguish the storm itself from competition that intensifies as rabbits crowd onto the remaining land.