Estuary Under Stress

Trace how storms and drought change aquatic habitats.

MAQ.4.6 "Research, analyze, and communicate the effects of natural phenomena (e.g., hurricanes, floods, drought, and sea-level rise) on the aquatic ecosystems."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline changes in water conditions and circle their effects on living things so you can trace how each event affects the estuary.

When River and Ocean Conditions Shift

1 At the mouth of a coastal river, an estuary mixes fresh river water with salty ocean water. After a hurricane, wind can push a surge of seawater into the estuary. At the same time, heavy rain sends a pulse of river water downstream. Salinity may rise in one place and fall in another, depending on where and when samples are taken. The floodwater also carries mud that clouds the water. Less sunlight reaches underwater grasses, so they may photosynthesize less. If flooding lasts long enough, fish and small animals lose some of the grass beds they use for shelter.

2 A drought produces a different set of changes. In a long drought, less river water reaches the estuary. Ocean water can move farther upstream, raising salinity in places that usually stay less salty. Some freshwater marsh plants struggle in saltier soil, leaving fewer stems to slow currents and shelter young fish. Drought can also reduce the flow that normally flushes nutrients from the estuary. In warm, still water, algae may grow rapidly when nutrients are available. As dead algae decay, bacteria use dissolved oxygen, which fish and crabs need to breathe. Drought does not guarantee an algal bloom, but it can increase the risk under these conditions.

3 To investigate these changes, a field team could sample the same three sites before and after a storm, then repeat its measurements during a drought. The team would measure salinity, water clarity, dissolved oxygen, and the area covered by underwater grasses. Comparing upstream and downstream sites matters because a single reading can hide the estuary's mixed conditions. The team would also record rainfall, river flow, and sampling dates. If grass cover drops after cloudy floodwater arrives, the pattern supports a possible light-related effect, but it does not prove that cloudiness alone caused the loss. Other stresses, including waves, could damage grass.

2 ANSWER WITH EVIDENCE

Use the passage

1. Why might salinity rise at one site and fall at another during a hurricane?

2. Trace how muddy floodwater could affect fish that shelter in underwater grasses.

3. How could a drought change both salinity and shelter for young fish upstream?

4. What measurements could help the field team investigate whether cloudy floodwater affected underwater grasses? Why would those measurements not prove that cloudiness was the only cause?

3 YOUR TURN

Your own words

Imagine that a drought is followed by a hurricane in this estuary. In four sentences, explain how the events could create different salinity conditions, predict one effect on an aquatic organism, name two measurements that could test your prediction, and explain one reason your prediction might not hold.

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PART 1 · READ AND MARK

Underline changes in water conditions and circle their effects on living things so you can trace how each event affects the estuary. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	Why might salinity rise at one site and fall at another during a hurricane?	**A seawater surge can raise salinity, while heavy rain and river flooding can lower it. The result depends on the site and sampling time.**
2	Trace how muddy floodwater could affect fish that shelter in underwater grasses.	**Mud clouds the water, reducing sunlight for grasses. If flooding lasts long enough, reduced photosynthesis may shrink grass beds and leave fish with less shelter.**
3	How could a drought change both salinity and shelter for young fish upstream?	**Less river water lets salty ocean water move upstream. Saltier soil can harm freshwater marsh plants, leaving fewer stems to shelter young fish.**
4	What measurements could help the field team investigate whether cloudy floodwater affected underwater grasses? Why would those measurements not prove that cloudiness was the only cause?	**The team could compare water clarity and grass cover at the same sites before and after the storm. A change in both would not rule out other causes, such as wave damage.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

During the drought, low river flow could let salty water reach farther upstream, but hurricane rain could later lower salinity there. Freshwater marsh plants might weaken during the salty period, leaving less shelter for young fish. I would measure upstream salinity and count young fish at the same site before and after each event. My prediction might not hold if the storm's seawater surge keeps upstream water salty despite the rain.

Accept other passage-supported cause-and-effect chains. For the open task, look for a plausible prediction, two relevant measurements, and a reason the outcome is uncertain.