Educator's Guide

Welcome to the Sewer in a Suitcase!

Urban areas use huge quantities of water – for drinking, cleaning, flushing, watering, manufacturing – you name it. New York City alone uses over ONE BILLION gallons of water every day! Where does it all come from? How does it get to us? What happens to it after we've used it?

The Sewer in a Suitcase is a model of a city sewer and water treatment system that was created to explore these and other questions about urban water systems, and New York City's system in particular. Like many older American cities, New York City relies on something called a combined sewer system. That just means that dirty water from buildings is collected into the same network of sewer pipes as stormwater from streets and rooftops. When it rains a lot, the amount of stormwater can be too much for this system to handle, and the combined sewage and stormwater spill over directly into local waterways, like the Hudson and East Rivers. And yes, it's as gross as it sounds.

That's how the Sewer in a Suitcase works, too. Under the streetscape is a working model of a combined sewer system, just like the one under our city streets. This guide will help you lead your students through the ins and outs of the real system, using the pieces contained in the Sewer in the Suitcase. All you need to do is add water!

Here's what you'll find in this guide:

- An introduction to using the model.
- A series of activities that use the model to explore how combined sewer overflow happens. These exercises are marked with a special icon  in the Table of Contents and at the top of each activity.
- Additional activities that further explore water infrastructure, pollution, and urban environmental health, without the use of the model.
- Next steps for following up on what you have learned.
- Instructions for caring for your Sewer in a Suitcase.
- Additional resources on these topics and a glossary of terms.

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Caring for Your Sewer in a Suitcase

How the Booklet Works

This booklet is aimed at educators, and the activities and concepts include questions and talking points that you can use to lead discussion in your classroom. Those sentences are called out with speech bubbles like this:

Sewer in a Suitcase in the Classroom

If you complete all the activities in this booklet, it will take you roughly 1 hour and 45 minutes. If you focus on the exercises with the model, you can complete them in a single 40-45 minute class period, excluding the 5 minutes of set-up time and 10 minutes of clean-up.

You can also create a 3-day lesson plan:

- Day 1. Activities 1 & 2; Concepts 1 & 2
- Day 2. Activities 3, 4, & 6, with the model
- Day 3. Concept 3; Activities 5 & 7

We've provided some background information on watersheds and other concepts. You can use it to introduce the activites with the model, or bring in your own material, or just jump right in to the activities.

NY State Learning Standards Addressed

Health, PE, & Family and Consumer Sciences

Standard 2 – A Safe and Healthy Environment

Students will acquire the knowledge and ability necessary to create and maintain a safe and healthy environment.

Standard 3 – Resource Management

Students will understand and be able to manage their personal and community resources.

Math, Science, Technology

Standard 1 – Analysis, Inquiry, Design

Students will use mathematical analysis, scientific inquiry, and engineering design, as appropriate, to pose questions, seek answers, and develop solutions.

Standard 4 – Science

Students will understand and apply scientific concepts, principles, and theories pertaining to the physical setting and living environment and recognize the historical development of ideas in science.

Standard 7 – Interdisciplinary Problem Solving

Students will apply the knowledge and thinking skills of mathematics, science, and technology to address real-life problems and make informed decisions.

Social Studies

Standard 3 – Geography

Students will use a variety of intellectual skills to demonstrate their understanding of the geography of the interdependent world in which we live – local, national, and global – including the distribution of people, places, and environments over the Earth's surface.

Standard 5 – Civics, Citizenship, and Government

Students will use a variety of intellectual skills to demonstrate their understanding of the necessity for establishing governments; the governmental system of the United States and other nations; the United States Constitution; the basic civil values of American constitutional democracy; and the roles, rights, and responsibilities of citizenship, including avenues for participation.

Introduction

Getting Your Feet Wet

Most of us would be hard-pressed to describe exactly how the everyday things that we see around us really work, especially infrastructure systems that are complicated and almost completely invisible.

This activity is meant to warm students up to the idea that the water we use comes from somewhere, and it probably goes somewhere beyond the drains in our homes. It will get students thinking about what they know and don't know before diving into the model.

Activity One
Before and After

Learning Objective
Students will articulate and share their existing ideas of where water comes from and what happens after we use it.

Materials
- Paper
- Any available drawing tools (pens, pencils, colored pencils, etc.)

Time
20 minutes

Instructions

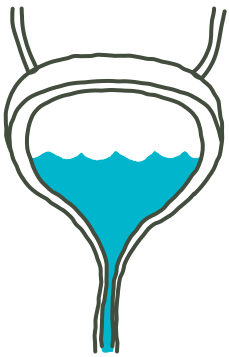
1. Draw the bladder

Hand out a sheet of paper to each student. On your blackboard, draw the bladder shown on the opposite page. Have the students draw the same thing, about an inch high, at the center of their pages. (Or, you can photocopy the opposite page onto larger sheets of paper and hand them out.)

This is your bladder. It is the frontier for water coming in and going out of your body.

2. Brainstorm water uses

Can anyone give an example of how they used water so far today?



Collect several examples. This discussion might swerve into toilet talk. Steel yourself!

3. Draw the process

On your sheet of paper, draw the route you think water takes to get to your bladder and where it goes from there. Show all the steps it takes to get inside "your bladder," and all the steps it takes after it comes out.

Encourage them to be creative. Let them draw fantastical or silly steps where they don't know something. The idea is to get the conversation started.

Give students 5-10 minutes or so to draw out their ideas. If people get stumped, you might ask:

Ok, what happened before that, what happened after that?

Sometimes the drawings can become quite elaborate. You should draw your own version, too.

4. Share out

Share the drawings as a group. Ask students to volunteer to describe the story they've drawn. Note recurring themes, whether or not they're realistic. You might find that some people come up with more advanced technologies than what is really out there, while others use magic to get water from point A to B!

5. Put the ideas together

Based on the conversation, make a drawing on the board of the route that water takes to get to the bladder, including all the steps the group can think of.

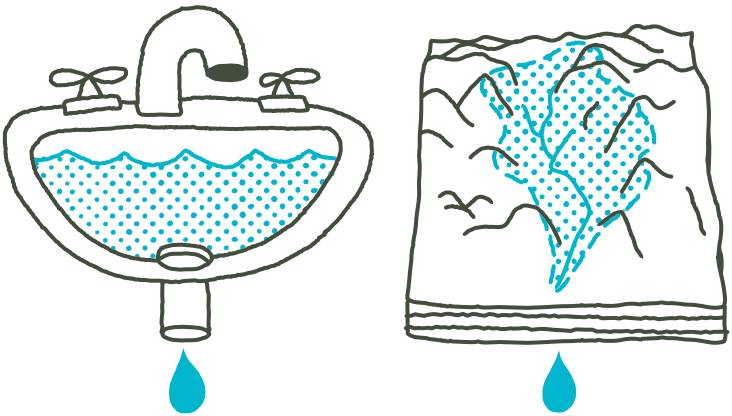
Producing and sharing the drawings helps us build our understanding together. We all have some idea of where water comes from and where it goes, and by sharing what we know, we become collaborators in finding the answer.

Concept One
The Watershed

When it rains, water hits the ground and flows downhill, usually finding its way into a waterbody like a river or stream. The term watershed is used to describe any area of land that drains into a particular river, lake, reservoir, or other waterbody.

A watershed is like the bathroom sink in your home. The sides of the sink are mountain ranges; they form a bowl shape in the landscape. When it rains on this landscape, water streams down the sides of the bowl and collects at the low part in the center.

