

A Guide to Flooding in Philadelphia

What to know:

Before it happens. As it happens. After it happens.



Version 1.2

Purpose

This guide was designed by Philadelphia's Citywide Flood Risk Management Task Force as a tool for property owners and residents. It can help you:

Understand
your flood
risks

Learn how to
prepare your
property and
family for flooding

Find out what
to do if you
experience
flooding

Citywide Flood Risk Management Task Force: Who We Are



The Flood Risk Management Task Force was created by the City of Philadelphia in 2014 to encourage collaboration between departments and agencies and to maximize the City's resources

for addressing flooding issues. The mission of the task force is to develop an improved strategy for flood management and to inform smart planning as we address evolving flooding challenges.

Task force members include: the Philadelphia Water Department (PWD), Philadelphia City Planning Commission (PCPC) the Office of Emergency Management (OEM), the Office of Sustainability, Philadelphia Streets Department, Philadelphia Parks and Recreation (PPR), Licenses and Inspection (L&I), Health Department, in addition to several other City department as well as State and Federal agencies.

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1 Why You Should Care

Flooding can happen anywhere, at any time.
And it can happen fast.

Flooding is the most common natural disaster in the United States, and Pennsylvania has the highest flooding rate of any state.

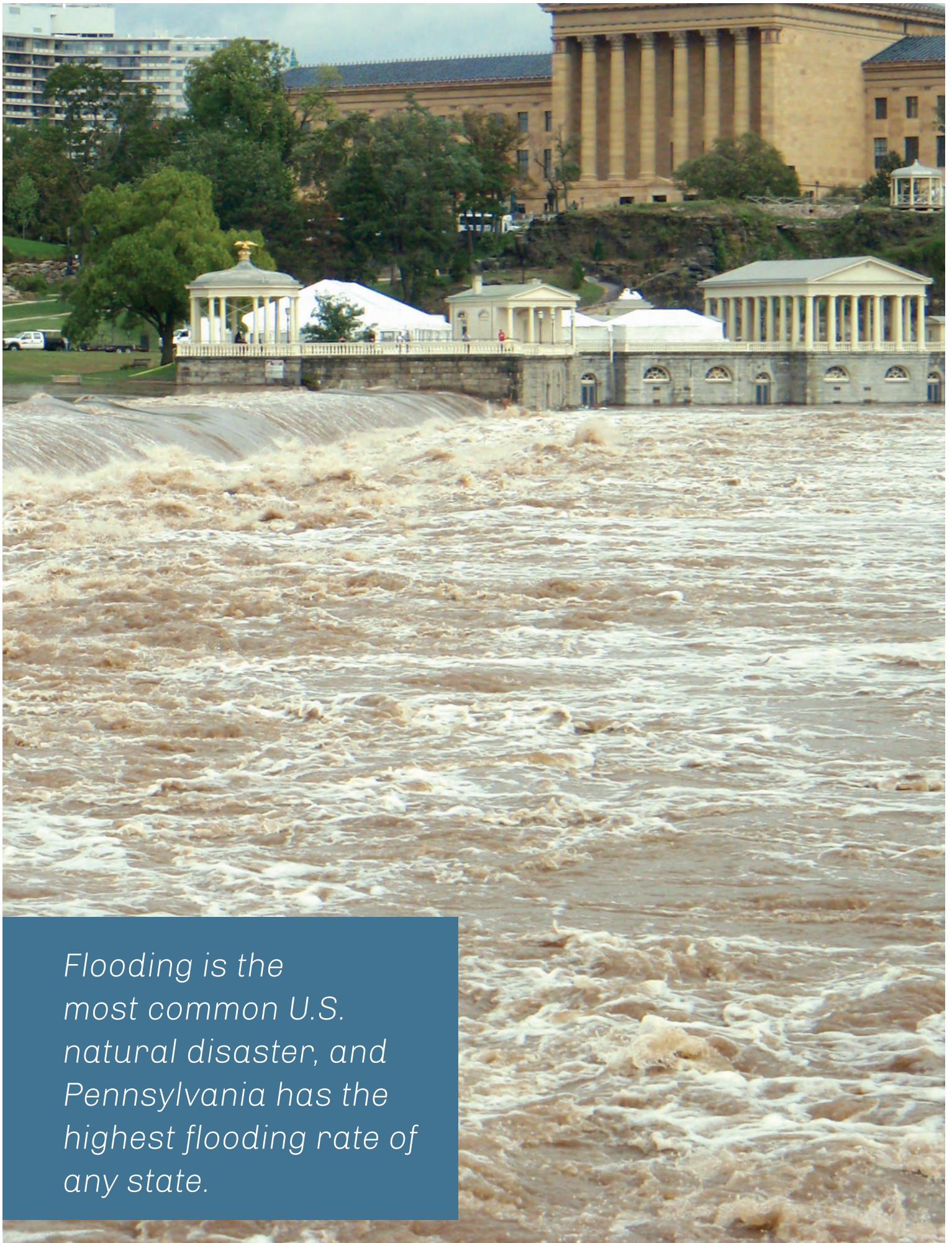
Philadelphia, like most major East Coast cities, grapples with the impacts of rain events that can trigger river, surface water and groundwater flooding. Intense storms combined with high tides can flood the network of sewers beneath our feet and create backups that flood basements. Warm temperatures after snowfall can cause floods. Flash floods can happen even without any rain in the area. You should be ready for flooding no matter where you live, but especially if you live in a low-lying area, near water, or downstream from a dam. Even a small stream or dry creek bed can overflow and cause flooding.

