

Three Kinds of Variety: Reading About Genes, Species and Ecosystems

Learning target: I can use evidence from a passage to explain the three levels of biodiversity and how habitat loss and invasive species reduce biodiversity at more than one level.

Reading with evidence

About 40 min

Individual

MS-LS2-4 · practice

MS-LS2-5 · supports

MS-LS4-4 · supports

reading

writing

Name _____

Date _____

Period _____

Directions

Read the whole passage once for the big picture. Then read it again with a pencil: underline each place where a level of biodiversity is named, and circle each threat. The paragraphs are numbered. Every answer must cite at least one paragraph number, and the long answer must quote or paraphrase evidence from at least two paragraphs.

You will need: This worksheet, Pencil, Highlighter (optional)

Three Kinds of Variety

[1] When scientists measure biodiversity, they do more than count animals. Biodiversity is the variety of life, and it can be described at three levels. **Genetic diversity** is the variety within one species, the differences in inherited instructions that make individuals unlike one another. **Species diversity** is the variety of species living in one place. **Ecosystem diversity** is the variety of ecosystems in a region, from forests to marshes to reefs. A loss at one level often spreads to the others.

[2] Species diversity is not the same everywhere. Arctic tundra has long, freezing winters and a short growing season, so relatively few species can live there. Where there are few species, each one can matter a great deal. Polar bears hunting seals on the sea ice leave scraps that Arctic foxes and gulls feed on in winter, so when shrinking ice makes hunting harder, the scavengers lose food too. Tropical rainforests are the opposite. Warmth, rain and food last all year, so many species survive by doing one narrow job, such as an anteater that eats mainly ants and termites or an orchid that clings to high branches. Because these specialists compete less with one another, a small patch of rainforest can hold an enormous number of species.

[3] Genetic diversity matters even when a species still survives. Individuals with different genes may differ in how well they resist a disease, survive a drought or raise healthy young. New Zealand's kākāpō, a flightless parrot, shows what happens when that variety is lost. By 1995 only 51 kākāpō were known, and every bird alive today descends from that small group. Many of their eggs never hatch because they are infertile, a problem scientists link to low genetic diversity. Since 2015, researchers have been reading the complete genes of the birds and using that information to pair mates that are not closely related.

[4] Ecosystem diversity is easy to see in California. In a few hours you can travel from kelp forests and salt marshes to oak woodlands, chaparral hills, redwood forests and deserts. Some species need more than one of these ecosystems. Chinook salmon hatch in rivers, grow up in the ocean and return to rivers to lay their eggs. If either the river or the ocean is badly damaged, the salmon cannot complete their life cycle.

[5] Two major threats to biodiversity are habitat loss, the leading cause of species decline worldwide, and invasive species. Habitat loss happens when the places organisms live are destroyed or changed, as when a wetland is drained for farms or houses. State wildlife scientists estimate that California has lost more than 90 percent of its historical wetlands. Habitat can also be broken into pieces, which is called fragmentation. Freeways surround the mountain lions of the Santa Monica Mountains near Los Angeles, and so few lions move in or out that the population has very low genetic diversity. Some young lions there have been born with kinked tails, a sign of inbreeding. A wildlife bridge over U.S. Highway 101 is being built so that animals can cross safely; it is scheduled to open in late 2026.

[6] An **invasive species** is one that people carried outside its natural range and that spreads and causes harm. Many invaders thrive because the predators, diseases and competitors that kept them in check at home are missing. Highway iceplant from South Africa was planted to hold soil along roads and coasts, and it now carpets dunes where native wildflowers once grew. Argentine ants from South America crowd out native ants near watered yards in Southern California. Coast horned lizards eat mainly native ants, and young lizards fed only Argentine ants barely grow, so where the invaders take over, the lizards decline.

[7] Protecting biodiversity protects people too. Wetlands filter water and soak up floodwater, insects pollinate crops, and some species give us medicines; chemicals from the Madagascar periwinkle are used to treat childhood leukemia. A species that disappears takes its genes and its role with it, and a paved-over marsh cannot simply be put back. That is why the strongest conservation plans protect variety at every level at once.

Original passage written for this worksheet. Facts were checked against New Zealand's Department of Conservation, the California Department of Fish and Wildlife, the National Park Service and published studies.

Questions: cite the passage

1. According to paragraph 1, what are the three levels of biodiversity? For one of them, give your own example from California that is **not** in the passage.

2. Using paragraph 2, explain why losing one species might change an Arctic tundra ecosystem more than losing one species would change a tropical rainforest. Quote one phrase that supports your answer.

3. Paragraph 3 says genetic diversity 'matters even when a species still survives.' Explain how a kākāpō population that is growing can still have low genetic diversity, and describe what scientists are doing about it.

4. Based on paragraph 4, why are Chinook salmon a good example of a species that depends on ecosystem diversity?

- ☐ A. They live in the warmest and wettest ecosystem in California.
- ☐ B. They need both river and ocean ecosystems to complete their life cycle.
- ☐ C. They are a keystone species in every California ecosystem.
- ☐ D. They can survive in any ecosystem because they have high genetic diversity.

5. Paragraph 5 describes two different ways habitat can be harmed. Explain the difference between habitat loss and habitat fragmentation, using the wetlands and the mountain lions. Then explain how a freeway can lower a population's genetic diversity even if no lion is ever hit by a car.

6. Paragraph 6 says many invaders thrive because something is 'missing.' What is missing, and why does that help an invasive species spread?

7. Trace the chain in paragraph 6 that links Argentine ants to coast horned lizards. Argentine ants do not attack the lizards. Is the lizards' decline a direct or an indirect effect of the ants? Explain.

8. Find one example in the passage where a change at one level of biodiversity causes a loss at a different level. Name both levels and give the paragraph number.

9. Paragraph 7 says the strongest conservation plans 'protect variety at every level at once.' Imagine a plan that keeps 300 kākāpō alive in pens on one island, all closely related. Using evidence from at least **two** paragraphs, argue whether this plan should count as a conservation success.

Find it, then say it

For each question, first find the paragraph that answers it and write its number in the margin. Then answer in two steps: one sentence that answers the question, and one sentence that begins 'Paragraph __ says...' or 'The passage explains that...'. For q7, draw the chain with arrows before you write: Argentine ants → native ants → coast horned lizards, and label each arrow with what happens.

Find the missing level

The passage gives California examples of genetic, species and ecosystem diversity, but it does not say how a single threat can hit all three levels at once. Choose one threat from paragraph 5 or 6 and write a paragraph that predicts its effect on genetic diversity, on species diversity and on ecosystem diversity in one California place. Then name one ecosystem service that would be lost and one measurement that could show whether your prediction is correct.