Like your sink, watersheds also have a "drain." Gravity carries water down the mountains where it collects in a stream, then a river, and eventually makes its way to the ocean. The body of water that carries the rainwater to the sea is like the drain



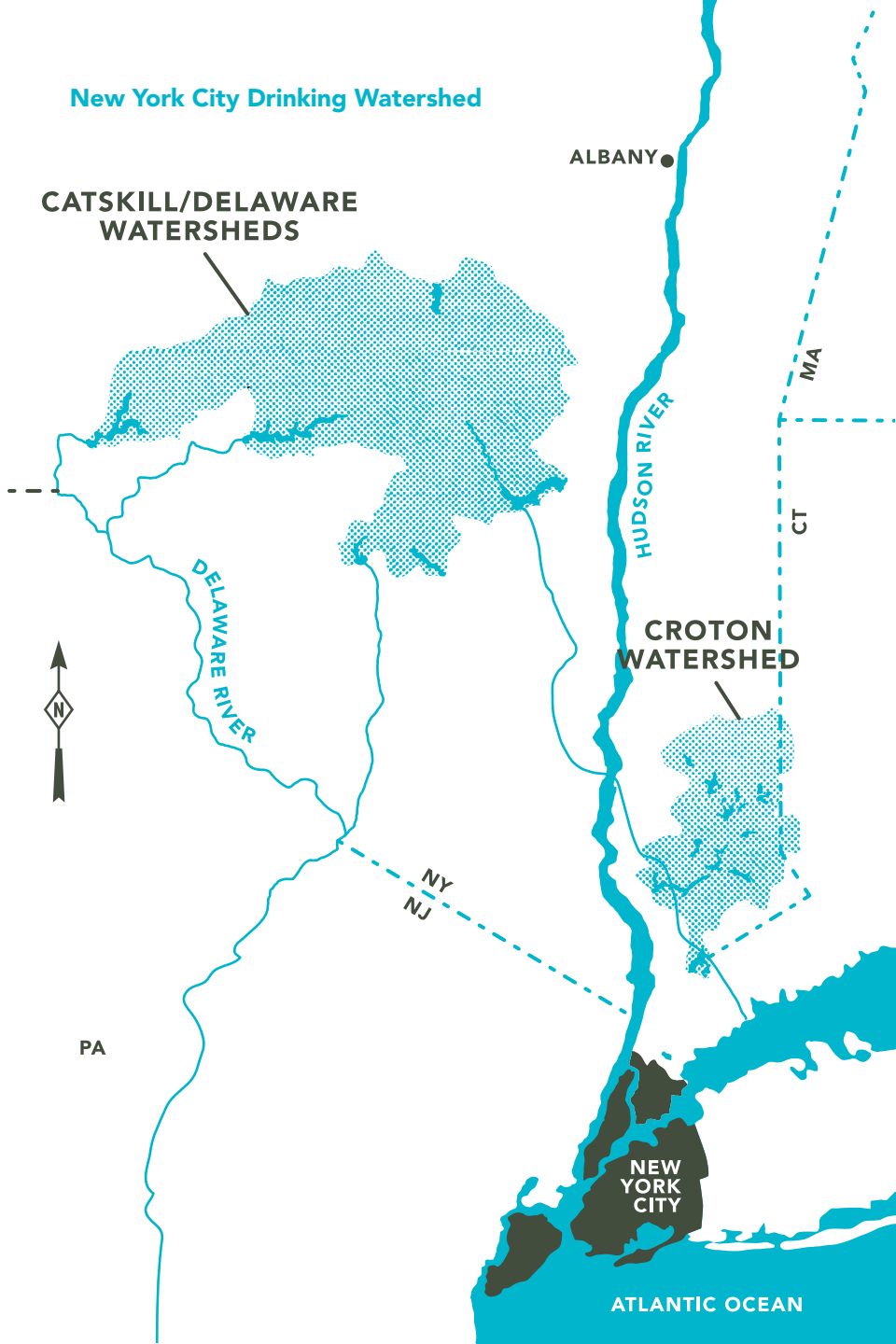
pipe carrying the water away from your sink. Where do you think that water goes? We're going to find out.

Most people think of a "watershed" as a green, forested area, far from the city. But watersheds are actually everywhere, and they come in many different sizes. After all, it rains everywhere, and all that water has to end up somewhere or we'd all be underwater by now.

For example, the Hudson River extends far north of the city, but the Hudson River's watershed – the area of land it collects water from – extends even farther upstate, almost to Canada. On the other hand, a puddle in the middle of a parking lot could be thought of as a very small watershed, one that might only collect water from a radius of several parking spots.

That puddle exists inside of a larger watershed, though, and large watersheds are made up of many smaller ones.

Many small streams will flow into a larger river, and that river might join other rivers to flow into a lake or a larger river, or even the ocean. Get the picture? Watersheds are everywhere, and they can move water very, very long distances.


New York City Drinking Watershed
ALBANY
CATSKILL/DELAWARE WATERSHEDS
HUDSON RIVER
MA
CT
DELAWARE RIVER
CROTON WATERSHED
N
NY
NJ
PA
NEW YORK CITY
ATLANTIC OCEAN

Activity Two
Pass the Goo

Learning Objective
Students will learn what happens to water as it travels from its source (the watershed) to the city, and how activities far away can affect New York City's water quality.

Materials
- Goo (like the sticky hands you get at supermarket toy vending machines)

Note: If goo isn't available, you can use a sheet of blue paper or some clay.

- A sign with ***"Catskill/Delaware Watershed"*** written on it
- A sign with ***"New York City"*** written on it
- A map of NYC's drinking watershed, like the one on the previous page

Note: You can also print a map of the watershed here:
www.nyc.gov/html/dep/html/drinking_water/wsmaps_wide.shtml

Time
15 minutes

Instructions
1. Look at the watershed

Introduce students to New York City's water supply system by showing them the drinking watershed map.

This is where our water comes from. New York City's drinking water comes from three different watersheds.

A watershed is an area of land that catches rain and snow-melt and collects it into a reservoir. A reservoir is like a lake. It is a natural or man-made body of water that collects and holds water from its watershed, to be piped away for use by a city. The water from these reservoirs rushes downhill and brings water to NYC.

Lead the students through Concept One – Watersheds, if you haven't already. Show the students the diagram of the sink and the drain.

How is the watershed like a sink and a drain? What do you think forms the edge of the watershed? How does the water collect in the reservoir? How do you think it gets from the reservoir to the city?

So this is the water that you get when you turn on the faucet. It's what we drink, what we shower with, and what we wash our cars with. It's pretty crazy that something so important to the city is coming from so far outside of the city. We're going to recreate this process.

2. Recreate the watershed

Line up the students in a row by height, from tallest to shortest. The tallest person is way above sea level. Give them the Catskill/Delaware watershed sign.

You are where New York City gets 90% of its water.

Give the shortest person the New York City sign. They're at sea level.

You are New York City. Why did I line you up from tallest to shortest?

3. Pass the goo

Give the tallest student the goo (or alternative).

Each of you can do whatever you want with the water when it's your turn. When you are done with the goo, pass it to the next person downstream from you.

Let the students pass the goo all the way through the watershed to New York City.

4. Discuss

What happened to the goo? What's better? Being upstream or downstream? Why?

If people pollute one part of the watershed, it can end up somewhere else downstream. The cleaner the water, the more ways humans and wildlife can safely use that water. The more polluted it gets, the less the water can be used for. Once pollution is in the water, it can be difficult and expensive to remove it.

What could be happening upstream in upstate New York that has an effect on the water we drink?

Activities related to development can create a lot of pollution, like leaking underground septic systems, runoff from roads and from lawn fertilizers, air pollution from lots of cars, and commercial or industrial pollution, just to name a few.

How do you think New York City tries to keep that from happening?

Here are some ways:

The water comes from the reservoirs through pipes instead of open waterways so pollution doesn't build up along the way.

New York City has spent a lot of money buying land around the reservoirs to create a buffer from pollution, and trying to get other landowners to minimize polluting activites near the watershed. The city also lobbies to keep development out of certain undeveloped areas upstate. (What do you think residents upstate think about New Yorkers telling them what kind of development they should or should not allow?)

The water is treated before it gets into the pipes in your building. Even though the reservoir water is very clean, the city still treats the drinking water it provides to you.

New York City's drinking water is treated with chlorine (to disinfect), fluoride (to prevent tooth decay), orthophosphate (to prevent metals on pipes from being released into the water), and in some cases, sodium hydroxide (to prevent corrosion in the pipes).

Ask students to come up with different ways you could try to keep the drinking water clean upstate and as it makes its way into the city. Encourage them to think of different approaches.

Could you pass laws to change people's behavior upstate? Could you use technology to keep the water clean? Could you bury all the water in underground caverns to keep pollution out? Could you buy up all the land? What else could you do?