Climate change promises to increase the frequency and scale of future events. The City of Philadelphia is working on a number of initiatives to reduce the impacts of flooding while ensuring citizens have the best information available to protect themselves.

According to the Federal Emergency Management Agency (FEMA), floods are one of the most common hazards in the United States. However, not all floods are alike. Some develop slowly, while others, such as flash floods, can develop in just a few minutes and without visible signs of rain. Floods can span entire river basins and multiple states, but they can also be localized and impact just one neighborhood or community.

Be aware of flood hazards no matter where you live or work, but especially if you are in low-lying areas, near water, behind a levee or downstream from a dam. Even very small streams, gullies, creeks, culverts, dry streambeds or low-lying areas that appear harmless in dry weather can flood.

NEXT: Flooding can look different depending on where you live.
See what flooding looks like across Philadelphia.



Flooding is the most common U.S. natural disaster, and Pennsylvania has the highest flooding rate of any state.

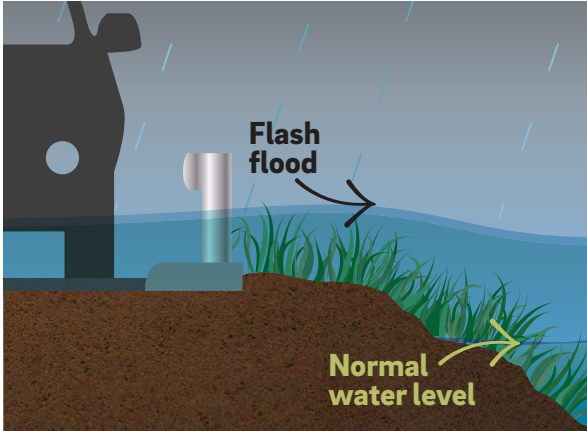
KNOW YOUR FLOODING THREAT:

2 What Flooding in Philadelphia Looks Like

Philadelphia—like cities across the nation—is dealing with more flooding and more intense floods that impact both properties and natural areas. But flooding takes different forms depending on where you live and the source of the floodwaters.



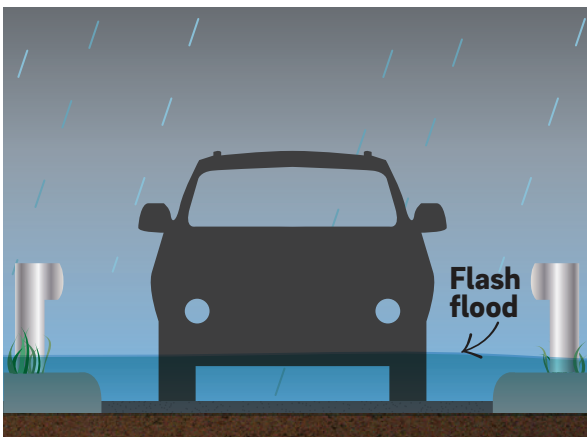
COMMON TYPES OF FLOODING



Riverine

What It Looks Like: Streams and rivers overtopping their banks during short, intense rainstorms and/or hurricane-level rainstorms. Because Philadelphia is located at the lower end of major watersheds, we often see the worst of this type of flooding. Flash flooding is becoming a regular occurrence.

