

Kelp Forest Coevolution - 5E Lesson Plan

Summary: Students will explore the co-evolution of life with Earth systems, and how each influences the other, by studying the development of kelp forests in the Santa Barbara Channel. At the end of the unit, students will write an extended CER to answer the question: “How has the evolution of kelp forests affected, and been affected by, Earth’s systems?”

Estimated total time: 4.5 hours - 7 hours classtime

Standard(s)	<i>Ex. HS ESS2-7: Construct an argument based on evidence about the simultaneous coevolution of Earth’s systems and life on Earth.</i>
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Lesson Sequence:

Engage	[20 minutes] L1 Article: The Ocean is Running Out of Breath
Explore	[25 minutes] L1 Videos: Intro to the Kelp Forest [50 minutes] L2 What is Kelp? Evidence dive & CERC
Explain	[60 minutes] L3 Earth’s Historic Atmosphere - Data Activity
Elaborate	[65-95 minutes] L4 Kelp Forest Evolution
Evaluate	[60-180 minutes] L5 Kelp in a Changing Climate

Other great resources to extend the learning in this lesson sequence:

- Interactive lesson on kelp forest food webs - especially great if students need a refresher on basics of ecosystem interactions, as the lesson is more of a middle-school level. Link: <https://www.calacademy.org/educators/lesson-plans/how-stable-is-your-food-web>
 - ◆ Include between L1 and L2
- HHMI BioInteractive: EarthViewer of Earth throughout its geologic history. For example, students can compare Earth when trees evolved (400 mya) vs kelp (30 mya). Link: <https://www.biointeractive.org/classroom-resources/earthviewer>
 - ◆ Include between L3 and L4 - have students explicitly notice when North America starts to look like its “modern” appearance (approx. 55 mya, with some argument either way)
- Data Nugget: “Do Urchins Flip Out in Hot Water?” - created from data collected by two high school science teachers on a research fellowship at UC Santa Barbara at the Kelp Forest LTER site! Link: <https://datanuggets.org/2024/08/do-urchins-flip-out-in-hot-water/>
 - ◆ Include between L4 and L5
- Gizmo “Stem Case” on Ocean Acidification (requires subscription). Link: <https://gizmos.explorellearning.com/find-gizmos/lesson-info?resourceId=3164>
 - ◆ Include during L5