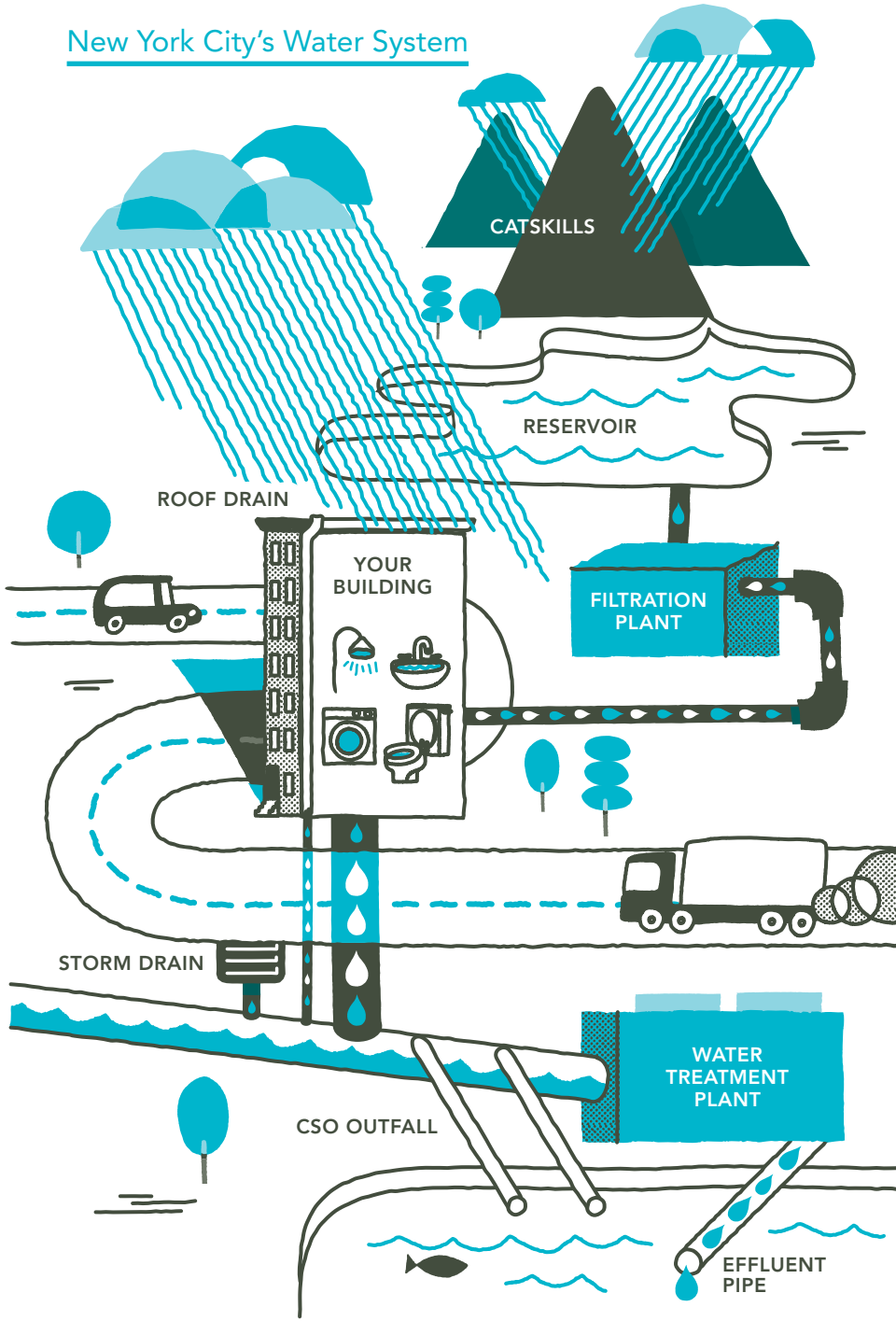
Concept Two
New York City Is a Watershed

The following information can be incorporated into your "script" as you run the Sewer in a Suitcase model. This is a good section to familiarize yourself with before leading the model exploration, or to use as review material for your class. After the script, we take you on a tour of the model mechanics. Let's get to it.

What happens to rain in New York City? An urban watershed like New York's is just like the one in the Catskills, it just has more buildings and roads and less undeveloped landscape. Most rain and snow fall on the pavement and rooftops instead of landing on grass and trees; most drinking water is piped in from other places; and sewer systems help remove pollution before water is released to local waterways. One of the most prominent features of an urban watershed is that there are many, many people living here, and they use a lot of water.

What are all the parts of an urban watershed? Use the drawing, opposite, to brush up before you present the model to your students, or use it with your students to introduce the concepts you'll explore in the model. (You can also use the unlabeled version of the drawing at the back of the book to quiz them later on.)

New York City's Water System



Where does the water come from?

No matter where it ends up, most of the water in the city comes from rain. Some of it falls far upstate and is captured in reservoirs before being carried to the city.

What happens to rain in the city?

Rain and snow in the city usually fall on streets, roofs, and other hard surfaces. Along with water from hoses and other outdoor uses, it runs into gutters and storm drains, which lead into the underground sewer system.

What are all the things you saw on the street or sidewalk this morning? What do you think happens to that stuff when it rains?

Rainwater picks things up along the way, like trash, pollutants from car exhaust, animal poo, and everything else we spill or drop on the ground, including chemicals.

The urban environment isn't all paved. In addition to roads and buildings, there are green spaces like parks. Grass and other unpaved surfaces are absorbent or "spongy."

What do you think happens to water when it comes in contact with grass and trees?

Instead of rolling across their surfaces, water is captured and slowly released through evaporation or absorbed into tree and other plant roots.

Okay, that's what happens to water outside. What about inside? Where does water in your building come from?

Drinking water in New York comes from reservoirs upstate. The water is piped hundreds of miles to the city and into your building.

This is called the treated water supply. It's the water that you drink, shower in, and flush with. It's clean water provided by the city and drawn from the regional watershed. That means that every time you flush the toilet, the water that fills the bowl has traveled hundreds of miles and been treated, just to carry away your poo!

What do you do with that water?

The treated water supply is used lots of different ways inside of buildings (toilets, showers, sinks, etc.) and then drains into the sewer system after we use it, carrying soap, food, and whatever we flush down the toilet along with it.

Okay, and then where does it go?

After water is used, a network of pipes normally carries it from our buildings and from street drains to the water treatment plant. At the treatment plant, pollution is removed and then the cleaned water is returned to local waterways through effluent pipes. (The stuff that gets cleaned out of the water goes to landfills or is used for fertilizer.)

This network is called a combined sewer system, because it receives both wastewater from buildings and stormwater from streets, and sometimes combines them during heavy rains. This is the type of system most older U.S. cities have.

What do you think happens when the building sewage is combined with stormwater from streets?

During heavy rains, the system can be overwhelmed by the amount of water. At this point, an overflow valve allows the dirty building water to combine with the water from street drains and both spill out directly into local waterbodies through the CSO outfall. This is basically poo water mixed with rain.

And where does it go?

It goes into the local waterways, bodies of water like the Hudson River, East River, or Bronx River (just to name a few) that receive water from the landscape around them. This includes rainwater, treated wastewater, or sewer overflow, depending on the weather.

Meet the Model
(For Teachers)

The Sewer in a Suitcase is a model of New York City's urban watershed. The next few activities use the model. This set-up section is for you to use before the class activities.

Take a moment to read through the description of the parts as you unpack the model. The pieces of the model correspond with the elements described in the previous section, and are shown in the drawing on page 28.

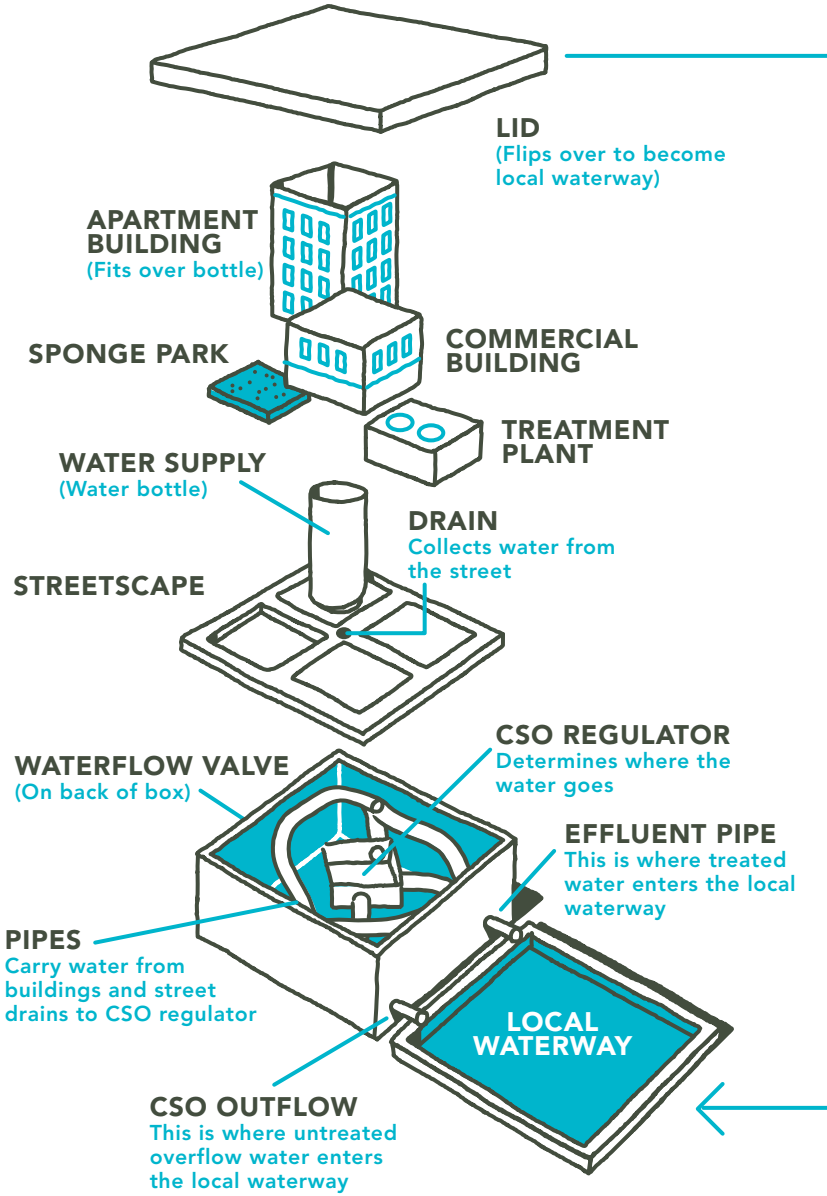
The Sewer in a Suitcase has three basic levels: the Suitcase, the Streetscape, and the Sewer System.

