Testing the Permit

Investigate whether a water policy made a difference.

HS-ENV6-1 "Conduct an investigation to evaluate the effectiveness of environmental policies and/or organizations (Clean Water Act, Clean Air Act, Endangered Species Act, Species Survival Plan, Resource Conservation and Recovery Act…"

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline the permit requirement and the action taken to meet it, circle the before-and-after creek measurements, and put a 1 beside one possible other explanation for the results.

What Changed at Cedar Creek?

1. At Cedar Creek, summer algae sometimes covered the water below a wastewater treatment plant. The plant releases treated water through an outfall, where a permit under the Clean Water Act limits certain pollutants. In 2021, the state announced a tighter phosphorus limit of 0.5 milligrams per liter of treated water, effective in 2022. Phosphorus can fuel algal growth, so a tighter limit might help the creek. To meet the new limit, the plant installed a phosphorus-removal step in early 2022. The permit set the requirement, and the upgrade was how the plant put it into practice.

2. A student team examined monthly samples from the same two creek sites in the summers of 2021 and 2023. One site was upstream of the outfall; the other was downstream. The average phosphorus concentration upstream was 0.07 milligrams per liter in both summers. Downstream, the average fell from 0.30 to 0.12 milligrams per liter. Plant records also showed that average phosphorus in its treated discharge fell from 1.8 to 0.4 milligrams per liter. The 2023 discharge average was lower than the permit's numeric limit, although a summer average cannot establish compliance on every sampling date.

3. These results support, but do not prove, that the tighter permit helped reduce phosphorus downstream. The discharge dropped after the required upgrade, while the upstream concentration stayed the same. The team cannot tell from these averages whether algae also declined; they did not count algae. Other discharges entering between the sites could have changed, and rainfall or stream flow could have diluted phosphorus differently across summers. To strengthen the investigation, the team could sample during similar flow conditions, check other outfalls, and compare several years of data. That would test whether the pattern persists beyond two summers.

2 ANSWER WITH EVIDENCE

Use the passage

1. How could the tighter permit have caused the change measured downstream? Include the plant's response to the permit.

2. Which creek measurements support the claim that conditions changed below the outfall rather than throughout the creek?

3. Can the team conclude that the permit reduced algae in Cedar Creek? Explain using the investigation's evidence.

4. Name one other possible cause of the downstream change. What could the team check to test it?

3 YOUR TURN

Your own words

Imagine a Clean Air Act permit sets a tighter sulfur dioxide limit for a power plant. Design an investigation to evaluate whether the permit improves nearby air quality: describe what you would measure, what you would compare, what result would support effectiveness, and one other cause you would check.

ANSWER KEY

Testing the Permit

HIGH SCHOOL · HS-ENV6-1

PART 1 · READ AND MARK

Underline the permit requirement and the action taken to meet it, circle the before-and-after creek measurements, and put a 1 beside one possible other explanation for the results. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	How could the tighter permit have caused the change measured downstream? Include the plant's response to the permit.	**The permit required a lower phosphorus level, so the plant added a removal step. Its discharge phosphorus fell, which could have reduced phosphorus downstream.**
2	Which creek measurements support the claim that conditions changed below the outfall rather than throughout the creek?	**Downstream phosphorus fell from 0.30 to 0.12 milligrams per liter, while upstream phosphorus stayed at 0.07 milligrams per liter.**
3	Can the team conclude that the permit reduced algae in Cedar Creek? Explain using the investigation's evidence.	**No. The team measured phosphorus, not algae, so it cannot tell whether algae declined.**
4	Name one other possible cause of the downstream change. What could the team check to test it?	**Changes in stream flow could have diluted phosphorus. The team could compare samples taken under similar flow conditions. Accept changed discharges paired with checking other outfalls.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

I would measure sulfur dioxide in the air near the plant before and after the permit takes effect, using the same seasons and sampling sites. I would also sample upwind to see whether regional air quality changes. Lower levels near the plant, without a similar drop upwind, would support the permit's effectiveness. I would check wind direction because it could change how much pollution reaches each site.

Accept investigations that connect a policy requirement to a measurable outcome, use a meaningful comparison, and check a plausible competing cause. Do not treat the required treatment upgrade as an independent explanation for the creek results.