

Fixing Priya's Report on Nature's Services

Learning target: I can find and explain errors in a report about ecosystem services, including mix-ups about pollination, energy, causes and value, and rewrite each statement so it is scientifically accurate.

Error analysis

About 40 min

Individual

MS-LS2-5 · practice

MS-LS2-4 · practice

MS-LS2-3 · supports

writing

independent practice

Standards connections

MS-LS2-5 (practice): Several statements misjudge what a service is worth or which planting choice best protects a food supply. Correcting them builds the reasoning students need to evaluate solutions for maintaining biodiversity and ecosystem services.

MS-LS2-4 (practice): Statement 5 overclaims cause from a correlation between two populations; students explain what evidence an argument about changes to an ecosystem would need.

MS-LS2-3 (supports): Statement 4 confuses matter cycling with energy flow, revisiting the ecosystem model from earlier lessons.

Purpose: practice · **Time:** about 40 minutes · **Format:** individual

Answers with reasoning

Priya's report: eight statements to check

1. An ecosystem service is something people do to help an ecosystem, like picking up trash on the beach.
2. Every crop needs bees. Without pollinators we would lose wheat, rice, corn and almonds.
3. Honey bees are the best thing for biodiversity, because more honey bees means more pollination everywhere.
4. Decomposers recycle the energy in dead leaves back into the soil so plants can use that energy again.
5. When India's vultures disappeared, the number of feral dogs went up. That graph proves the dogs caused every extra human death.
6. Stone, copper and iron are ecosystem services because they come from nature.
7. The vultures' cleanup was free, so it was not worth anything. Only things people pay for have value.
8. Planting one kind of banana everywhere is the safest choice, because farmers know exactly how it will grow.

Reference: how some crops are pollinated

Crop	What moves its pollen	How much the harvest depends on animal pollinators
Almonds	Insects, mostly honey bees	Heavily; most varieties need pollen from a different variety
Apples	Insects such as honey bees and mason bees	Heavily; need pollen from a different variety
Blueberries	Bumble bees and other bees	Heavily
Squash and pumpkins	Bees, including native squash bees	Almost completely; male and female flowers are separate
Wheat	Mostly its own flowers (self-pollinating)	Little or not at all
Rice	Mostly its own flowers (self-pollinating)	Little or not at all
Corn (maize)	Wind	Not at all

Summarized from the U.S. National Research Council report Status of Pollinators in North America (2007) and university extension guides.

Part A: Diagnose

1. Complete the table for all eight statements. If a statement is partly correct, say which part is right.

Answer: 1 Incorrect: reverses who benefits; a service is done by the ecosystem for people. 2 Partly correct: almonds do need pollinators; wheat, rice and corn do not. 3 Incorrect: honey bees are one managed, non-native species; more of one species is not more biodiversity, and crowds of honey bees can compete with native bees. 4 Incorrect: decomposers recycle matter (nutrients), not energy; energy leaves as heat. 5 Incorrect: a correlation is treated as proof, and 'every' death is an overclaim. 6 Incorrect: stone and metals form by geologic processes; they are natural resources, not ecosystem services. 7 Incorrect: free does not mean worthless; replacing the service or living without it is costly. 8 Partly correct: a single variety is predictable, but a genetically uniform crop can be wiped out by one disease.

Why: Two statements (2 and 8) contain a true part; the other six are wrong in their main idea.

Also acceptable: Accept statement 3 rated 'partly correct' if the student notes that honey bees do pollinate many crops and still explains why more honey bees is not more biodiversity.

- Correct rating for all eight
- Error named briefly for each
- Identifies the true part of 2 and 8

Part B: Explain and rewrite

2. Statement 1: Explain what Priya has turned backwards, and rewrite the statement correctly. Then say what picking up beach trash actually is.

Answer: Priya reversed who does the work and who benefits. Rewrite: 'An ecosystem service is a benefit people get from the natural processes of a healthy ecosystem, such as a wetland filtering water or bees pollinating crops.' Picking up trash is stewardship (conservation): something people do to protect an ecosystem, which can help keep its services working.

Why: This is the most common misreading of the term.

Also acceptable: Accept 'cleanup or protection' for stewardship.