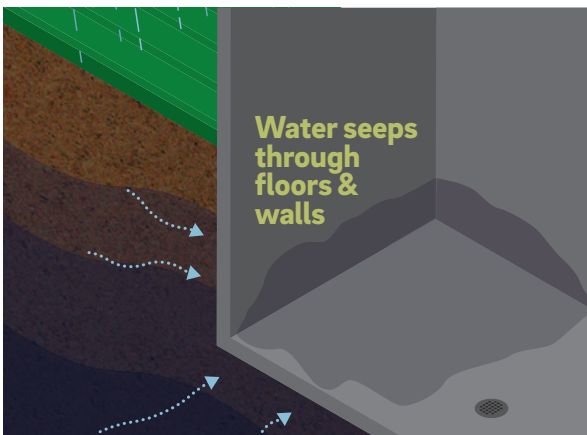
Areas Most Impacted: Eastwick, Manayunk, East Falls, Delaware Avenue, Kelly Drive, Martin Luther King Jr. Drive, and watershed parks.



Overland or Street Runoff

What It Looks Like: Created by excessive water running over the ground and streets. This flooding can be made worse when sewers can't handle the volume. Some areas of Philadelphia experience overland flooding due to the absence of sewers. Overland runoff can also lead to flash floods.

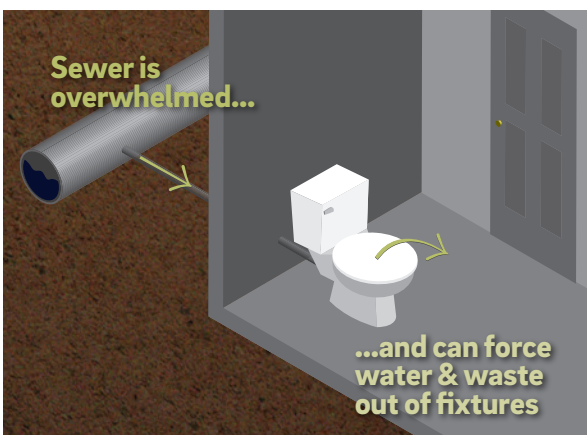
Areas Most Impacted: Chestnut Hill, Roxborough, Andorra, Germantown, Torresdale



Groundwater

What It Looks Like: When the ground becomes saturated, groundwater may seep through the floors and walls of basements.

Areas Most Impacted: Exists citywide, but groundwater depth varies depending on rainfall and snow melt.



Basement Backups

What It Looks Like: Sewer backups occur when combined sewer systems are overwhelmed by extreme precipitation. The underground sewer system becomes overwhelmed and forces water into basements through drains and fixtures like sinks and toilets. High tides on the Delaware River can contribute to basement backups.

