Forests That Changed Earth

Use rock evidence to trace changes between ancient forests and Earth's systems.

EN.ESS2.7 "Engage in argument from evidence for how the simultaneous co-evolution of Earth's systems and life on Earth led to periods of stability and change over geologic time."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline three pieces of rock or fossil evidence, circle two ways plants changed Earth's systems, and number two places where changing conditions affected plants. Use your marks to trace how life and Earth shaped each other.

The Forests Beneath the Coal

1 About 350 million years ago, vast wetlands spread across low-lying parts of Earth. Trees and other plants drew carbon dioxide from the air to build their tissues, releasing oxygen through photosynthesis. Their roots broke rock and helped form soils, changing how rainwater moved across land. Fossil roots in ancient soils show where forests grew, while thick layers of buried plant matter show that some wetlands lasted a long time. Forests needed wet ground to thrive, yet their growth also changed the ground and atmosphere around them. Life and Earth's systems were shaping one another at the same time.

2 When wetland plants died, many fell into waterlogged ground, where decay was slow. Some of their carbon was buried instead of returning quickly to the air as carbon dioxide. Over millions of years, buried plant material formed some of the coal beds preserved in rocks today. Because less buried carbon reacted with oxygen during decay, oxygen could build up in the atmosphere. Evidence from this period points to oxygen levels higher than today's, although exact amounts remain uncertain. Coal beds therefore record more than a fuel source: they are evidence of a link between living forests, buried carbon, and a changing atmosphere.

3 More oxygen also affected the forests. Fires need oxygen, and charcoal preserved in rocks shows that wildfires burned in these ancient landscapes. Fire consumed plants and oxygen, limiting some growth even as surviving plants spread again. Meanwhile, carbon burial and weathering of silicate rock helped reduce atmospheric carbon dioxide over long periods, contributing to cooler conditions. As climate and wetland areas changed, forests did not remain the same forever. Coal layers show periods when wetland plant matter accumulated; charcoal shows interruptions by fire. Together, these clues support an argument for relative stability in wetland ecosystems and major changes driven partly by the plants themselves.

2 ANSWER WITH EVIDENCE

Use the passage

1. How do fossil roots and thick layers of buried plant matter support the claim that wetlands lasted a long time while plants changed the land?

2. Use coal beds as evidence to explain how wetland plants could help raise atmospheric oxygen.

3. What does charcoal in the rocks show, and how did the change that helped support fires affect plants in return?

4. What evidence and processes support an argument that forests helped change climate, and how could that change affect forests?

3 YOUR TURN

Your own words

A museum sign says, "Ancient forests were only passengers in Earth's changing environment." Write a 90 to 110 word rebuttal using at least two different clues from the passage. Explain an effect in each direction between plants and Earth's systems, and distinguish a period of stability from a later change.

ANSWER KEY

Forests That Changed Earth

HIGH SCHOOL · EN.ESS2.7

PART 1 · READ AND MARK

Underline three pieces of rock or fossil evidence, circle two ways plants changed Earth's systems, and number two places where changing conditions affected plants. Use your marks to trace how life and Earth shaped each other. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	How do fossil roots and thick layers of buried plant matter support the claim that wetlands lasted a long time while plants changed the land?	**Fossil roots show where forests grew and broke rock to help form soils. Thick layers of buried plant matter show that wetlands accumulated plant remains over a long time.**
2	Use coal beds as evidence to explain how wetland plants could help raise atmospheric oxygen.	**Coal beds formed from buried plant material. Burial kept some carbon from reacting with oxygen during decay, allowing oxygen to build up.**
3	What does charcoal in the rocks show, and how did the change that helped support fires affect plants in return?	**Charcoal shows that wildfires occurred. Increased oxygen helped support fires, which consumed plants and limited some forest growth.**
4	What evidence and processes support an argument that forests helped change climate, and how could that change affect forests?	**Coal beds provide evidence that plant carbon was buried. Carbon burial and silicate rock weathering helped lower carbon dioxide and contributed to cooling; changing climate and wetland areas then changed the forests.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

The sign misses a two-way relationship. Fossil roots in ancient soils show that forests grew where wet ground supported them, and coal beds show that plant matter accumulated in wetlands for long periods. These clues suggest some stability. But plants were not just passengers: their roots helped make soils, and burial of their carbon helped atmospheric oxygen increase. Charcoal in rocks records fires that this oxygen helped support. Fires consumed plants and oxygen, so a change partly driven by plants also altered the conditions they faced. Over longer periods, falling carbon dioxide contributed to cooling, and changing wetlands reshaped the forests.

Accept arguments that use at least two distinct rock or fossil clues and explain both directions of influence. Students may use long-lasting wetlands as stability and fire, cooling, or changing forest areas as change.