Practice: ecological evidence

Student activity • observation and reasoning

YEAR 11 / LESSON 114 / BIOLOGY + SCIENCE (DOUBLE AWARD)

The question

Can you calculate an estimate and state what the evidence does not prove?

Use the supplied examples, record your reasoning and correct it using evidence.

Equipment

- Student booklet, pencil and ruler
- Printed practice dataset and calculation paper

Paper, modelling and written reasoning only. No chemicals or biological samples are handled.

Course coverage: Shared ecology and human impacts; Biology-only biodiversity extension marked.

Plan, model or apparatus sketch

Draw and label the apparatus or biological model; identify one limitation.

Method and reasoning

Read the whole sequence before starting

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1. Use the invented quadrat counts 2, 4, 3, 1 and 5 from 0.25 m² quadrats to calculate a mean.

2. Estimate density and population in a 60 m² survey area, showing units and assumptions.

3. Calculate transfer efficiency for 500 kJ entering a level and 45 kJ stored in new biomass.

4. Explain why a low-oxygen observation after a nutrient input is consistent with eutrophication but does not alone prove the complete causal chain.

5. Biology extension: compare two samples with four species each but very different relative abundances; explain why equal richness need not mean equal diversity.

6. Mark the original practice questions and write one improvement to sampling and one to causal inference.

Cleanup

• Return models and keep the corrected work.

Record your evidence

Blank spaces are for your own work

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Reference and task data

All numerical values are invented practice data. Mean count is 3 per 0.25 m^2, density 12 m^{-2} and estimated population 720. Transfer efficiency is 9%. Real field estimates need representative samples and evidence of variation. Biology extension: sample A has species counts 25, 25, 25, 25; sample B has 97, 1, 1, 1 for the same four species and the same total of 100 individuals. Compare evenness without inventing a required diversity-index formula.

Example / trial	Observation / evidence	Explanation / limit
Evidence / comparison		
Explanation		
Limit / correction		

Show your calculations, labelled model or correction here.

Explain and evaluate

Use evidence and show calculation steps where relevant

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1. Calculate mean count.

2. Calculate density.

3. Estimate the population.

4. Calculate transfer efficiency.

5. Why report an estimate rather than an exact census?

6. Biology: does equal richness guarantee equal evenness?