Creekside Design Challenge

Read an environmental action plan, then design your own.

MAQ.4.8 "Enrichment: Choose an environmental issue that currently exists in one of the aquatic ecosystems and use an engineering design process to propose and develop a solution using scientific knowledge and best management practices (BMPs)..."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Part 1 READ AND MARK: Underline the evidence for the creek problem, circle each proposed design or testing step, and number the decisions that involve people, rules, or costs.

A Rain Garden for the Creek

1. After heavy rain, a tidal creek near a Chesapeake Bay neighborhood turns cloudy green. Water from parking lots and fertilized lawns rushes through storm drains into the creek. The runoff carries nitrogen and phosphorus, which can fuel algal growth. When algae die, decomposers use dissolved oxygen, leaving less for fish and bottom-dwelling animals. Residents have reported fewer juvenile fish along the shore in late summer, but no one has counted a reliable trend. A student engineering team chooses a testable goal: reduce nutrients entering the creek without blocking public access or shifting polluted water onto nearby properties.

2. For a pilot, the team proposes a rain garden beside the parking lot, with native plants and a shallow basin that holds runoff while it filters into suitable soil. First, they test soil drainage and check for buried pipes, since poorly draining soil could make the basin overflow. They leave a safe overflow route for large storms and plan to clear sediment from the inlet. To evaluate the pilot, they will measure water flow and nutrient concentrations entering and leaving the garden during several storms. They will also measure creek oxygen and count fish over subsequent seasons.

3. The team argues that downstream wildlife deserves protection, while neighbors disagree about losing parking for cleaner fishing water. The council must decide whether to use part of a street-improvement budget for construction and yearly upkeep. The team proposes using an unused strip rather than removing accessible spaces and asking local businesses to help fund maintenance. City engineers must check drainage rules and secure any required permits. If storm samples show little nutrient reduction, the team will adjust the planting or soil and test again. Reduced runoff could improve habitat soon, but recovery of fish diversity may take years and depends on other pollution sources.

2 ANSWER WITH EVIDENCE

Use the passage

1. Part 2 QUESTIONS: How could the rain garden address the cause of poor fish habitat rather than just the creek's appearance?

2. Which two measurements at the garden's inlet and outlet would help test whether it reduces nutrient delivery? Why are both useful?

3. How does the proposed location balance protection of wildlife with a concern about public access?

4. If storm samples show little nutrient reduction, what should the team do next? Why might fish diversity still take years to recover?

3 YOUR TURN

Your own words

Part 3 YOUR TURN: Choose an aquatic problem other than nutrient runoff and write one action plan that includes a design based on science, a best management practice, a test and possible revision, and moral, legal, societal, political, and economic decisions. Explain possible short- and long-term effects on animal diversity, and name one result you would share with classmates.

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PART 1 · READ AND MARK

Part 1 READ AND MARK: Underline the evidence for the creek problem, circle each proposed design or testing step, and number the decisions that involve people, rules, or costs. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	Part 2 QUESTIONS: How could the rain garden address the cause of poor fish habitat rather than just the creek's appearance?	**It could reduce nitrogen and phosphorus entering the creek. With less nutrient-fueled algal growth and decay, more dissolved oxygen may remain for fish.**
2	Which two measurements at the garden's inlet and outlet would help test whether it reduces nutrient delivery? Why are both useful?	**Measure water flow and nutrient concentrations. Together, they help estimate how much nutrient enters and leaves during storms.**
3	How does the proposed location balance protection of wildlife with a concern about public access?	**The rain garden would reduce runoff that threatens wildlife, while its location on an unused strip would preserve accessible parking.**
4	If storm samples show little nutrient reduction, what should the team do next? Why might fish diversity still take years to recover?	**The team should adjust the planting or soil and test again. Fish diversity may recover slowly, partly because other pollution sources still affect the creek.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

At a freshwater lake, discarded fishing line entangles turtles and birds. I would install covered line-collection tubes at two fishing docks and arrange weekly collection, a practice that keeps line out of the water. I would count visible line and record reported entanglements before installation and monthly afterward. If one dock stays littered, I would add a tube. Protecting wildlife matters, but dock users should keep access. The parks board would approve locations and pay for upkeep, while staff check local disposal rules. Fewer entanglements could protect animals soon; continued collection could help preserve species diversity over years. I would share monthly line counts with classmates.

Accept other scientifically plausible aquatic issues and designs. Look for a measurable test, a revision tied to results, all five decision types, and distinct short- and long-term effects on animal diversity.