Creek Clues

Measure an ecosystem, then weigh the evidence

HS-ENV1-5 "Evaluate, measure, and communicate biological, chemical, and physical (abiotic and biotic) factors within an ecosystem."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline the three abiotic factors measured in the passage, circle the biotic measure, and write 1 beside the sentence that limits what the data can prove.

One Afternoon at Willow Creek

1 A class sampled three reaches of Willow Creek on a clear afternoon. At each reach, students measured water temperature with a thermometer and dissolved oxygen and nitrate with test kits. They also swept a net through a ten-meter stretch for ten minutes and counted mayfly larvae. Each reach was sampled once.

WILLOW CREEK MEASUREMENTS

Reach	Water temperature (°C)	Dissolved oxygen (mg/L)	Nitrate (mg/L)	Mayfly larvae (count)
Shaded	17	9.0	0.3	18
Meadow	22	7.1	1.1	10
Roadside	25	5.2	3.8	2

2 The table reports the class's measurements. Temperature is a physical, abiotic factor, while dissolved oxygen and nitrate are chemical, abiotic factors. Mayfly larvae are living organisms, so their count is a biological, biotic measure. Comparing these measurements can reveal a pattern across reaches, but a single afternoon cannot show whether the pattern holds in other seasons.

3 Rain can wash material from paved surfaces into a stream, and warmer water usually holds less dissolved oxygen. Low oxygen can stress aquatic animals, but several factors may differ among reaches, including shade, flow, and streambed habitat. The class did not track rainfall or repeat its measurements, so its data describe conditions at one time rather than a cause.

2 ANSWER WITH EVIDENCE

Use the passage

1. Compare water temperature and mayfly counts at the shaded and roadside reaches. Which measure is abiotic, and which is biotic?

2. Which reach has the highest nitrate level? Compare its dissolved oxygen level with that of the reach with the lowest nitrate level.

3. How do nitrate and dissolved oxygen change across the three reaches? Use numbers to describe the pattern.

4. A student says the data prove nitrate caused the low roadside mayfly count. Evaluate this claim using the table and one limit of the investigation.

3 YOUR TURN

Your own words

Design a follow-up study to test whether the creek pattern persists after rain. In four sentences, name a biological, a chemical, and a physical measurement; explain how you would collect comparable data; and state how you would communicate the results and limit your conclusion.

Creek Clues

PART 1 · READ AND MARK

Underline the three abiotic factors measured in the passage, circle the biotic measure, and write 1 beside the sentence that limits what the data can prove. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	Compare water temperature and mayfly counts at the shaded and roadside reaches. Which measure is abiotic, and which is biotic?	**From shaded to roadside, temperature rises from 17°C to 25°C, while the mayfly count falls from 18 to 2. Temperature is abiotic; the larval count is biotic.**
2	Which reach has the highest nitrate level? Compare its dissolved oxygen level with that of the reach with the lowest nitrate level.	**Roadside has the highest nitrate level, 3.8 mg/L, and 5.2 mg/L dissolved oxygen. Shaded has the lowest nitrate level, 0.3 mg/L, and 9.0 mg/L dissolved oxygen.**
3	How do nitrate and dissolved oxygen change across the three reaches? Use numbers to describe the pattern.	**Nitrate rises from 0.3 to 1.1 to 3.8 mg/L, while dissolved oxygen falls from 9.0 to 7.1 to 5.2 mg/L.**
4	A student says the data prove nitrate caused the low roadside mayfly count. Evaluate this claim using the table and one limit of the investigation.	**The roadside reach has the highest nitrate level, 3.8 mg/L, and the fewest larvae, 2. The class sampled each reach only once and did not isolate nitrate, so the data do not prove causation.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

I would count mayfly larvae, test nitrate, and measure water temperature at all three reaches before and after several rainstorms. At each visit, I would use the same ten-minute net sweep, the same test methods, and the same sampling locations. I would graph each measurement by reach and date, then describe whether changes in nitrate match changes in mayfly counts. Even if the patterns match, other changes after rain could affect larvae, so the results would not prove nitrate caused any difference.

Accept other evidence-based comparisons and reasonable study limitations. For Part 3, accept different measurable biological, chemical, and physical factors if the plan keeps sampling comparable and avoids claiming that a pattern proves causation.