

Preparing for a Wetter Philadelphia

ACTIVITY TYPE: Hands-on exploration

AUDIENCE: All ages

TIME FRAME: 5-10 minutes

SUMMARY:

The Ready Row Home kit is a model urban streetscape that invites learners to explore ways to prepare for living in a wetter Philadelphia. Guests will learn that climate change will cause more heavy downpours in Philadelphia, that heavy downpours lead to flooding and sewage overflow into waterways, and that real-life green infrastructure – like rain gardens, rain barrels, and pervious pavement – can help manage increased rainwater volumes.

MATERIALS:

1. Model Ready Row Home
2. Sponges to represent green roofs/planters
3. Mini rain barrels (2)
4. Clear plastic container to collect storm drain outflow with purple rubber band wrapped around (the rubber band represents maximum sewer volume)
5. Small red watering can
6. Stopwatch or any timer

SET UP:

1. Place Ready Row Home on blue bin lid, with the printed graphic facing upwards
2. Ensure red watering can is filled with water

PROCEDURE:

1. Engage guests in conversation by asking how they think climate change is impacting Philadelphia.

- a. Many guests will be familiar that climate change means hotter temperatures, but may not also realize that it's getting wetter, too
 - b. Here's a standard script: *Climate change means it's going to be getting much wetter in Philadelphia. The Northeastern United States has been experiencing more frequent extreme precipitation events than any other region in the United States. According to the National Climate Assessment, between 1958 and 2010, the Northeast saw more than a 70% increase in the amount of precipitation falling in very heavy events. Scientists project that climate change will cause heavy downpours to become even more common and intense because air temperatures are increasing, warmer air holds more moisture, causing more rain to fall at once.*
 - c. **Note: There may be some confusion here because many people associate climate change with hotter temperatures and increase droughts. Clarify that climate change will be redistributing precipitation patterns, so that while Philadelphia will receive more rain during heavy events, other parts of the country will receive much less.**
2. Introduce the Ready Row Home as a model of a typical Philadelphia block. Explain that we'll use the Ready Row Home to help us explore what happens when rain falls on cities like Philadelphia.
 - a. Point out the following features: gutters, downspouts, storm drains, sewer opening
 3. Show guests your clear plastic container that will act as your "sewer" to collect rainfall. Note that the purple rubber band signifies maximum volume in the sewer. Tip the row home backward and place the plastic "sewer" beneath the storm drain.
 4. Explain to your guests that you're going to "make it rain" on the city sidewalk using your red watering can. Ensure that the watering can's shower spout is on and explain to your guests that this will simulate a typical, gentle rain shower
 5. Gently pour the red watering can over the Row Home's roof and sidewalks, back and forth, for ~10 seconds
 - a. Have your guests countdown, "3...2...1..." and help you count upwards of 10 seconds
 6. After you are finished "making it rain," ask your guests where they noticed the rain was running off to.
 - a. Point out that it flowed off the roof and into the gutters and eventually into the storm drain. Water may pool a bit on the sidewalk, on the roof, or in the street – you can point this out, too
 7. Explain to guests that it's time now to measure how much water went into the sewer. Say this as you are tipping back the Row Home and removing the storm drain.
 - a. Note the volume of water in the "sewer" in relation to the purple rubber band. The water level it should be below or at the rubber band – tell guests that this is a typical gentle rainstorm, it does not overwhelm the sewage system.
 8. Pour the water in the sewer into the red watering can

9. Remove the shower head from the watering can and explain to guests that you're going to simulate a heavy downpour event now
10. Repeat Steps 4-6. **Note: Pour gently. If you pour too rapidly it can get messy!**
11. After you are finished "making it rain," ask your guests where they noticed the rain was running off to this time. *How is it different than the previous, gentle rainstorm?*
 - a. Point out heavy pooling on the roof (*This can cause roof leaking!*) and on the sidewalk and street (*This can cause flooding in our basements - perhaps leading to more pests - and flooding along the streets, which may impact traffic.*)
12. Explain to guests that it's time now to measure how much water went into the sewer during a heavy downpour event. Say this as you are tipping back the Row Home and removing the storm drain.
 - a. When you reveal the sewer now, water should exceed the purple rubber band
 - b. Why is this a problem? Explain that Philadelphia has combined sewage system. Here's a standard script: *Most of Philadelphia has a combined sewer system—household sewage and stormwater all end up in the same pipe on its way to a water treatment plant. But if too much water comes at once, the overflow of combined stormwater and sewage goes straight into waterways, or can even back up onto streets!*
13. Pour the water in the sewer into the red watering can
14. Challenge your guests to think about how we can manage future heavy downpours
 - a. Here's a sample script: *We certainly can't stop the rain from coming, or spread it out to make it come a little at a time, so what could we do to solve this problem? The old ways of dealing with rain water don't seem to be adequate for a wetter city. Digging up sewers and building water treatment plants takes a lot of time and money. In Philadelphia, one of the things people are working on is absorbing or slowing down the water, so it doesn't all go into the sewer at once.*
15. Show guests the sponges and rain barrels and explain that they can be used to slow the rate at which rain enters the sewer and reduces the overall amount
 - a. Here's a sample script: *One great way to soak up rain water is with gardens—plants use up water, and the soil they're planted in absorbs water like a sponge. Another is to find holding places where the water can be stored and either used for other things or released back into sewers later when the water level is lower.*
16. Ask guests (especially younger guests) to help you place the sponges on the Row Home. **Note: Guide guests where to place rain barrels (directly beneath the downspouts) and the sponges (they can go on roofs and sidewalks, but not on the road, that would block traffic!)**
17. Ask guests to predict what will happen if it rains again – *Where will water go? How much will end up in the sewer?*
18. Repeat Steps 4-6. **Note: You are once again simulating a heavy downpour –the watering can should not have the shower head on it**

19. Tip back the Row Home and inspect the storm drain again
 - a. Water levels should be below the purple rubber band, indicating we have not overwhelmed the sewage system
20. To close, ask your guests, “What are some ways you could make this happen in your neighborhood?”
 - a. This is an excellent opportunity to engage parents/adults while younger guests help squeeze water from the sponges back into the watering can. Provide information on programs/resources related to the activity.

TAKE IT FURTHER:

Many Philadelphia residents will be interested in understanding how they can help implement these solutions along their own block. Recommend that guests check out the Office of Sustainability’s Greenworks Program – this is the City of Philadelphia’s official climate adaptation plan. It provides information on green infrastructure solutions available to Philadelphia residents (many of which are free!).

ADAPTATIONS:

- For younger guests, simplify the process to communicate the following take home messages:
 - Climate change is making Philadelphia hotter, making summer heat waves are becoming both longer and hotter.
 - Tree cover helps cool city blocks.

WHAT’S THE SCIENCE?

- Evapotranspiration
 - Trees & other plants have high amounts of water in them. Water has a very high specific heat, meaning it takes a lot of energy to warm it up – energy that would otherwise be absorbed by other city surfaces, like roads and sidewalks, and raise the ambient air temperature