Level 1. The Suitcase. Inside the case is a model of a city and a sewer system. Open the lid to reveal the streetscape. The lid can be flipped upside down, with the blue side facing up, and placed in front of the box, where it becomes the local waterway. Make sure it is placed under the effluent pipe and CSO outfall.

Level 2. The Streetscape. The streetscape represents a typical urban environment, with roads, buildings, and parks.

Lift the streetscape to get the rest of the items you'll need for set-up. These include the three buildings, the water bottle, and the bag of glitter. (Note: when you put the streetscape back down, make sure the sponge park or depression in the streetscape is in the back, left corner if you are facing the part of the model with the tubes sticking out.)

The Sewer in a Suitcase



The water bottle represents the treated water supply, the water that comes out of the tap or the shower when you turn it on at home. To set it up, screw the water bottle into the cap built into the streetscape. Be sure to screw it in tightly to prevent water from leaking.

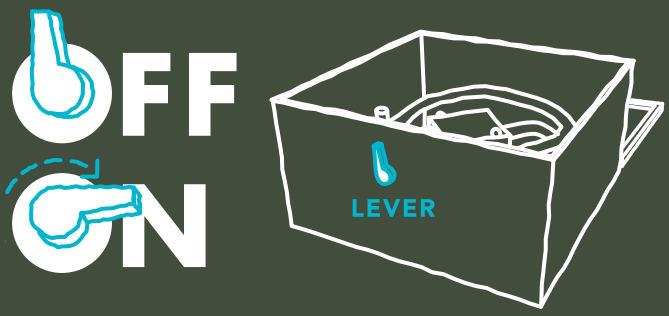
Now you can erect the buildings. The apartment building is the tallest one, and it should slide over the slot containing the water bottle. The sewage treatment plant should slide over the slot near the effluent pipe, across the street from the apartment building. The last building goes in the space diagonally across from the apartment building.

In the center of the streetscape is a hole, the storm drain, where surface water gets carried to the sewer system.

The urban environment isn't all built up. In addition to roads and buildings, there are green spaces like Sponge Park. The sponge represents an open space with an absorbent, "spongy" surface that holds water or slowly releases it through evaporation. Insert the green sponge included in the kit into the indented space on the streetscape.

Level 3. The Sewer System. Under the street level are the pipes that carry wastewater to several places, depending on the weather.

On the outside of the box, opposite the side with tubes, you will find the building valve, which controls the release of water from the apartment buildings into the pipe system. You will turn this on and off to allow water to flow out during the activities. Make sure it is in the off position (lever turned vertical) before you begin. Turning the lever to the on, or horizontal, position allows water to flow from the apartment building.



The regulator directs the movement of water through the system. Usually it directs water to the treatment plant (in the model, this is represented by the filter, which screens out pollution). When it is inundated, water escapes through the CSO outfall.

Your kit also includes a bag of terrible pollution (which might look a lot like glitter). You will use it in the activities to see how pollution travels through the system and into our local waterways.

Meet the Model
(For Students)

Now it's time to introduce the model to your students. With the model set up, begin a discussion about how water travels through the city.

Here's a model of a NYC street. Is it a watershed? Where does water go in the city?

Ask students if they can identify the various parts of the model, based on what they learned in the previous section.

If you didn't use that section, you could just have them identify the obvious ones, and then tell them about the others yourself. There are some clues on the buildings that you can point to. For example, the water treatment plant has a big drop of water.

Activity Three
Sunny Day Flow

Learning Objective
Students will learn what happens to water after it goes down the drain.

Time 10 minutes

Materials
- Sewer in a Suitcase
- A one liter/quart container filled with tap water
- A tablespoon

Instructions
1. Set up

Making sure that the **building valve** is closed, fill the **apartment building** almost to the top with tap water. (This is about 32 ounces of water.)

NOTE

The Local Waterway is fairly shallow and can be difficult to handle when it is filled with water. You may want to have a bucket or tub nearby that you can pour the water into between activities without having to carry it far. If you have a sink in your classroom, you might want to set up nearby. When you empty the water, you may want to have a student hold up a sieve or fine strainer to catch the pollution from the water so that you can keep reusing it.

This represents our clean drinking water! Where does it come from?

2. Let it flow

Release the **building valve** (or ask a student to release it) and allow some of the water to flow through the system until you can see it coming out of the **effluent pipe**. Turn off the valve.

Where does the water go?

3. Discuss common water uses

How have you used water already today? Has anyone flushed a toilet? Taken a shower? Brushed their teeth? What else has gone down the drain?

Show the students the back of the **apartment building** for clues. For example, there's a toilet, a shower head, some soap, and some toothpaste.

4. Add the pollution

As students call out water uses, add a heaping tablespoon of **terrible pollution** to the **apartment building** water by shaking it out over the tank. Use the spoon to stir the water so that the **terrible pollution** is distributed throughout the water.

This is terrible pollution. It is made up of all the things we flushed down the toilet or washed down the sink.

What do you think will happen to the terrible pollution when we turn the valve again?

5. Follow the pollution

Now, ask a student to open the **building valve** until you see water spill out of the **effluent pipe** into the **local waterway**. (You can let all of the water flow out as you discuss what is happening. Stir the water in the bottle if the glitter sticks to the inside of the bottle.)

Where is the pollution?

The sewage treatment plant has removed the terrible pollution! Well, most of it anyway.

6. Find the pollution

Allow the water to empty out from the building. When there is no more water in the building, insert your finger in the drain hole and lift up the streetscape (it is attached to pipes so be careful not to dislodge them) to see where the water and pollution are in the pipes. The filter in the **CSO regulator** is removing pollution like the **treatment plant** does.

Before moving on, you should empty the water from the local waterway. You might want to keep a bucket on hand for your extra water, especially if you are running the model a few times in a row.

Activity Four
Making It Rain

Learning Objectives
Students will learn how the sewer system overflows during heavy rainfall, and the forms of pollution that can result.

Time 15 minutes

Materials
- Sewer in a Suitcase
- A one liter/quart container filled with tap water
- A tablespoon

Instructions
1. Introduce the streetscape

Now we are going to explore the **streetscape** of the model. Water moves through the **streetscape** in one of two ways. We just saw how water is pumped into buildings from the water supply and makes its way through the sewer system. Stormwater runs into the streets and also enters the sewer system through the street drains.

What kinds of pollution can collect on the city's streets? Sidewalks? Buildings? Rooftops? Parks?

2. Make a mess

Sprinkle a heaping teaspoon of **terrible pollution** around the **street level**.

What pollution do you make? Pigeons make? Pets make?

Some answers include air pollution, car exhaust, gasoline, animal poo and urine, leaves, and trash. (Have the students look around the model to find evidence of these and other sources of pollution. For example, there is a dirty fire hydrant, there are trucks and cars on the streets, and there's some trash by the restaurant.)

3. Make it rain

Fill the **apartment building** water supply with 32 ounces of water, or most of the way up. Now make sure you have about half that amount of water (or about 16 ounces of water) in your bottle or pitcher. We only need a smaller amount of water because we're going to see what happens during a regular rainfall. (Later, we'll look at a heavy rainfall.)

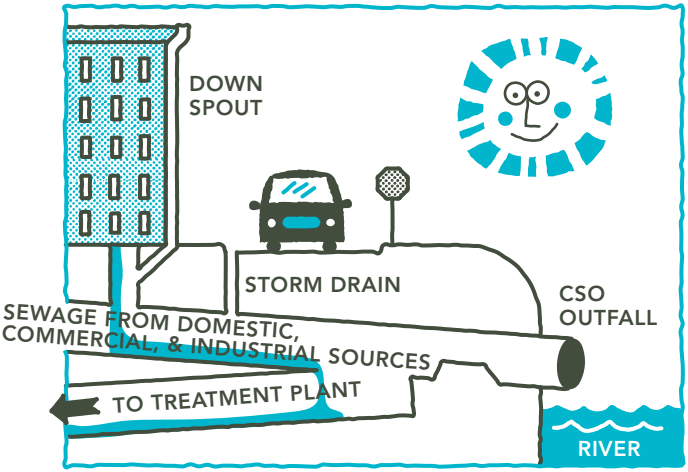
Add some more pollution (about a tablespoon) to the **apartment building**.

