

Stormwater Experiment Activity Guide

Do you know where the stormwater goes in Pittsburgh when it rains?

In this activity, you'll build a model of our city and learn about the challenges caused by too much rain. In the second half of the experiment, you'll design green stormwater solutions to help address Pittsburgh's stormwater pollution and flooding issues.

Let's get started!



MATERIALS

- 1 metal paint tray
- 1 PVC pipe with 3/8 or 1/2 inch outer diameter
- 1 utility knife
- Waterproof glue or hot glue
- 1 foam or bristle paint brush
- Clear waterproof, rust proof spray paint primer
- Gray, black, and blue acrylic paint
- White-out correction fluid
- Lego bricks and bases to build 4 small buildings
- 12-16 thin flat magnets
- 1 yellow foam sheet
- 1 brown foam sheet
- 1 pair of scissors
- 4 sponges in 4 colors
- 1 thin scour pad sponge
- 5 containers for sponges
- 1 mesh strainer
- 1 watering can (toy or regular)
- 1 liquid measuring cup
- 1 towel

ASSEMBLY INSTRUCTIONS

Adult supervision recommended. Glue, spray paint, and paint in a safe outside workspace with good ventilation.

1. Cut the PVC pipe with a utility knife to the inside width of the paint tray then cut in half length-wise to make a cross section of a sewer.
2. Cut 3 semicircles on one edge of the pipe to create sewer outfalls.
3. Glue the PVC pipe to the paint tray on flat bottom next to the slope, with the semicircles facing the tray bottom. Let the glue set.
4. Spray paint the tray with a few coats of clear primer. Let it dry.
5. Paint the tray slope above the PVC pipe gray to represent city blocks and paint the tray bottom below the pipe blue to represent the river. Let the paint dry.
6. Paint black lines to create streets surrounding the gray city blocks. Let it dry, then use white-out to paint dashed lines on the streets.
7. Spray paint the tray with a few more coats of clear primer. Let it dry.
8. Assemble 4 small Lego buildings.
9. Glue the magnets to the bottom of Lego buildings. Let the glue set.
10. Cut the yellow and brown foam sheets into tiny squares.
11. Cut the sponges and scour pad into smaller pieces that are different sizes for each sponge color. Place in different containers.
 - Smallest sponge = rain barrels (orange in photo)
 - Next smallest sponge = green roofs (light green in photo)
 - Medium sized sponge = rain gardens (purple in photo)
 - Largest sponge = urban forests (blue in photo)
 - Thin large scour pad = grassy spaces (dark green in photo)

Experiment Instructions

PART ONE

1. Fill up the measuring cup with 2 cups of water.
2. Place the Lego buildings on the paint tray using the magnets.
3. Sprinkle half of the yellow and brown foam dots in the pipe, representing sewage in the sewer.
4. Sprinkle half of the foam dots on the city streets, representing litter, dog poop, excess fertilizer and pesticides, and other pollution.
5. What do you predict will happen when it rains over this model city?

PART TWO

6. Measure out 1.5 cups of water into the watering can, then pour that water over the city's buildings and streets as rain.
7. What happened? Where did you see water flowing in the model? Does this look similar to anything you've seen during real storms? Stormwater picks up pollution on streets then enters our sewers. Too much rain overwhelms the sewers, which then overflow to our rivers. How much water do you predict ran off of the city into the river?
8. Take the buildings off the tray. Pour the water back into the measuring cup through the mesh strainer to filter out the foam dots.
9. How much water did you pour back into the cup? Why do you think that much water ran off of the city?

PART THREE

10. Now it's time for you to design stormwater solutions for the city. Green stormwater infrastructure is engineered with tools like water storage, plants, and soil to soak up rain before it gets to the sewers. The sponges represent different types of green stormwater infrastructure: rain barrels, green roofs, rain gardens, urban forests, and grassy spaces. Read about each type below.
11. Place enough sponges on the city to make something different happen when it rains again.
12. What do you think will happen this time when another storm of 1.5 cups of water hits your model city?

← RAIN BARRELS

- These containers are attached to downspouts and used to catch rain from building roofs.
- Captured rain barrel water can be used to water garden plants, wash outdoor tools, or simply flow slowly out onto a yard away from buildings.
- Residents can install rain barrels at home, and businesses can install larger rain barrels called cisterns on commercial buildings.





← Green Roofs

- These roofs are specially engineered to capture stormwater with plants and soil.
- They also help insulate buildings, keeping them cool in the summer and warm in the winter, which lowers energy costs
- It is more common to see green roofs on flat commercial building roofs than on sloped roofs.

Rain Gardens →

- These gardens are designed to catch, slow, and absorb stormwater runoff from driveways, sidewalks, and streets.
- The plants provide habitat for pollinators, like bees and butterflies.
- The Pittsburgh Water and Sewer Authority is building large rain gardens with underground water storage throughout the city.
- Residents can also create rain gardens in their yards.



← Urban Forests

- Trees benefit human health and provide habitat for wildlife.
- Tree canopies slow down rain before it hits the ground and tree roots absorb lots of stormwater.
- Trees also provide shade, keeping streets and parks cool in the summer.

Grassy Spaces →

- Offer places for recreation and relaxation.
- Grass and the soil absorb and hold water after it rains, though not as much as trees or rain gardens.
- Grassy spaces stay cooler than paved surfaces in the summer.



PART FOUR

13. Pour 1.5 cups of water over the city's buildings and streets again.
14. What happened? What was different this time? How much water do you predict ran off of the city?
15. Take the buildings and sponges off the tray without squeezing any water out of them. Pour the water in the tray into the measuring cup.
16. How much water ran off of the model city? Compare this amount to the previous rain storm. Does green infrastructure help to hold back rainwater? Can you think of other ways to reduce pollution and flooding?

Thank you to the Pittsburgh Climate & Urban Systems Partnership (CUSP) for developing this Extreme Events activity. Learn more at www.cuspproject.org/cities/pittsburgh and www.pgh2o.com/education-for-kids.