- Identifies the reversal
- Accurate rewrite naming an example service
- Labels trash pickup as something people do for the ecosystem (stewardship or conservation)

3. Statement 2: Use the reference table to explain which part is right and which part is wrong. Rewrite the statement.

Answer: Right: almonds depend heavily on insect pollinators, mostly honey bees. Wrong: wheat and rice mostly pollinate themselves and corn is pollinated by wind, so they would not be lost without bees. Rewrite: 'Many crops, especially fruits, nuts and some vegetables such as almonds, apples, blueberries and squash, depend on animal pollinators, but major grains such as wheat, rice and corn do not.'

Why: The reference table shows that grain crops do not depend on animal pollinators.

Also acceptable: Accept any accurate rewrite using examples from the table.

- Keeps almonds as pollinator-dependent
- Uses the table to remove wheat, rice and corn
- Rewrite uses 'many', not 'every'

4. Statement 3: Use the meaning of *biodiversity* to explain the problem. (Hint: honey bees are one species, and they were brought to North America from Europe.) Rewrite the statement.

Answer: Biodiversity means variety: many different species and varied traits within them. Adding more of a single species does not add variety. Honey bees are not native to North America, and where hives are crowded they can compete with native bees for nectar and pollen and may spread some diseases to them. The United States has about 4,000 species of native bees, such as bumble bees, mason bees and squash bees, and they also pollinate crops and wild plants. Rewrite: 'Honey bees are important pollinators of many crops, but a healthy variety of native pollinators is also important for biodiversity and for reliable pollination.'

Why: Separates abundance of one managed species from biodiversity.

Also acceptable: Accept a rewrite that says relying on one pollinator species is risky.

- Defines biodiversity as variety
- Notes honey bees are one, non-native species
- Mentions native bees or competition
- Accurate rewrite

5. Statement 4: What do decomposers recycle, and what happens to the energy stored in dead leaves? Rewrite the statement.

Answer: Decomposers recycle matter: they break dead leaves into simpler substances and release nutrients such as nitrogen into the soil, and carbon dioxide into the air, which plants can take up again. The energy stored in the leaves is used by the decomposers for their own life processes and leaves the ecosystem as heat; plants get new energy from sunlight. Rewrite: 'Decomposers recycle the nutrients in dead leaves back into the soil so plants can use that matter again; the energy is released as heat, and plants capture new energy from sunlight.'

Why: Matter cycles; energy flows through and leaves as heat.

Also acceptable: Accept 'energy is used up' only if the student adds that it leaves as heat.

- Nutrients (matter) recycled
- Energy leaves as heat or is used by decomposers
- Plants get energy from sunlight
- Accurate rewrite

6. Statement 5: Name two problems with Priya's conclusion. What kind of evidence would support a claim that losing vultures caused more human deaths? Rewrite the statement.

Answer: Problem 1: a graph of two trends changing together shows a correlation, not proof that one caused the other; dogs might have increased for other reasons, such as more garbage in growing towns. Problem 2: 'every extra death' is too strong; losing vultures likely harmed people through several pathways, such as rabies from dog bites and germs from rotting carcasses. Supporting evidence: a comparison of places that lost many vultures with similar places that never had many, before and after the drug spread (as a 2024 study did), showing deaths rose only where vultures were lost. Rewrite: 'When India's vultures disappeared, feral dog numbers rose, and studies comparing districts suggest the loss of vultures increased human deaths, with rabies from dog bites as one likely pathway.'

Why: Students should name both the correlation problem and the overclaim, and describe a comparison that tests cause.

Also acceptable: Accept an experiment-style answer ('compare places with and without vultures') without naming the 2024 study.

- Correlation is not proof of cause
- 'Every' is an overclaim or there are several pathways
- Describes comparison evidence
- Accurate rewrite

7. Statement 6: Explain why stone and metals are natural resources but not ecosystem services. Give one example of a provisioning service that a living ecosystem really does provide.

Answer: Stone, copper and iron are formed and concentrated by geologic processes, such as cooling magma, heat and pressure, and hot water moving through rock, over millions of years. Even a stone like limestone, which began as shells, became rock through geology. Today's ecosystems do not make or renew these materials on any human time scale. They are natural resources, but ecosystem services are benefits from the ongoing living processes of ecosystems. A real provisioning service: food such as almonds or fish, lumber from a forest, fresh water collected by a watershed, or medicine chemicals from plants.

