**Unless otherwise specified, "descriptions" referenced in the evidence statements could include but are not limited to written, oral, pictorial, and kinesthetic descriptions.*

HS-ESS2-7

Students who demonstrate understanding can:

HS-ESS2-7. **Construct an argument based on evidence about the simultaneous coevolution of Earth's systems and life on Earth.** [Clarification Statement: Emphasis is on the dynamic causes, effects, and feedbacks between the biosphere and Earth's other systems, whereby geoscience factors control the evolution of life, which in turn continuously alters Earth's surface. Examples include how photosynthetic life altered the atmosphere through the production of oxygen, which in turn increased weathering rates and allowed for the evolution of animal life; how microbial life on land increased the formation of soil, which in turn allowed for the evolution of land plants; or how the evolution of corals created reefs that altered patterns of erosion and deposition along coastlines and provided habitats for the evolution of new life forms.] [*Assessment Boundary: Assessment does not include a comprehensive understanding of the mechanisms of how the biosphere interacts with all of Earth's other systems.*]

The performance expectation above was developed using the following elements from *A Framework for K-12 Science Education*:

Science and Engineering Practices

Engaging in Argument from Evidence
Engaging in argument from evidence in 9–12 builds on K–8 experiences and progresses to using appropriate and sufficient evidence and scientific reasoning to defend and critique claims and explanations about the natural and designed world(s). Arguments may also come from current scientific or historical episodes in science.

- Construct an oral and written argument or counter-arguments based on data and evidence.

Disciplinary Core Ideas

ESS2.D: Weather and Climate

- Gradual atmospheric changes were due to plants and other organisms that captured carbon dioxide and released oxygen.

ESS2.E Biogeology

- The many dynamic and delicate feedbacks between the biosphere and other Earth systems cause a continual coevolution of Earth's surface and the life that exists on it.

Crosscutting Concepts

Stability and Change

- Much of science deals with constructing explanations of how things change and how they remain stable.

Observable features of the student performance by the end of the course:			
1	Developing the claim		
	a	Students develop a claim, which includes the following idea: that there is simultaneous coevolution of Earth's systems and life on Earth. This claim is supported by generalizing from multiple sources of evidence.	
2	Identifying scientific evidence		
	a	Students identify and describe* evidence supporting the claim, including:	
		i.	Scientific explanations about the composition of Earth's atmosphere shortly after its formation;
		ii.	Current atmospheric composition;
		iii.	Evidence for the emergence of photosynthetic organisms;
		iv.	Evidence for the effect of the presence of free oxygen on evolution and processes in other Earth systems;
		v.	In the context of the selected example(s), other evidence that changes in the biosphere affect other Earth systems.
3	Evaluating and critiquing		
	a	Students evaluate the evidence and include the following in their evaluation:	

		i.	A statement regarding how variation or uncertainty in the data (e.g., limitations, low signal-to-noise ratio, collection bias, etc.) may affect the usefulness of the data as sources of evidence; and
		ii.	The ability of the data to be used to determine causal or correlational effects between changes in the biosphere and changes in Earth's other systems.
4	Reasoning and synthesis		
	a	Students use at least two examples to construct oral and written logical arguments. The examples:	
		i.	Include that the evolution of photosynthetic organisms led to a drastic change in Earth's atmosphere and oceans in which the free oxygen produced caused worldwide deposition of iron oxide formations, increased weathering due to an oxidizing atmosphere and the evolution of animal life that depends on oxygen for respiration; and
		ii.	Identify causal links and feedback mechanisms between changes in the biosphere and changes in Earth's other systems.