Wetland What-Ifs

Use model results to explain changes at two ecosystem scales

HS-ENV4-1 "Use a model or simulation to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline two comparisons that show how a factor affects frogs or plant species. Circle the words that name each factor, then number the comparisons by scale: 1 for one pond and 2 for the whole wetland.

A Road Through Four Ponds

1. A road is proposed across a wetland with four linked ponds. Researchers build a computer model that tracks adult frogs and native plant species for five years. Each run starts with the same number of frogs and the same plant species. The model varies frog movement, water flow, and rainfall, then reports results for one pond and the whole wetland.

2. In the model, a road without a passage blocks frogs moving between ponds and reduces water flow. A culvert, a tunnel beneath the road, lets some frogs and water pass. Frogs need connected habitat to find mates, while water can carry plant seeds. The table shows simulated outcomes, not measurements from a real wetland.

MODEL RESULTS AFTER FIVE YEARS

Model run	Frogs in one pond	Frogs in wetland	Plant species in one pond	Plant species in wetland
No road, normal rain	70	280	12	27
Road, no culvert, normal rain	40	155	10	21
Road, culvert, normal rain	60	245	11	25
Road, culvert, dry year	38	170	9	19

3. An initial explanation might blame the road alone for every decline. Yet the run with a culvert and a dry year predicts fewer frogs and plant species than the culvert run with normal rain. This comparison suggests that rainfall also matters. Because models simplify real ecosystems, these results support a revised explanation but cannot prove exactly what would happen.

2 ANSWER WITH EVIDENCE

Use the passage

1. Compare the no-road run with the road, no-culvert run. How does the road affect the modeled frog population at each scale under normal rain?

2. How does adding a culvert change modeled plant biodiversity at each scale under normal rain? Use both plant-species comparisons and explain a possible cause.

3. A student says the road alone explains every decline. Compare the two culvert runs, then revise that explanation.

4. A classmate says, “The road makes 30 frogs disappear from the wetland.” Use results at both scales to revise the claim.

3 YOUR TURN

Your own words

Imagine a fifth model run with no road and a dry year. Predict how it might compare with the no-road, normal-rain run, give two reasons for your prediction, and explain what comparing it with the culvert-and-dry-year run could help test.

Wetland What-Ifs

PART 1 · READ AND MARK

Underline two comparisons that show how a factor affects frogs or plant species. Circle the words that name each factor, then number the comparisons by scale: 1 for one pond and 2 for the whole wetland. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	Compare the no-road run with the road, no-culvert run. How does the road affect the modeled frog population at each scale under normal rain?	**With a road and no culvert, frogs decrease from 70 to 40 in one pond and from 280 to 155 across the wetland.**
2	How does adding a culvert change modeled plant biodiversity at each scale under normal rain? Use both plant-species comparisons and explain a possible cause.	**Plant species rise from 10 to 11 in one pond and from 21 to 25 across the wetland. The culvert restores some water flow, which can carry seeds.**
3	A student says the road alone explains every decline. Compare the two culvert runs, then revise that explanation.	**With a culvert, the dry-year run has fewer frogs and plant species at both scales than the normal-rain run. Rainfall, as well as the road, affects the modeled outcomes.**
4	A classmate says, "The road makes 30 frogs disappear from the wetland." Use results at both scales to revise the claim.	**The model predicts 30 fewer frogs in one pond but 125 fewer across the wetland when a road without a culvert is added. It does not show that those frogs died.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

I predict fewer frogs and native plant species than in the no-road, normal-rain run because less water could reduce frog breeding habitat and limit the movement of plant seeds. Frogs might still move between ponds more easily than they could in the culvert-and-dry-year run. Comparing those two dry-year runs could help test the road's effect while rainfall stays the same.

Accept other reasonable predictions for the new run if students give two causal reasons and identify what the comparison holds constant. Treat all table values as model predictions, not observed losses.