

The Ten-Year Puzzle: Hares, Lynx and a Pattern That Almost Repeats

Learning target: I can explain, with evidence from a passage, why predator and prey populations rise and fall in a lagged pattern and why that pattern is a useful tool rather than a fixed law.

Reading with evidence

About 40 min

Individual

MS-LS2-2 · practice

reading

writing

Name _____

Date _____

Period _____

Directions

Read the passage once without stopping. Read it again with a pencil, number the paragraphs 1 to 7, and circle every number and every place name. Answer in complete sentences. When a question asks for evidence, quote or closely paraphrase the passage and give the paragraph number.

You will need: This worksheet, Pencil

The Ten-Year Puzzle

[1] For more than a century, fur-trading companies in northern Canada kept records of the pelts trappers brought in each year. The ledgers were meant for business, but ecologists later realized they were a treasure: a year-by-year count, stretching back into the 1800s, of how many Canada lynx were being caught. Plotted on a graph, the numbers did not wander randomly. They rose and fell in waves, with a peak roughly every ten years. The animal the lynx depends on, the snowshoe hare, showed the same kind of waves.

[2] The two species are tightly linked. A snowshoe hare is a rabbit-like animal of the northern forests that eats twigs, buds and bark through the long winter. Hares breed fast: a female can raise several litters in one summer. A Canada lynx is a medium-sized cat whose huge furry paws work like snowshoes. Hares make up most of its diet. When hares are everywhere, lynx eat well and raise more kittens. When hares are scarce, lynx kittens starve and adult lynx may not breed at all.

[3] Put those facts together and the waves make sense. Hares increase first. A year or two later the lynx population catches up, because it takes time for well-fed lynx to raise kittens and for those kittens to grow into hunters. Now there are many lynx and they eat hares faster than hares can replace themselves, so the hare population crashes. With little food, the lynx population crashes next, again a year or two behind. With few lynx left, the surviving hares begin to multiply, and the whole sequence starts over. Each peak in the predator follows a peak in its prey. Ecologists call that delay a lag.

[4] It would be tidy to call it a law, but the waves are not identical. Some peaks are tall and some are small. The spacing is 'about' ten years: sometimes eight, sometimes eleven. Lynx are not the only thing pushing hares down. At the top of a wave, hares have eaten so many twigs and buds that food runs short, and hares that live in constant fear of predators raise fewer young. Hard winters, disease and

other predators such as great horned owls and coyotes all add their push. The cycle is a pattern produced by several causes acting together, not a clock.

[5] In the 1980s and 1990s, a team of ecologists in the Kluane region of the Yukon tested which causes mattered most. On some large forest plots they built fences that kept out lynx and other mammal predators. On other plots they put out extra food for hares all year. On a few plots they did both. Extra food alone roughly tripled the number of hares. Fencing out predators alone roughly doubled it. Doing both together raised hare numbers to about eleven times the level on untreated plots. Yet on every plot, even with fences and feeders, the hare population still cycled. Food and predation together drive the waves, and neither one alone explains them.

[6] This story matters far beyond the Yukon because the shape keeps turning up. In the meadows of northern Europe, voles and the owls that hunt them rise and fall in waves a few years apart, with the owls lagging behind. On an island in Lake Superior, wolves and moose have been tracked for decades, and the wolf numbers tend to follow the moose numbers, though disease, ticks and harsh winters bend the pattern. The species are different, the cycle lengths are different, but the lagged rise-and-fall is the same.

[7] That is why ecologists treat the predator-prey pattern as a tool. If they know a predator depends mostly on one prey, they can predict that the predator's numbers will trail the prey's, and they can warn a park manager that a prey crash will be followed by a predator crash. What they cannot do is promise the exact year or the exact size of the next peak, because weather, food and disease always have a vote. A pattern that repeats across ecosystems is powerful evidence that the same cause-and-effect links are at work everywhere. It is not a guarantee that any single ecosystem will behave on schedule.

Questions: cite the passage

1. According to paragraph 1, where did the long-term lynx data come from, and what did ecologists see when they graphed it?

2. Suppose hares in one forest peaked in 1990 and the cycle followed the pattern in paragraphs 1 and 3 exactly. In what year or years would you expect the lynx peak, and how many hare peaks would you expect between 1990 and 2030? Show your reasoning with numbers from the passage.

3. Explain the **lag** in your own words. Use paragraph 3 to say what has to happen inside the lynx population before its numbers can rise.

4. Paragraph 4 says the cycle is 'not a clock.' Quote one sentence from that paragraph that supports this, and list two causes other than lynx that push hare numbers down.

5. In the Kluane experiment (paragraph 5), what happened on the plots with extra food only, with fences only, and with both? Include the numbers.

6. The hares on the fenced-and-fed plots still cycled. Explain what that result tells ecologists about the cause of the waves, and why a scientist could not have learned it from the fur records alone.

7. Paragraph 6 gives two other ecosystems. Name the predator and prey in each, and state the one feature all three ecosystems share.

8. The passage calls the pattern 'a tool' but 'not a guarantee.' Using evidence from at least two different paragraphs, explain what a park manager **can** predict from the pattern and what they **cannot**.

Mark the four stages first

In paragraph 3, underline the four stages of the cycle in order: hares up, lynx up, hares down, lynx down. Write the numbers 1 to 4 in the margin beside each. Questions 2, 3 and 6 all depend on seeing that the lynx stages come after the hare stages. For question 5, draw a quick three-column table (food, fences, both) and copy the number from the passage into each column before you write.

Design the next experiment

The Kluane team tested food and predators. The passage also says that hares living in fear raise fewer young, and that hard winters matter. Choose one of those two causes and design a fair test for it on forest plots: what you would change, what you would keep the same, what you would count, and how long you would run it. Then explain in two sentences why a ten-year cycle makes this kind of experiment slow and expensive.