

Kelp Forest Shifts

Trace how changing conditions reshape a coastal ecosystem.

LS.9.c "variations in biotic and abiotic factors can change ecosystems."

NAME _____

DATE _____

1 READ AND MARK _____ Read it twice

YOUR JOB Underline each change in a nonliving factor, circle each change in a living population, and number the effects that follow each change. This will help you trace how variations can change an ecosystem.

Changes Along the Coast

- ① Along a rocky Pacific coast, a kelp forest grows where sunlight reaches shallow, cool water. Giant kelp anchors to rocks and rises toward the surface, making a tall habitat. Fish hide among its blades, sea snails feed on algae, and sea otters hunt sea urchins. The nonliving conditions, including water temperature, light, waves, and dissolved nutrients, help determine how quickly kelp can grow. Living populations also affect one another through feeding and shelter in this community.
- ② One summer, unusually warm ocean water remained near the coast for several weeks. This abiotic change brought less nutrient-rich water upward from deeper layers. Kelp grew slowly, and some plants lost blades. With fewer blades, young fish had less cover from predators, so more fish were eaten. The change did not affect every organism in the same way. Some open-water fish could still swim through the area, but animals that depended on dense kelp for food or shelter had fewer resources.
- ③ Later, a disease reduced the number of sea otters in the same forest. This biotic change left more sea urchins alive. Urchins grazed heavily on kelp holdfasts and young plants, preventing much regrowth after the warm period. As kelp became scarce, the forest changed into a rocky area with many urchins and fewer kelp-dwelling fish. A single ecosystem can respond to both kinds of variation at once. The warm water limited kelp growth, while the altered predator population increased grazing pressure.

2 ANSWER WITH EVIDENCE Use the passage

1 What abiotic factor changed during the summer, and how did it affect the water's nutrients?

2 Explain how the loss of kelp blades affected young fish.

3 What biotic change occurred later, and how did it lead to more sea urchins?

4 How did the warm water and the reduced sea otter population together make kelp scarce?

3 YOUR TURN Your own words

Invent a change in a pond ecosystem. Write 3 or 4 sentences that name the changed factor, label it biotic or abiotic, and explain at least two linked effects on organisms in the pond.

PART 1 • READ AND MARK

Underline each change in a nonliving factor, circle each change in a living population, and number the effects that follow each change. This will help you trace how variations can change an ecosystem. Accept any marking that follows this job and points at the right text.

PART 2 • ANSWERS

#	QUESTION	ANSWER
1	What abiotic factor changed during the summer, and how did it affect the water's nutrients?	The ocean water became unusually warm. Less nutrient-rich water moved upward from deeper layers.
2	Explain how the loss of kelp blades affected young fish.	Fewer kelp blades gave young fish less cover from predators, so more young fish were eaten.
3	What biotic change occurred later, and how did it lead to more sea urchins?	Disease reduced the sea otter population. With fewer otters hunting them, more sea urchins survived.
4	How did the warm water and the reduced sea otter population together make kelp scarce?	Warm water slowed kelp growth and caused some plants to lose blades. Fewer sea otters allowed more urchins to graze on kelp holdfasts and young plants, preventing regrowth.

PART 3 • YOUR TURN (SAMPLE ANSWER)

A long drought is an abiotic change in a pond. Lower water levels expose some plant roots, so fewer aquatic plants grow. With less plant cover and food, fewer tadpoles survive, and frogs have less prey.

Accept equivalent descriptions of the passage's cause-and-effect relationships. For the open response, accept any scientifically reasonable pond scenario that correctly identifies a biotic or abiotic factor and traces at least two connected effects.