

When the Coyotes Left: A Claim-Evidence-Reasoning Case

Learning target: I can use population data from two neighboring sites to argue that removing one population changed others through direct and indirect effects, and explain my reasoning with a food web model.

Claim, evidence, reasoning

About 45 min

Individual

MS-LS2-4 · practice

MS-LS2-3 · supports

writing

data analysis

Name _____

Date _____

Period _____

Directions

Read the scenario, study the food web facts and the six years of data, and answer the warm-up questions first; they will organize your evidence. Then write your Claim, Evidence and Reasoning in the boxes. Strong evidence quotes specific years and numbers from the table and uses the comparison site. Strong reasoning explains the numbers with arrows in the food web and uses the words *direct effect* and *indirect effect* correctly.

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

The scenario

Dry Creek Ranch and Oak Flat Ranch sit side by side in the foothills, with the same soil, the same grasses and the same weather. In spring 2018 the owner of Dry Creek began trapping and removing coyotes to protect newborn lambs. Oak Flat did nothing. A county biologist had been surveying both ranches since 2016, so she kept going. Each spring she drove a 10-kilometer route and counted coyotes, walked a 1-kilometer line and counted black-tailed jackrabbits, and measured the percent of ground covered by living grass in ten sample plots.

Food web facts for both ranches — Grasses are the main producers. Black-tailed jackrabbits eat grass; an adult can eat close to its own mass in green plants each week. Coyotes eat jackrabbits (their main prey here), as well as ground squirrels and mice. Nothing on these ranches hunts coyotes. Rainfall in the six years was close to average every year and nearly identical on the two ranches.

Spring surveys on two neighboring ranches, 2016-2021 (teaching dataset)

Simulated teaching dataset: the numbers are invented to be realistic, not measured.

Year	Dry Creek: coyotes per 10 km	Dry Creek: jackrabbits per km	Dry Creek: grass cover (%)	Oak Flat: coyotes per 10 km	Oak Flat: jackrabbits per km	Oak Flat: grass cover (%)
2016	6	4	62	5	5	60
2017	5	5	60	6	4	61
2018	2	9	55	5	5	59
2019	1	16	41	6	4	58
2020	1	21	33	5	6	57
2021	1	19	30	5	5	59

Simulated data for teaching. Coyote removal at Dry Creek began in spring 2018. Oak Flat is the comparison site with no removal.

Warm-up: organize the evidence

- At Dry Creek, by how many times did the jackrabbit count change from 2017 to 2020? By how many percentage points did grass cover change over the same years? Show both calculations.

- Describe what happened to jackrabbits and grass cover at Oak Flat between 2016 and 2021. Why does the biologist need Oak Flat at all?

- Draw the three-organism food chain for these ranches with arrows (grass, jackrabbits, coyotes). Label which pair of populations would show a direct effect of removing coyotes and which would show an indirect effect.

Your argument

CLAIM

Claim: State what removing coyotes did to the jackrabbit population and to the grass at Dry Creek. Your claim must name a cause and two effects.

EVIDENCE

Evidence: Give at least three specific pieces of evidence from the table, with years and numbers. At least one piece must compare Dry Creek with Oak Flat, and at least one must show the timing (what changed first, and when).

REASONING

Reasoning: Use the food web to explain why the evidence supports your claim. Explain the jackrabbit change as a direct effect and the grass change as an indirect effect, say what role Oak Flat plays in ruling out other causes, and explain why the grass did not drop until after the jackrabbits rose.

4. Jackrabbit counts at Dry Creek dipped from 21 to 19 in 2021 while coyotes stayed at 1. Suggest one food-web reason for the dip, and say what data from 2022 would support your suggestion.

5. A rancher says, 'The grass died because 2019 and 2020 were dry years.' Use one specific comparison from the table to show why the data do not support that explanation.

Three-row evidence chart

On scrap paper, make a chart with three rows (coyotes, jackrabbits, grass) and two columns (Dry Creek, Oak Flat). In each cell write the 2017 value, the 2020 value, and an arrow showing up, down or flat. Every cell that shows a change at Dry Creek but not at Oak Flat is a piece of evidence. Copy the numbers into your Evidence box with the years.

Add the ground squirrels

Coyotes also eat ground squirrels, and ground squirrels compete with jackrabbits for the same grass. Suppose the biologist adds a squirrel count and finds that squirrels rose in 2018 and 2019 at Dry Creek but then fell in 2020 and 2021. Write a paragraph explaining both the rise and the later fall using direct and indirect effects, and explain why adding a fourth population makes the argument about grass stronger, not weaker.