

Twenty-Nine Reindeer: Boom and Crash on St. Matthew Island

Learning target: I can use evidence from a passage and a data table to explain how a limiting resource allowed a population to boom, then caused it to crash, and why a carrying capacity is not a fixed number.

Reading with evidence

About 40 min

Individual

MS-LS2-1 · practice

MS-LS2-4 · supports

reading

writing

data analysis

Name _____

Date _____

Period _____

Directions

Read the passage once straight through. Read it a second time with a pencil: number the paragraphs 1 to 7, circle every number of reindeer, and underline every sentence that names a resource. Answer in complete sentences. When a question asks for evidence, quote or closely paraphrase the passage and give the paragraph number. Use the table for the calculations.

You will need: This worksheet, Pencil, Scrap paper for the timeline, Calculator (optional)

Twenty-Nine Reindeer

[1] St. Matthew Island sits alone in the Bering Sea, over 300 kilometers from the Alaska mainland. It is roughly 50 kilometers long, treeless, cold and windy, and no one lives there. During the Second World War the United States Coast Guard ran a small radio navigation station on the island. In 1944, to give the crew an emergency food supply, the Coast Guard shipped in 29 reindeer, 24 females and 5 males, and set them loose. Soon after the war ended the station was closed, the crew left, and the reindeer stayed behind with the whole island to themselves.

[2] For a reindeer, the island looked like a feast. In summer there were grasses, sedges and willows. In winter, when snow covered the ground, there was something even more important: a thick carpet of lichen, a slow-growing partnership of fungus and algae that reindeer dig for and eat through the cold months. Lichen is the resource that gets reindeer through an Arctic winter, and on St. Matthew Island, which had never had reindeer before, the lichen mat had been building up for centuries. There were no wolves or bears on the island, and no hunters. Every resource a reindeer needs was abundant, and nothing was eating reindeer.

[3] The herd did what populations do when a needed resource is abundant: it grew. A biologist who visited in 1957 counted about 1,350 animals, and he noted that they were fat and healthy, heavier on average than reindeer on the mainland. In 1963 a survey counted about 6,000 reindeer. In nineteen years, 29 animals had become six thousand. But the same biologist saw something worrying on that visit. Across much of the island the lichen carpet was cropped short, trampled and broken. Six thousand mouths were taking lichen far faster than lichen can grow back, and the animals were already thinner than they had been in 1957.

[4] Here is the key idea. The island's summer food was still plentiful, so during the warm months there was no shortage. The winter food, lichen, was the resource that ran short first. Scientists call the resource that runs out first the limiting resource, because it, not the other resources, sets the limit on how many animals the area can support. For the St. Matthew reindeer, the limiting resource was winter lichen, and by 1963 the herd had grown past what the lichen could feed.

[5] The winter of 1963 to 1964 was unusually severe, with deep snow that made the remaining lichen even harder to reach. Thousands of animals that were already thin could not find enough to eat. When the biologist returned in the summer of 1966, he counted 42 reindeer: 41 females and a single male, all in poor condition. The population had fallen by more than 99 percent in about three years. The crash was not caused by a disease or a predator. It was caused by a resource shortage that the herd itself had created, made worse by a hard winter.

[6] The story also shows that an area's carrying capacity, the number of animals its resources can keep supporting over time, is not carved in stone. Before the reindeer arrived, the island's deep lichen mat could probably have fed a much smaller herd for many years if the herd had stayed near that size. But lichen grows only a few millimeters a year, and the overgrazed mat could not recover quickly. After the crash, the island could support far fewer reindeer than it could have in 1944, because the limiting resource itself had been damaged. With only one male left, the tiny herd never recovered, and by the 1980s there were no reindeer on St. Matthew Island at all.

[7] Ecologists still use this island as a clear example of what happens when a population grows without a check: a boom, an overshoot past the carrying capacity, and a crash. In most places, predators, disease, competition from other species and migration slow a population down before it climbs so high. On St. Matthew none of those brakes existed, so the only brake left was the resource itself, and that brake came on all at once. The numbers tell the story: 29, 1,350, 6,000, 42.

Reindeer counts on St. Matthew Island (real counts, rounded as reported)

Year	Reindeer counted	Notes from the surveys
1944	29	24 females and 5 males released by the Coast Guard
1957	about 1,350	Animals fat and heavier than mainland reindeer; lichen still deep in most places
1963	about 6,000	Lichen cropped and trampled over much of the island; animals thinner
1966	42	41 females and 1 male, all in poor condition, after the severe winter of 1963-64

These are the counts reported by the wildlife biologist who studied the herd; the 1957 and 1963 figures are survey estimates.

Questions: cite the passage

1. According to paragraphs 1 and 2, why were the reindeer brought to the island, and what three things made the island a good place for a reindeer population to grow? Give the paragraph numbers.

2. Using the table, calculate how many times larger the 1963 population was than the 1944 population. Round to the nearest whole number and show your division.

3. Paragraph 4 says lichen, not summer grass, was the limiting resource. Explain in your own words what makes a resource 'limiting,' and quote the words from paragraph 4 that define it.

4. Between 1957 and 1963 the herd grew from about 1,350 to about 6,000. Calculate the average increase in reindeer per year over those six years. Show your work.

5. Paragraph 5 says the crash had two causes working together. Name both, give evidence from paragraphs 3 and 5 for each, and explain why the severe winter alone would probably not have caused such a huge crash if the herd had been small.

6. Paragraph 6 argues that carrying capacity 'is not carved in stone.' Using the lichen's growth rate, explain why the island could support fewer reindeer after the crash than before the reindeer arrived.

7. Paragraph 7 lists four 'brakes' that usually slow a population before it overshoots. Name them, and state which ones were missing on St. Matthew Island according to the passage.

8. In many classroom experiments, a population of yeast or duckweed grows quickly, slows, and then levels off at a steady number. The reindeer did not level off; they overshoot and crashed. Using evidence from at least two paragraphs, explain what was different about the reindeer's situation, and what the island story teaches about the difference between a resource being **abundant now** and a resource being **renewed as fast as it is used**.

Track the numbers and the resource together

On scrap paper draw a two-row timeline: 1944, 1957, 1963, winter 1963-64, 1966, 1980s. On the top row write the reindeer count at each date. On the bottom row write one or two words about the lichen at that date (deep, cropped, buried by snow, damaged). Most of the questions ask you to connect the top row to the bottom row, so having both in front of you makes the answers easier to find.

Could it have been managed?

Suppose the Coast Guard had kept a crew on the island and wanted the herd to last for a century. Using the passage's numbers, propose a target herd size and a rule for how many reindeer to remove each year, and explain how you would use measurements of the lichen mat (not just counts of reindeer) to decide whether the target is too high. Then explain in a paragraph why counting the limiting resource is often a better early warning than counting the population.