Open the **building valve** until you see the **effluent pipe** draining again, and then very slowly pour the remaining water from your bottle or pitcher out over the **streetscape**.

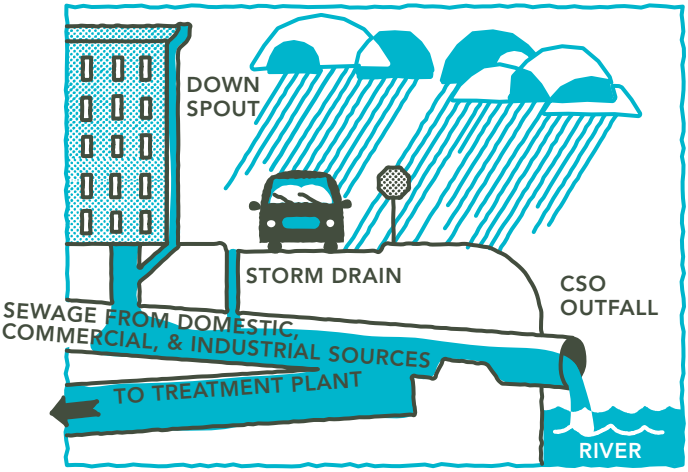
What's happening? Where is the water going? How is it getting there?

There should be clean water coming out through the **effluent pipe**. With the students, look at the dry weather flow drawing at the top of the opposite page, and discuss where the water is coming from and where it is going.

Dry Weather



Wet Weather



Now we're going to see what happens when it REALLY rains.

4. Refill

Close the **building valve**. Empty the **local waterway** again, then refill the **apartment building** water supply (about 32 ounces). Now make sure you have about that same amount of water (32 ounces) in your bottle or pitcher. Add another heaping tablespoon of **terrible pollution** to the **apartment building**.

5. Make it rain harder

What do you think is going to happen when it really rains?

Open the **building valve** until you see the **effluent pipe** draining again, and then quickly dump the remaining water from your bottle or pitcher out over the **street level** in a massive rainstorm, making sure to get it all over the model. Your students can assist by making thunder and rain noises.

See the stormwater moving **terrible pollution** into the **storm drain**.

Now, look at the **effluent pipe** and the **CSO outfall.** During or after the rain, polluted water should be spilling out of the **CSO outfall** and into the **local waterway**.

6. Discuss

What's happening now?
Why is the pollution getting into the waterway?

Here is a brief summary of how the system works. You can also have your class follow along with the wet weather flow drawing on page 37. Be sure to point out the differences between dry/light rain weather and heavy rain.

NYC has a combined sewer system. Combined sewer systems drain both sanitary wastewater from buildings (sewage) as well as stormwater runoff from streets, roofs, and sidewalks. When weather is dry and sunny, the sewer flow is slow and steady to your local sewage treatment plant. But when it's wet outside, stormwater can rapidly fill a combined sewer system to capacity. Instead of making it to the sewage treatment plant, the wastewater and stormwater will overflow to your local waterway without being treated.

What kind of pollution is coming out of the CSO pipe?
Discuss what you have learned about the water entering the system and what it contains (toothpaste, soap, poo, etc.)

How often does this happen? What is a heavy rain?
In New York, it takes less than one inch of rain per hour to cause a combined sewer overflow event. That's one out of every two rainfalls! That means an overflow occurs once a week, on average.

What if we didn't have CSOs?
Though they might seem like a bad idea – poo in the water? No thanks – CSOs are better than what came before them. In the old days, water in New York City often backed up in the streets or inside of people's homes. When it rained, surface water didn't get drained away and the streets, which weren't paved, would be muddy.

What's a better idea?
Later on, we're going to think of better ways to handle our wastewater. Next, though, let's look at what happens to the waterways that get dumped on.

Concept Three
Waterways

Take a look at the local waterway.

What is the local waterway nearest to you right now? Do you ever use it? How?

What do you think the impact is of combined sewer overflow in the waterways?

All the waters surrounding New York City are part of a dynamic ecosystem where a freshwater river (like the Hudson) meets a saltwater sea or ocean (like the Atlantic Ocean). This is called an estuary. People use the waterfront for work, boating, fishing, swimming, research, education, and other activities. When CSO pollution is released into the water, it creates health problems for both wildlife and humans. CSO pollution can contain disease-causing pathogens, heavy metals, nutrients that disrupt the food web, and a wide variety of toxins that can be stored in sediments indefinitely. Not to mention the sights and smells of street litter and toilet water on our beaches and waterfronts.

How might CSO pollution get in the way of activities like fishing and swimming?

Activity Five

What's in My Waterway?

Learning Objective

Students will learn the environmental and public health effects CSOs have on local water bodies.

Time

15 minutes

Materials

- A hat
- Activity cards (see below)
- A photocopier OR index cards and markers
- Scissors
- Goldfish crackers

1. Prepare the cards

Photocopy the card pages in the following section or handwrite the text from them onto index cards. If you're using the photocopied pages, cut out the cards and place them in a hat.

2. Split the class into two groups

Team 1 and Team 2.

Last night, there was a very heavy rainfall. You've decided to go swimming and fishing in the East River and are about to find out what could happen to you.

3. Pick your fate

Have a representative from Team 1 pick a card out of the hat and hand it to a person on Team 2. The member of Team 2 reads the card out loud.

4. True or false?

The person on Team 1 has to decide whether you could really meet that fate from swimming or fishing in the East River.

If they guess correctly, and what they got is not deadly, they get to stay "alive" and keep playing.

If they guess incorrectly, they "die" and have to sit on the floor.

If they guess correctly, and what they got is deadly, they "die" and have to sit on the floor.

The right answer is at the bottom of the card in parentheses.

5. Switch

Now it is Team 2's turn to pick a card, with Team 1 reading it to them, and Team 2 guessing if you could really meet that fate. Teams switch back and forth until either the whole team is dead or the cards run out. The team with the most people still living wins.

6. Resuscitate

Bring everyone back to life with goldfish crackers.

You've got: **DYSENTERY**
You went swimming after a CSO and the water is contaminated with bacteria. You have intestinal inflammation and you're vomiting blood. You decide not to get it treated. You die. Can you really get dysentery?

(yes)

You've got: **CRYPTO**
Some dog poo runoff got into the water. Now you have flu-like symptoms, diarrhea, gas, and nausea. You don't die. Can you really get crypto?

(yes)

You've got: **GIARDIA**
There was a pipe break and you went swimming in untreated water and swallowed some of it. Now you have diarrhea, bloating, and gas because there's a parasite living in your intestines. You don't die. Can you really get Giardia?

(yes)

You've got: **TYPHOID FEVER**
Waste from someone with typhoid fever got into the water. You're sweating like crazy and have diarrhea. You decide not to get treated, and now you are delirious. Your liver gets huge. You die. Can you really get Typhoid Fever?

(yes)

You've got: **FLUORIDE**
So you went swimming and it turns out NYC's water is all treated with fluoride. Now you are less likely to have tooth decay. You don't die. Does the water really have fluoride?

(yes)

You've got: **A THREE FOOT LONG STRIPED BASS**
You caught a huge fish. Too bad bass can have very high levels of mercury. And you've eaten ten bass in the past month, which can cause brain damage. You decide to keep eating this contaminated fish every week. In twenty years, you die. Can you really die from eating all that bass?

(yes)

You've got: **A BLUEFISH**
You caught a bluefish. Too bad bluefish have chemicals in them called PCB's. And you've eaten ten bluefish in the past month, so the PCB's are building up in your body, which may increase your risk of getting cancer. You decide to keep eating this contaminated fish. In twenty years, you die. Can you really die from eating all that bluefish?

(yes)

You've got: **A RAINBOW SMELT**
Nice catch. You decide to eat your fish, but promise to only eat one fish you catch in the East River per month. You don't die. Is it really OK to just eat one smelt per month?

(yes)

You've got: **A POO ON YOUR HEAD**
So there was a CSO and sewage from some buildings got into the water. You don't die, but it is pretty gross. Can you really get a poo on your head?

(yes)

You've got: **SKIN CANCER**
You decided to go swimming and now you have lesions and it's skin cancer. You die. Can you really get skin cancer?

(no, but you can get skin rashes from swimming in the East River)

You've got: **A CIGARETTE BUTT**
You went swimming and a cigarette butt poked you in the eye. These are called "floatables." You don't die. Can you really find floatables in the water?

