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Part B: Bayou Engineering Design Challenge Worksheet Answer Key

Objective:
Design and build a structure that reduces sediment transport and erosion in a bayou model.

Materials:
- 1 large plastic bin (one per group)
- sand (to cover the bottom of the bin)
- water
- 1 measuring cup
- 1 ruler or measuring tape

Available Materials:

sponges	coffee filters
craft sticks	gravel
popsicle sticks	clay
cotton balls	small rocks
straws	

Design Plan:
1. Draw your structure in the space below. Label the materials you plan to use, and explain where you'll place each part of your structure in the bayou model.

Drawings will vary.

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2. Explain how your structure will work to reduce sediment transport. Which parts of your design will slow down the water? Where will sediment get trapped?

   Potential answer: Our structure includes sponges placed at the sides of the channel to slow down water flow, craft sticks across the channel to act as barriers, and cotton balls near the end of the channel to trap sediment. The sponges will reduce water speed, and the barriers will prevent larger particles from moving. The cotton balls at the end will trap finer sediment before it reaches the end of the channel.

3. Where do you think the most sediment will accumulate in your model? How much do you think your design will reduce sediment movement?

   We predict that the most sediment will accumulate in front of the craft stick barriers and at the cotton balls near the end. We expect that our structure will reduce sediment movement by trapping particles in the middle and end sections of the channel.

Create and Test:

4. Use the materials provided to build your design in the bayou model.
5. Pour water slowly at one end of the bayou model and observe how well your structure reduces sediment movement.
6. Measure and record where sediment accumulates in the table below.

Observation Table:

Observation Point	Sediment Movement Without Structure	Sediment Movement With Structure
Start of the channel	Some sediment moved but stayed mostly in place.	Minimal movement; sponges kept sand in place.
Middle of the channel	Sediment was carried along by the water flow.	Some sediment buildup in front of the craft stick barrier.
End of the channel	Most sediment accumulated here.	Sediment trapped in cotton balls before reaching the end.

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Analysis:

7. Where did sediment build up the most with your structure in place? How did this compare to the bayou without a structure?

   With the structure in place, sediment built up mostly around the craft stick barriers and cotton balls. This was different from the test without a structure, where most sediment was collected at the end of the channel.

8. Did your design reduce sediment movement as expected? Why or why not?

   Our design worked as expected because the barriers and cotton balls slowed down the water and trapped the sediment. The structure successfully reduced the amount of sediment reaching the end of the channel.

9. Improve: If you could redesign your structure, what would you change to make it more effective?

   To make the structure more effective, we could add another layer of cotton balls or sponges closer to the end to catch even more sediment. We could also place sponges across the channel to slow the water down even more.

Reflection Questions:

10. Why is it important to control sediment movement in real rivers and bayous? How might this help the environment and communities?

    Controlling sediment movement in rivers and bayous is essential to prevent erosion, protect habitats, and maintain clean water. Too much sediment can clog waterways, harm fish and plants, and increase the risk of flooding for communities nearby.

11. What engineering skills did you use in this challenge? Think about planning, problem-solving, and testing.

    We used engineering skills like planning by creating a detailed design, problem-solving by choosing materials that would best reduce sediment movement, and testing to see if our structure worked. These skills helped us design and improve our structure.