Kelp Through Cycles

How recurring ocean changes reshape a coastal ecosystem

ES.5 "Obtain, evaluate, and communicate information regarding how short-term and long-term natural cyclic fluctuations cause ecosystem change."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline each recurring ocean change, circle its time scale, and number the steps that connect it to a change in the kelp forest. Use your marks to compare the two cycles.

A Forest That Moves with the Ocean

1 Off the California coast, kelp forms underwater forests that shelter fish and other animals. Each spring and summer, winds often push warm surface water away from shore. Cold water rises to replace it, bringing nutrients from deeper water. This process, called upwelling, helps tiny drifting algae grow and supplies nutrients that kelp needs. In winter, the winds that drive upwelling often weaken, so the nutrient supply may drop. This seasonal cycle changes growing conditions each year, but it does not mean every kelp plant dies each winter. Local winds and storms also vary from year to year.

2 A longer cycle can disrupt that familiar seasonal pattern. El Niño is a recurring warming of parts of the Pacific Ocean that develops irregularly, usually every two to seven years. During some El Niño events, warmer water reaches the California coast and upwelling weakens. Even in summer, less cold, nutrient-rich water may reach kelp. If poor growing conditions last, kelp cover can shrink, leaving less shelter for fish. The effect varies by location and event. El Niño is not an annual season, and its irregular timing means a calendar alone cannot tell scientists when the next event will occur.

3 Scientists compare observations across seasons and years to understand why a kelp forest changes. They can record water temperature, nutrient levels, winds, and kelp cover at the same sites. A warm, kelp-poor summer might fit an El Niño explanation, especially if upwelling was weak. But that pattern alone does not prove the cause. Sea urchins can eat kelp, and storms can tear it away. Repeated measurements help scientists separate a normal seasonal shift from an unusual change that lasts beyond one season. Checking for other causes makes an explanation more reliable.

2 ANSWER WITH EVIDENCE

Use the passage

1. Trace how the spring and summer wind pattern can change conditions for kelp and the animals that use it.

2. How could an El Niño event make a summer different from the usual spring and summer pattern described in the passage?

3. A scientist finds warm water and little kelp during one summer. Why is that not enough to conclude that El Niño caused the change? Name two other observations that would help.

4. Why would a prediction based only on the calendar work differently for the seasonal upwelling pattern and for El Niño?

3 YOUR TURN

Your own words

At one cove, a student measures less kelp cover in August than in April of the same year. Write a 70 to 100 word field note describing two possible causes from the passage and explaining how observations across seasons and years could help distinguish them.

Kelp Through Cycles

PART 1 · READ AND MARK

Underline each recurring ocean change, circle its time scale, and number the steps that connect it to a change in the kelp forest. Use your marks to compare the two cycles. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	Trace how the spring and summer wind pattern can change conditions for kelp and the animals that use it.	**Winds push surface water offshore, allowing cold, nutrient-rich water to rise. The nutrients support kelp growth, and kelp provides shelter for fish and other animals.**
2	How could an El Niño event make a summer different from the usual spring and summer pattern described in the passage?	**Warmer water and weaker upwelling during some El Niño events can reduce the nutrient supply even in summer. If those conditions last, kelp cover can shrink.**
3	A scientist finds warm water and little kelp during one summer. Why is that not enough to conclude that El Niño caused the change? Name two other observations that would help.	**One summer cannot establish a longer pattern or rule out causes such as urchin grazing or storms. The scientist could also check nutrient levels and upwelling winds, or compare measurements across seasons and years.**
4	Why would a prediction based only on the calendar work differently for the seasonal upwelling pattern and for El Niño?	**Upwelling often follows a spring and summer pattern each year. El Niño recurs irregularly, usually every two to seven years, so a calendar cannot identify its next occurrence.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

Kelp cover fell between April and August, but two surveys cannot show why. An El Niño event might have brought warmer water and weakened upwelling, reducing the nutrients available to kelp. Sea urchins might also have eaten more kelp at this cove. I would measure water temperature, nutrients, winds, and urchin numbers at the site. Repeating the surveys through several seasons and years would show whether the decline matches unusual ocean conditions, a recurring seasonal pattern, or increased grazing.

Accept explanations that correctly connect a recurring change to its time scale and an ecosystem effect. For the field note, accept storms in place of urchin grazing as an alternative cause.