(yes)

You've got: **A SEA LION**
You went fishing and caught a huge sea lion to share with your whole family. You don't die. Can you really catch a sea lion around here? ***(no, there are no sea lions around here)***

You've got: **SWINE FLU**
You went swimming in the East River and swallowed a lot of water. Now you have a slight case of swine flu. You don't die. Can you really get swine flu?

(no, it's really unlikely that you'd get swine flu from swimming in the East River)

Activity Six
City as Sponge

Learning Objective
Students will learn about viable alternatives to existing CSO systems, and will generate alternatives of their own.

Time 10 minutes

Materials
- Sewer in a Suitcase
- A one liter/quart container filled with tap water

Instructions
1. Types of water

What are the different kinds of water in the city?

Walk the students through the model to find each of the following types of water:

Drinking water – very clean, disinfected, all the water that gets piped to us in our buildings

Wastewater – can be a little polluted ("greywater", like water you washed dishes or clothing with) or a lot (sewage, as in water you flush down the toilet)

Stormwater Runoff – can pick up all kinds of litter and toxins from surfaces like the street

Effluent – treated water from the sewage treatment plant; it's treated, but not as clean as the water we start with

Combined Sewer Overflow – lots of pollution, but can we be sure what or how much?

Local Waterways – in New York, this is often salt water and freshwater mixed, plus all of the other types of water described above!

2. Analyze water treatment options

Do you think these different kinds of water should all be treated the same in the sewer system? Why or why not? Should you be allowed to use them differently?

Some cities allow greywater to be reused to flush toilets or water gardens, or for other uses that do not require pristine water. This kind of system acknowledges that we use water for different purposes that require different levels of cleanliness. It can be difficult to know how people will use the water, though, so some government agencies worry that people will get sick if they drink from a water source meant for other uses.

Greywater reuse is a way to reduce the amount of treated water we use, which can help reduce the demand on the combined sewer system. There are other ways to reduce that demand, as well. Next we'll look at some of those.

3. Demonstrate the sponge park

Remember earlier, when we talked about spongy surfaces? How much of a difference do you think they make?

Pick up the sponge in **Sponge Park** on the model. Hold it over the **local waterway** or a pitcher or sink and squeeze all the water out.

4. What happened?

How do you think Sponge Park affects the amount of pollution that gets into the system? Are you surprised by how much water was in the sponge?

If there were a lot of parks, do you think it would be possible to prevent combined sewer overflow from happening? Why or why not?

What happens to the terrible pollution that made it's way to Sponge Park? Does it come out when you squeeze the sponge?

5. Solutions

What other ways are there to make the city more like a sponge, other than just adding parks?

One way to prevent CSO pollution is to capture stormwater on the surface of the city, making streets, roofs, sidewalks parks, and yards act more like sponges. Using materials that absorb water or that direct water to vegetated areas instead of directly to the

sewer system can reduce the number of CSO events and their severity. Green roofs, street trees, and permeable pavement are just some ways to manage stormwater.

What other ways can we prevent pollution from getting into local waterways?

Although the CSO problem only happens when it rains, we can all help make more space in the sewer system by conserving drinking water (which is all the water that comes in our pipes, whether or not we drink it). The less water that goes into the drains, the less chance there is of overflow.

Another way is to keep the rain out of the sewer system entirely and let it infiltrate into the surfaces of soils, yards, street tree beds, gardens, and parks. This is called stormwater management. Not only can it prevent water from contributing to CSO events, but it also decreases the demand for treated water in the first place by using water collected from rainfall. You can also collect the rain in barrels or other big containers and use it to water plants or a garden. This is called rainwater harvesting, and there are people in New York that are doing it right now.

How can we use less water? What ideas do you have?

How can we add less pollution to wastewater and stormwater?

When overflows occur, the pollution that comes out is only as bad as the pollution that we put down the drain or out on the city's streets. We can all help reduce the severity of CSO pollution by not putting chemicals or other things we know are harmful in the toilet or down the drain; we can use non-toxic soaps and other products; we can dispose of hazardous materials properly (not on the ground outside or down the drain); we can avoid littering; we can make sure we don't leave our pets' poo on the sidewalk… What else can you think of?

In the next activity, you will have a chance to come up with other ideas for how we can prevent sewer overflow or make it less toxic.

Activity Seven
The Future

Learning Objective
Students will learn how other cities are addressing the challenges of CSO pollution and will generate creative visions for improving our sewer system.

Time
20 minutes

Materials
- Large pieces of paper (at least legal-sized)
- Colored markers, a few per person
- Post-it notes

Instructions
1. Give each student a sheet of paper and some markers.

2. Draw your own system
Ask each student to draw how they would improve the sewer system in New York City.

Encourage them to think about the different places in the system that could be altered to make a difference, such as:

- **Using less water in the first place**
- **Reducing the pollution that we put into the water**
- **Keeping water out of street drains**
- **Removing pollution from wastewater before it gets into the waterways**

What other places in the system can be altered to make an impact?

3. Examples

Give some examples that make the students feel more comfortable creating weird and fantastic solutions. Help them think of ways to take concepts discussed above on a smaller scale (don't pollute; don't put chemicals down the drain; create more green space) into larger, systemic solutions, even if they are silly.

For example, students interested in creating more spongy surfaces might propose: a system of gardens that grow on the sides of buildings; a fleet of giant robot sponges that are let loose into the city after a big rainfall; or a giant spongy umbrella that opens over parts of the city that don't have a lot of rooms for parks.

4. Share out

After 10 minutes, ask each student to present their drawing to the room. Put their drawings up on the wall as they present. After everyone has presented, ask:

Is there anything these drawings have in common? What?

Which would you be most excited to see happen? Why?

Or…

4. Pin up the drawings

If you have a very large group or not enough time to present individual drawings, students can be given post-it notes and asked to browse the drawings as though they were at an exhibition. Once students have gotten a chance to look at each drawing, they can write comments on their post-its and attach them to the drawings they are most provoked by. Ideally, the display can be left up for a few days so that the ideas can sink in.

Discuss the ideas in those drawings and what students found interesting about them.

5. Discuss solutions

What are other solutions that people are already using to address this issue? Here are some that are being implemented throughout the U.S. Use this as a springboard for research on how these systems work and what their advantages and disadvantages are. (See the resource section for more information.)

One option is to build more or larger treatment plants. Most of the time, they won't be used to capacity, but in big storms, they would be able to handle the flow. Imagine building new facilities like that in New York City today. It would be very expensive to buy up the land, let alone convince the neighbors to let you put a sewage treatment plant in their community!

Some cities have sewer separation projects to build a second piping system, one for stormwater and one for building waste, but this can be extremely expensive. Think of how many miles of pipes you would have to replace in NYC!

Another solution is to build a CSO storage facility, like a tunnel that can store flow from many sewer connections. When the storm is over, the flows are pumped out to a wastewater treatment plant. Other systems, called retention treatment basins, even treat the water while it is being held.

Screening and disinfection facilities use very fine filters to remove solid pollution from the combined sewage, and chemicals to disinfect the water. The clean water is released and the stuff from the filters is sent to the treatment plant.

Some cities are trying to prevent pollution and excess water from getting into the system in the first place through low impact development. This includes using permeable materials to pave streets and sidewalks, green roofs on buildings, and rain gardens, all of which slow down water moving through the city and allow the soil in the ground to pull pollutants out before the water makes its way into the groundwater or treatment system.

Low impact development, or, as it is sometimes called, green infrastructure, includes many different forms of stormwater management such as rain barrels, rain gardens, infiltration swales, permeable pavement, green roofs, and more.

OK, Now What?

Want to channel your newfound knowledge into action? Here are some things you can do next.

Now that you know the connection between street trash and CSO pollution, you can organize a street clean-up day with your class or your whole school.

You can change your own behavior, like being careful not to litter, or taking shorter showers.

Have someone from one of the organizations listed in the "resources" section come to your class. Better yet, organize a field trip and visit them in their natural habitat. Ideally, your students can prepare questions as a class that they want to ask the speaker so that they're driving the interview experience.

Write a letter about what you'd like to see change in your neighborhood and send it to a decision-maker or someone deeply involved in this issue. You can send it to someone that is working on the issue to show that you support their cause, or you could send it to someone to convince them to change the way the city deals with CSOs. Your city council member, a community board member, or congressional representatives are all good places to start. You can also send it to the editor of your local newspaper, or to The New York Times.

Visit a sewage treatment plant. The Newtown Creek Wastewater Treatment Plant has a visitor's center and a nature walk.

Want your neighborhood to capture more stormwater? Request a street tree, here:
www.milliontreesnyc.org

Or see if your school can start a garden. Even if there isn't enough open space for a lot of plantings, you might be able to have a container garden where you grow plants in large pots.

Look in the Resources section for more information on organizations doing work to improve water quality in your watershed.

