

### Visible Elements in Photo



- A blue metal water valve or utility box (marked with orange/yellow cap and signage) embedded in grass near a sidewalk
- An orange and white traffic cone positioned on grass adjacent to a body of water
- A concrete sidewalk/pathway on the left
- A grassy embankment sloping toward the water on the right
- A body of water (canal or retention pond) with visible water line and erosion at the bank edge
- A wooden stake or post driven into the ground near the cone

### Reasonable Inferences

- From the erosion visible at the water's edge + the traffic cone placement: The embankment is experiencing water erosion, and the cone signals a hazard or active maintenance zone. The utility box may control water flow, suggesting this is a managed water system (canal, stormwater, or drainage infrastructure).
- From the wooden stake + cone positioning: Someone has attempted a temporary fix or is monitoring the erosion problem, implying the slope needs stabilization.
- From the sidewalk proximity to the water: This is a public or residential area where erosion threatens infrastructure safety.

### Engineering Task

#### K-2 Challenge:

Your job is to design a wall or fence that stops the dirt from washing into the water. Use sticks, grass, small rocks, or clay to build a barrier on a slope. Test it by slowly pouring water down the slope. Does your barrier hold the soil in place? Can you make it stronger?

#### 3-5 Challenge:

The Problem: Water flow is eroding the grassy slope next to a canal, threatening nearby infrastructure.

Your Challenge: Design and build a structure using natural and recycled materials (grass, sticks, stakes, cloth, sand, gravel, or cardboard) that:

- Reduces soil loss when water flows down a tilted surface (your "slope")
- Costs less than \$5 in materials
- Can be installed without heavy equipment
- Remains stable for at least 3 simulated rainstorms (water poured from a pitcher)

Success Criteria:

- Measure and record soil loss before and after your design (weigh collected sediment or count particles).
- Your barrier must not block water drainage entirely.
- Sketch your design and explain why you chose those materials.

### EDP Phase Targeted

Ask / Define Problem

This phase fits because the photo shows a real-world problem (visible erosion and a utility valve at risk) without showing a solution in place. Students must first understand why erosion is happening and who it affects (the municipality, people using the sidewalk, the ecosystem) before jumping to fixes. This grounds the engineering work in authentic need rather than abstract design.

### Suggested Materials

- Grass clippings or sod
- Wooden stakes or dowels
- Gravel and sand
- Burlap or landscape fabric scraps
- Cardboard or newspaper
- Small branches or twigs
- Soil or clay
- Pitcher or spray bottle (for testing water flow)

### Estimated Time

- K-2: 40–50 minutes (design + 2–3 test rounds)
- 3-5: Two 45-minute sessions (Day 1: problem exploration, design, and build; Day 2: testing, measurement, redesign, and documentation)

### Why This Works for Teachers

This task directly addresses NGSS ETS1.A (defining engineering problems) and ETS1.B (developing possible solutions) by having students identify a community infrastructure problem from a real photograph and prototype solutions with measurable outcomes that reflect actual practices in civil engineering and environmental management.