Why: The textbook implies building stone and metals come from ecosystems; this corrects that.

Also acceptable: Accept 'rocks and metals are made by geology, not by living ecosystems', even if the student does not mention limestone.

- Geologic origin of stone and metals
- Distinguishes natural resource from ecosystem service
- One correct provisioning example

8. Statement 7: Use the idea of replacement cost, and what happened in India when the vultures disappeared, to explain why a free service can be very valuable. Rewrite the statement.

Answer: Free means no one is billed, not that the job is worthless. If people had to do the vultures' job with trucks, workers and incinerators, the replacement cost would be large. And when the service vanished, India paid in other ways: more feral dogs, more rabies vaccine and bites, and a rise in human deaths. Rewrite: 'The vultures' cleanup was free, but it was very valuable: replacing it would cost a lot, and losing it harmed people's health.'

Why: Value can be measured by replacement cost or by the harm caused when a service is lost, not only by price.

Also acceptable: Accept cultural value arguments (people value wildlife) as an additional reason.

- Free does not mean worthless
- Uses replacement cost
- Uses a consequence from India
- Accurate rewrite

9. Statement 8: Keep the part that is true and fix the part that is risky. Explain what can happen to a crop when every plant is genetically the same.

Answer: True part: growing one variety is predictable; farmers know how it grows, ripens and ships. Risky part: when every plant is genetically the same, a disease that can infect one plant can infect them all, so the whole crop can be lost. This happened to the Gros Michel banana in the export trade and now threatens Cavendish bananas, which are all clones. Rewrite: 'Planting one kind of banana everywhere is predictable, but it is risky, because a single disease can spread through every plant; keeping a variety of bananas and their wild relatives protects the food supply.'

Why: Genetic uniformity removes the variety of traits that lets some plants survive a disease.

Also acceptable: Accept the explanation without naming banana varieties.

- Keeps predictability as the true part
- Explains shared vulnerability of identical plants
- Accurate rewrite

Part C: The thinking behind the mistakes

- 10.** Choose two of Priya's mistakes that come from the same kind of thinking (for example, jumping from one case to 'every', or treating price as the only measure of value). Name that kind of thinking and write two sentences of advice that would help Priya avoid it next time.

Answer: Example: Statements 2 and 5 both jump from some cases to 'every' (overgeneralizing): some crops need bees, so Priya says every crop does; one pathway linked vultures to deaths, so she says it caused every death. Advice: 'Before you write all, every or proves, look for one example that breaks the rule. If you find one, use words like many or likely, and say what evidence would make the claim stronger.' Another valid pair: statements 1 and 7 both judge nature only by what people do or pay, missing the work ecosystems do for free.

Why: Students should identify a pattern of thinking, not just repeat two corrections.

Also acceptable: Other sensible pairings: 3 and 8 (more of one kind is not variety); 4 and 6 (mixing up categories: matter vs energy, living vs geologic).

- Two statements that share a type of error
- Names the type of thinking
- Two sentences of practical advice

Teacher notes

The reference table is real information summarized from the National Research Council (2007) and extension guides: wheat and rice are mostly self-pollinating and corn is wind-pollinated, while almonds, apples, blueberries and squash depend heavily on animal pollinators. The textbook overstates pollinator dependence (it lists grains and oranges); statement 2 targets that. Statement 6 targets the textbook's claim that building stone and metals come from ecosystems. Statement 3: honey bees compete with native bees where hives are dense and can share some pathogens with them; keep the claim hedged ('can', 'may') because the size of the effect varies. Statement 5 connects to the reading in W3 and the 2024 district comparison. If students rate statement 3 as partly correct, accept it with the right explanation.

Scaffold offered to students: Three checks for every statement

Check 1: Who benefits? An ecosystem service benefits people; it is done by the ecosystem. Check 2: Is the word 'every', 'all', 'proves' or 'only' too strong? Look for a case that breaks the rule. Check 3: Is it about matter or energy, about a living process or a rock, about price or value? Many errors mix up a pair like these.

Extension: Write statement 9

Write a ninth statement Priya might have written about New York City's water or about coastal dunes that sounds reasonable but contains a subtle error. Then write the teacher's comment explaining the error, and the corrected statement. Trade with a partner and see whether they can find your error without the comment.