Special thanks to the Stormwater Infrastructure Matters (S.W.I.M.) Coalition for these ideas!

Keep CUP informed. If you wrote a letter, or made some drawings, we'd love to see what you made. Please send any feedback or scanned materials to:
info@anothercupdevelopment.org

We love hearing how our Sewer in a Suitcase is being used!

Resources

WATERSHEDS

EPA's Office of Wetlands, Oceans and Watersheds
www.epa.gov/owow/
The U.S. Environmental Protection Agency's website includes an overview of educational resources, grants programs, and research in US watersheds.

NYS Department of Environmental Conservation
www.dec.ny.gov/lands/60135.html
Getting closer to home…This site has maps and overviews of the 17 main watersheds of New York State. For each watershed, there's geographic info, major tributary watersheds, and water quality information.

NYC Department of Environmental Protection
nyc.gov/html/dep/html/drinking_water/index.shtml
Information on the NYC drinking watershed and reservoirs, drinking water quality and protection, and the history of the NYC water supply system.

Watershed Agricultural Council
nycwatershed.org/edu_tours.html
WAC facilitates tours throughout the year to educate visitors to the watershed about agriculture and forestry best management practices.

Arm of the Sea Mask and Puppet Theater performance, City that Drinks the Mountain Sky
www.armofthesea.org/repertoire.php?id=3
Take your students to a puppet performance on the epic story of the creation of New York City's water supply system.

The Relief Map of the New York City Water Supply System
www.queensmuseum.org/a-watershed-moment
Visit a large-scale (almost 700 square feet) model of the New York City watershed on permanent display at the Queens Museum.

URBAN WATERSHEDS IN NEW YORK

The Bronx River Alliance
www.bronxriver.org
Coordinates programs on ecology, education, recreation, habitat restoration, and more along the Bronx River. Partner organizations offer a wide array of opportunities to explore the watershed.

Newtown Creek Alliance
newtowncreekalliance.org
Historic information and current events about one of the city's most industrialized and polluted waterways.

Lower East Side Ecology Center
www.lesecologycenter.org
LESEC offers hands-on exploration of the East River through fishing clinics with the Fishmobile, water quality monitoring, and pollution mapping. They also offer resources like The Citizen's Guide to the Sewershed.

Alley Pond Environmental Center
www.alleypond.com/
APEC provides education and stewardship programs in the unique wetlands habitat and nature preserve of Alley Pond Park in Queens for class visits, the general public, and special events.

The Gowanus Dredgers
waterfrontmuseum.org/dredgers
The Gowanus Dredgers Canoe Club is a volunteer organization dedicated to providing waterfront access and education to the public. They run programs on the shorelines of Gowanus, Red Hook, and DUMBO.

STORMWATER MANAGEMENT

Sustainable Stormwater Management Plan
www.nyc.gov/html/planyc2030/html/stormwater/stormwater.shtml
New York City's plan to address stormwater management issues.

NYC Soil and Water Conservation District
www.nycswcd.net
A representative body that works to conserve the soil and water resources of New York City, The District offers resources, stewardship, and education programs on low impact development, soils, and water quality.

NYC Department of Environmental Protection's Staten Island Bluebelt
www.nyc.gov/html/dep/html/dep_projects/bluebelt.shtml
The Staten Island Bluebelt is an award winning, ecologically sound and cost-effective stormwater management for approximately one third of Staten Island's land area.

Stormwater Strategies: Community Responses to Runoff Pollution
www.nrdc.org/water/pollution/storm/stoinx.asp
This May 1999 report from the Natural Resources Defense Council documents some of the most effective strategies being employed by communities around the country to manage stormwater.

Sustainable Raindrops: Cleaning New York Harbor by Greening the Urban Landscape
www.riverkeeper.org/about-us/publications/reports/#
A report published by Riverkeeper in January 2008 that details stormwater management opportunities for NYC.

Swimmable River
www.riverkeeper.org/special/swimmableriver/
Links to finding out if it's safe to swim in your local waterbody.

ACTION

Stormwater Infrastructure Matters (S.W.I.M.) Coalition
swimmablenyc.info
S.W.I.M. is a coalition dedicated to ensuring swimmable waters around New York City through natural, sustainable storm water management practices in our neighborhoods.

HabitatMap
www.habitatmap.org
An online mapping and social networking tool designed to raise awareness about the impact the environment has on human health.

NYC City Council
council.nyc.gov
Learn about your local representative as well as relevant committees to see how issues of environmental and human health, stormwater management, and sustainability are dealt with by local lawmakers.

CSO Documentation Project, Academy of Urban Planning
www.flickr.com/groups/cso-nyc/
Adam Schwartz's high school-level urban geography curriculum includes trying to photograph every sign that marks a CSO outfall in New York City. You can add to his photo pool on Flickr.

Glossary of Terms

combined sewer overflow
(CSO) is the overflow pollution that is released from a combined sewer system during wet weather, when the system becomes inundated with stormwater. CSOs contain rainwater as well as untreated human and industrial waste, toxic materials, and debris. They are a major water pollution concern for the more than 700 American cities that have them.

combined sewer system
sewers that are designed to collect rainwater runoff, domestic sewage, and industrial wastewater in the same pipe and transport the water to a sewage treatment plant, where it is treated and then discharged to a water body. During heavy rains or snowmelt, the volume of water can exceed the capacity of the sewer system or treatment plant, and the system is allowed to overflow and discharge excess wastewater directly to nearby water bodies.

drinking watershed
the area of land from which a city's drinking water is collected, usually into a reservoir. A drinking watershed is typically protected from polluting activities that might contaminate the water supply. New York City's drinking water is stored in multiple reservoirs and brought to the city through a system of aqueducts and tunnels.

effluent
the way we are using this term here, effluent is an outflowing of water from a from a man-made structure such as a sewage treatment plant. Effluent in this sense is the cleaned-up water that is released back into the local waterways.

estuary
where a river meets the sea, forming a transitional zone that is ecologically productive, dynamic and resilient. One of the main features of an estuary is brackish water that results from the mixing of freshwater and salty ocean water, and fluctuates in salinity with the ocean tides.

green infrastructure
in the context of stormwater management, green infrastructure refers to using ecological systems and low-environmental impact techniques, such as rain gardens and permeable surfaces, to absorb rainwater rather than processing it through man-made in-

frastructure like combined sewer systems and treatment plants.

greywater
water that has been used for light activities like laundry or dishwashing and that is not as polluted as sewage. Depending on local laws, greywater can be reused on-site for uses such as watering plants.

household hazardous waste
cleaning products, medicines, and other materials such as batteries that are commonly found in homes but pose environmental hazard when improperly disposed of or discarded into the drainage system. This material can become a part of CSO pollution.

impervious
not penetrable by water. This usually refers to hard surfaces such as a typical road or roof that does not absorb rain water.

low-impact development
according to the EPA, low-impact development is "an approach to land development that works with nature to manage stormwater as close to its source as possible." Similar to the concept of green infrastructure.

outfall
a pipe where discharge such as treated effluent or CSO pollution is released to a local waterway.

pervious
penetrable by water. This usually refers to surfaces that are planted (like rain gardens or green roofs) or porous (like brick pavers) and that can absorb stormwater.

rainwater harvesting
the practice of collecting stormwater off of an impervious surface such as a rooftop or parking lot, and storing it in a rain barrel or cistern for later use, often for greywater uses such as watering a garden.

regulator
a juncture in the sewer system that directs wastewater to the sewage treatment plant or, in wet weather conditions, to a CSO outfall. A regulator is basically an intersection between the sewer pipe that goes to the treatment plant and the CSO outfall.

reservoir
a natural or man-made lake used to store water, such as New York City's drinking water.

runoff
often used with the term stormwater, runoff is rain that collects on an impervious surface. Runoff can pick up pollution from the surfaces it flows across, and can be a problem when it occurs in large volumes.

sewage
sanitary waste, or water that you flush down the toilet, and everything that's in it.

sewage treatment plant
the facility where wastewater is cleaned up before it can be released to your local waterway. At a sewage treatment plant, the sanitary waste, litter, toilet paper, and other solids are removed from the wastewater using screening and skimming techniques, as well as biological systems. A sewage treatment plant might also be called a water pollution control plant.

stormwater
water from rain or snow melt. If stormwater cannot soak into the ground, like in an urban watershed, it can accumulate in large volumes and move pollution with it.

stormwater management
strategies to address pollution and other negative impacts of stormwater runoff. The strategies include rainwater harvesting, green roofs, permeable pavement, and infiltration swales, among others.

urban watershed
like any watershed, an urban watershed describes the area of land that drains into a particular waterbody. However, urban watersheds are characterized by lots of impervious surfaces, engineered sewer systems for handling sewage, dense human population, and polluted runoff.

wastewater
water that has been used in some way that has added pollution to it, and that now requires treatment to be safely returned to the watershed.

water conservation
measures you can take to reduce the amount of drinking water that you use, especially for non-potable uses. For example, using a low-flow showerhead, a low volume toilet, or even turning the water off while you brush your teeth are all water conservation measures.

watershed
any area of land that drains into a particular river, lake, reservoir, or other waterbody.

