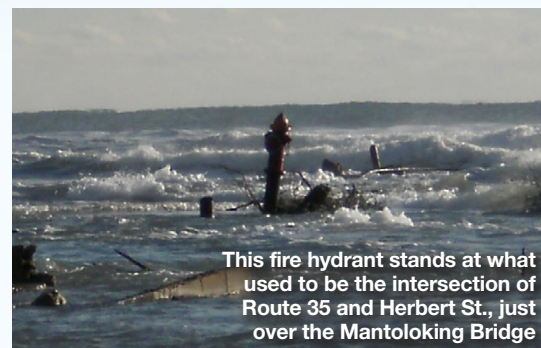


# Storm Surges

## A science lesson about Hurricane Sandy's effects on New Jersey's water system



### Getting Started:

1. **Ask:** What do you think happens to rain or melted snow during a "normal" New Jersey storm?
2. **Explain** that several things can happen:
  - a. Water can soak into the ground, eventually seeping into aquifers.

- b. Water can flow into rivers, lakes, and reservoirs.
- c. Water can flow onto roads and streets and into storm drains.
3. Following are two experiments that explore some of the things that happen to the local water systems during extreme weather. Please use the one that best suits your students and class.

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### Class Experiment A: Surges and Floods

**Objective:** Understand the difference between a flood and a surge.

**Materials:** empty plastic egg carton, glue or water-resistant tape, sink, spray bottles or watering can, spoon, paddle or pastry scraper.

**Time required:** 40 minutes

#### Directions:

1. **Click here** to view an animated graphic from the National Hurricane Center that shows how a storm surge builds and erodes the shore.
2. **Ask:** Do you remember Hurricane Irene? If so, did you observe a difference between the storm water during Hurricanes Irene and Sandy? Explain that Hurricane Irene brought a tremendous amount of rain to New Jersey. Rivers and lakes flooded all across the state and storm drains backed up, overwhelming homes, businesses, and roads with the excess (fresh) water. Hurricane Sandy, however, did not contain much rain. Very high winds, combined with a very high tide, caused a *storm surge*. Salt water from the Atlantic Ocean was forcefully pushed into coastal communities and up rivers, overwhelming homes, businesses, and roads with the excess (salt) water.

#### 3. Try this experiment:

- a. Open an empty plastic egg carton and lay it flat at the bottom of a shallow sink. Attach it to the sink with glue or strong tape. Press in a few "lumps" to represent reservoirs and lakes.



- b. **Explain:** This egg carton represents New Jersey's coast. Coastal towns are protected by sand dunes or other barriers (point to the edge of the egg carton), but the areas behind the dunes are often at or below sea level. The state is also dotted with hills, valleys, lakes, rivers,

and reservoirs. Fill the basin with water so that the level is about a half inch below the top lip of the egg carton.

- c. Demonstrate flooding by filling several spray bottles with water. Ask students to vigorously spray water all over the egg carton and water to represent *rain*. At several increments, stop to observe what is happening.
- d. Now empty the water out of the sink and egg carton and reset the experiment to show what happens during a *storm surge*. Use a spoon, paddle, or pastry scraper to move only the "ocean" water on the left side of the egg carton.
- e. **Explain:** This movement represents high winds blowing in from the ocean. Gradually increase the wave movement to indicate the power of the water over time. Pause at increments to discuss your observations.
4. **Discuss** the difference between the *storm surge* and *flooding* and how it affected your part of New Jersey.

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# Storm Surges (continued)

## Class Experiment B: The Water System

**Objective:** Understand the mechanical systems that are in place to manage storm water.

**Materials:** straw, cup, sink

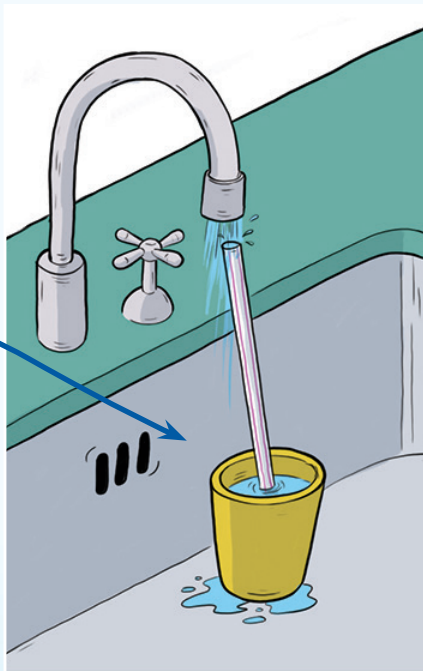
**Time required:** 40 minutes

### Directions:

1. **Explain** that when water flows into storm drains, it is redirected into rivers or lakes, which can be treated at a water treatment plant to become drinking water.
2. **Ask:** *Have you ever seen a storm drain overflow? Why do you think this happens?* Perform this experiment in a sink to demonstrate:
  - a. Place a drinking straw into a shallow cup. Fill the cup one-third of the way with water. The straw represents a storm pipe and the cup represents a lake.
  - b. Place the straw under a running faucet, gradually increasing the water speed.
  - c. Ask students to write down their observations.
3. **Discuss** how the straw eventually couldn't capture all of the water

and it began to run out around the edges. Also discuss the effect of the lake overflowing from the tremendous amount of water being brought in by the "storm."

4. **Explain:** Electricity is very important to the water system. It is needed to pump water into water towers



to provide pressure to keep water flowing to houses and businesses. It is needed to run the water treatment plants. It is needed to pump water out of lakes, rivers, and reservoirs and into treatment plants.

5. **Ask:** *The worst storm damage from Hurricane Sandy occurred on the coast because of the storm surge, so why do you think that most of the state's electricity and water services were affected? Remember, Hurricane Sandy's high winds knocked out power across New Jersey.*

### Wrap-up:

6. Download the poster at [www.scholastic.com/njaw](http://www.scholastic.com/njaw) and make a copy for each student. Together or in small groups, use markers or colored pencils to show the influence of Hurricane Sandy's storm surge.
7. Visit [www.scholastic.com/njaw](http://www.scholastic.com/njaw) for additional lessons and experiments about the water system including building a water filter, creating a model aquifer, and constructing an Archimedes pump.

### Resources

There are many resources available to help children deal with anxiety and fear after an event like Hurricane Sandy. [Click here](#) for some suggestions on how to approach this

potentially sensitive topic. (Or type [www.scholastic.com/teachers/top-teaching/2012/11/heading-back-school-after-hurricane-sandy-%E2%80%93-brainstorm](http://www.scholastic.com/teachers/top-teaching/2012/11/heading-back-school-after-hurricane-sandy-%E2%80%93-brainstorm).)