

Creek Solution Check

Use environmental data to judge and improve a stormwater design.

HS-ESS3-4 "Evaluate or refine a technological solution that reduces impacts of human activities on natural systems. Clarification Statement: Examples of data on the impacts of human activities could include the quantities and types of pollutants..."

NAME _____

DATE _____

1 READ AND MARK _____ Read it twice

YOUR JOB Underline each piece of impact or outcome data, circle each proposed action or refinement, and number the trade-offs or limits that affect whether the solution should be kept or changed.

Testing Rain Gardens

- ① After years of paving, the city of Riverton found that rain washed oil, fertilizer, and trash from parking lots into Willow Creek. Water tests after storms showed high cloudiness and elevated phosphorus, a nutrient that can fuel algae growth. Surveys also found fewer mayfly larvae at two downstream sites than at an upstream reference site. The city proposed rain gardens beside three large parking lots. Their soil and plant roots would slow runoff and filter some pollutants before water reached the creek during storms each year.
- ② Before construction, engineers measured the drainage area and estimated that the three lots sent about 1.8 million liters of runoff toward the creek during a typical year. They planned to record runoff volume, phosphorus concentration, cloudiness, and mayfly larvae each season. The project would cost \$240,000 and remove 24 parking spaces. Because gardens need weeding and mulch replacement, the city also budgeted yearly maintenance. A solution should be judged by whether its environmental benefits are large enough to justify its costs and trade-offs for residents and city budgets.
- ③ One year after installation, runoff volume reaching the creek fell by 28 percent during similar storms. Average phosphorus concentration fell from 0.42 milligrams per liter to 0.29 milligrams per liter, and cloudiness declined. Mayfly larvae increased at one downstream site but remained low at the other. Inspectors discovered that water bypassed one garden when leaves blocked its curb opening. Instead of declaring the project fully successful, engineers recommended clearing openings before forecasted heavy rain and adding a larger inlet at the problem garden to capture more runoff.

2 ANSWER WITH EVIDENCE _____ Use the passage

1 What evidence in the passage shows that parking-lot runoff was affecting Willow Creek? Use two findings from before the rain gardens were installed.

2 Which planned measurements would help engineers evaluate both pollution reduction and biological response? Name the measurements from the passage.

3 Evaluate the rain gardens after one year. Give one result that supports keeping the solution and one result that shows the solution needs refinement.

4 What refinement did the engineers recommend, and how would it reduce the problem they found?

3 YOUR TURN _____ Your own words

In two sentences, describe a different local human impact on a natural system and propose a technological solution. Include data you would collect to evaluate the solution, plus a condition that would make you refine it.

PART 1 • READ AND MARK

Underline each piece of impact or outcome data, circle each proposed action or refinement, and number the trade-offs or limits that affect whether the solution should be kept or changed. Accept any marking that follows this job and points at the right text.

PART 2 • ANSWERS

#	QUESTION	ANSWER
1	What evidence in the passage shows that parking-lot runoff was affecting Willow Creek? Use two findings from before the rain gardens were installed.	Storm runoff carried oil, fertilizer, and trash into the creek, and tests showed high cloudiness and elevated phosphorus. Surveys also found fewer mayfly larvae downstream than at the upstream reference site.
2	Which planned measurements would help engineers evaluate both pollution reduction and biological response? Name the measurements from the passage.	Runoff volume, phosphorus concentration, cloudiness, and the number of mayfly larvae.
3	Evaluate the rain gardens after one year. Give one result that supports keeping the solution and one result that shows the solution needs refinement.	Supporting results include a 28 percent decrease in runoff volume, lower phosphorus concentration, and lower cloudiness. A limitation is that mayfly larvae remained low at one downstream site because water bypassed a garden when leaves blocked its opening.
4	What refinement did the engineers recommend, and how would it reduce the problem they found?	They recommended clearing curb openings before heavy rain and adding a larger inlet at the problem garden. These changes would keep runoff from bypassing the garden and help capture more water.

PART 3 • YOUR TURN (SAMPLE ANSWER)

At a school bus loop, winter runoff contains 380 mg/L chloride, and grass beside the drain has thinned, so the school will use a covered salt-storage bin and a calibrated brine sprayer. For two winters, staff will compare chloride concentrations and plant cover before and after storms, keeping the system if chloride falls and plant cover recovers, but recalibrating the sprayer and repairing leaks if chloride remains high.

Accept supported evaluations that use the passage's environmental data together with costs, maintenance, parking-space loss, or incomplete biological recovery. For Part 3, accept varied local problems if the response includes measurable impact data, a technological solution, and a clear evaluation or refinement condition.