Cleaning and Caring for Your Sewer in a Suitcase.

Like in the real world, pollution and rain can really take their toll on the Sewer in a Suitcase. For best results, follow these instructions to clean and store it after each use.

1. Refill the apartment building with water, and run the whole thing through the system, to clear out any glitter in the pipes below. (This will make it work better the next time you use it, too.)

2. Pour any remaining water in the local waterway out through a basic kitchen sieve (that you can get in any store that sells kitchen goods) or through the CSO filter. This way you can recapture as much of the pollution as possible, and either reuse it or put it in the trash rather than letting it go down the drain. (See the note below about getting more pollution.)

3. Wipe down the waterway with a paper towel or cloth rag to remove all water. The suitcase is resistant to water, but it will get gross pretty fast if you don't dry it out completely between uses.

4. Remove the buildings. Twist off the bottle from the apartment building. Wipe off any water on the buildings and bottle. Set them aside. Wipe as much glitter as you can out from the grooves on the base where the water bottle attaches onto the model. This will prevent leaks in the future.

5. Wipe down the streetscape to remove any water and glitter. Make sure to dry out the pocket with the Sponge Park, as a lot of water can accumulate in there.

6. Lift the street level and make sure there is no water floating around in the system underground. Wipe off any water you see.

7. Carefully pull out the screen in the CSO regulator. Remove the pollution and keep as much as possible or put it in the trash. To remove any pollution that sticks to the screen, rinse it under a faucet.

8. While the screen is still out, use the sponge from the sponge park or a cloth to soak up the water at the bottom of the CSO regulator. Squeeze as much water as possible out of the sponge and set it aside. It also helps to let the sponge dry a bit before storing it.

9. Clean off as much glitter as you can from the screen at the bottom of the CSO, if any has accumulated there.

10. Put the screen back in the CSO regulator. Place the empty water bottle inside the apartment building and lay both in the bottom of the box. Place the other two buildings in the box, along with the bag of any remaining glitter. They should all fit along the edges of the box walls.

11. Drop the streetscape back into place – remember, the sponge park space goes at the back corner, near the building valve. Place the sponge back into its slot. Close the box, making sure to align the CUP logo with the side of the box that has the pipes coming out of it.

Getting More Pollution.

In the real world, we try to avoid this, but you can't use the Sewer in a Suitcase without it! We have found that glitter works well as pollution. In particular, dark colors like black or brown get right to the point; plus they are more visible in the system. When you run out of the pollution provided, you can find more glitter at local arts and crafts stores, or even at drug stores.

Getting More Parks.

We all want more parks! At some point, your Sponge Park may need to be replaced. You can trim down a supermarket sponge to fit into the streetscape base. 6" x 3-3/4" sponges work best, as they catch and hold more water; they are a little bigger than standard sponges, but still widely available in supermarkets and other stores, and you can use a utility knife to cut them down to size.

The Sewer in a Suitcase Project

The Sewer in a Suitcase was originally developed as part of an Urban Investigation project on water infrastructure in New York City. That project was a collaboration of CUP, Kate Zidar of the Lower East Side Ecology Center, and students from City-as-School. Together, they made a short documentary called The Water Underground, as well as the first version of the Sewer in a Suitcase. With help from the New York City Environmental Fund and a group of designers, fabricators, and volunteers, CUP was able to produce a new version of the Sewer in a Suitcase in 2010.

Sewer in a Suitcase 2010 Team

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Thanks to Michael Scimeca and the Industrial Design Model Shop at RISD, Dan Wiley, Mark Torrey, Leslie McBeth, Zoe Levitt, and Karen Miller

Sewer in a Suitcase 2006 & *The Water Underground* Team

Center for Urban Pedagogy (CUP). Rosten Woo, Damon Rich, Valeria Mogilevich, Amber Yared, Naoki Fujita, Jae Shin

The Lower East Side Ecology Center. Kate Zidar, Teaching Artist

City-as-School Students. Sean Kelleher, Kim Nuñez, Maggie Acevedo, Ruben Arroyo, Danny Aviles, Adrian Lau, Jared Pierre, Edwin Rodriguez

This project was made possible through the support of:

the new york city
ENVIRONMENTAL *fund*
HUDSON RIVER FOUNDATION

Special thanks to:

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New York City's Water System

Name the parts of our water system.

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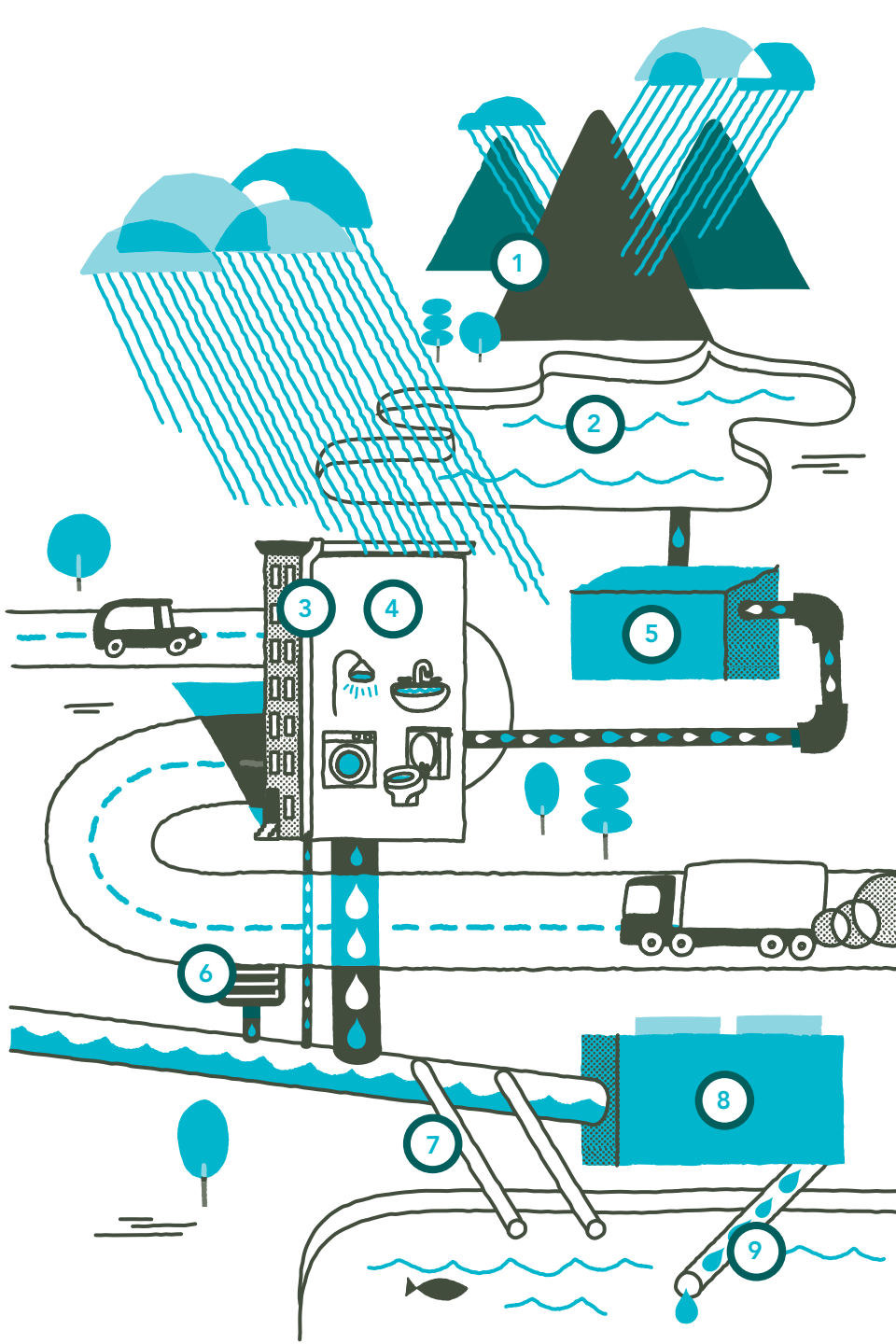
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The Center for Urban Pedagogy (CUP) is a nonprofit organization that uses the power of art and design to improve the quality of public participation in urban planning and community design.

The Sewer in a Suitcase is a product of CUP's Urban Investigations Program. Urban Investigations are semester-long, afterschool projects that, through collaborative research and design, enable high school students to explore fundamental questions about how the city works.

To find out more, visit us online at:
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