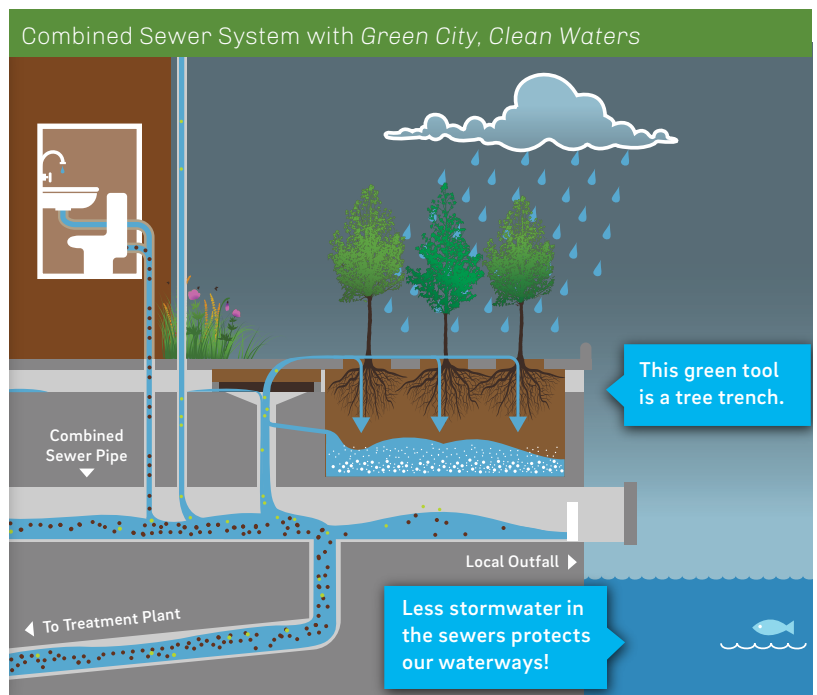
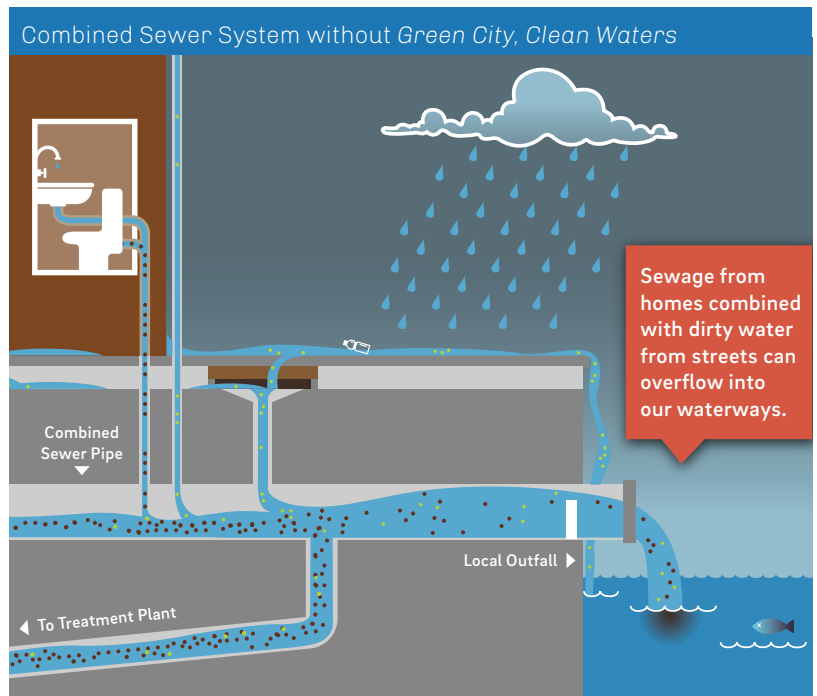
Areas Most Impacted: Germantown, Kensington, Northern Liberties, Center City, South Philadelphia, Port Richmond

Combined Sewer System and Flooding

Philadelphia's combined sewer system—which was built in the late 1800s and early 1900s—was designed to handle both wastewater and stormwater. At the time, it was state of the art. Centuries of development have dramatically increased the number of hard surfaces like roofs and streets that force stormwater into the sewers. More frequent and intense rainstorms are making matters worse. Today, the system is overtaxed and cannot handle the excessive volume of water.

When too much water enters the combined sewer system, it can lead to overflows that release billions of gallons of polluted water and diluted sewage into our rivers each year. It also can lead to the basement backups referred to in the figure.

The Philadelphia Water Department is working to address combined sewer overflows with other City departments, residents, and private stakeholders through its **Green City, Clean Waters** program. *Green City, Clean Waters* uses primarily green stormwater infrastructure—systems that include natural materials like plants, soil, stone and special water-absorbing pavement—to store, slow and filter the stormwater that leads to sewer overflows. Combined with traditional stormwater tools like larger sewers, *Green City, Clean Waters* will allow the City to reduce the volume of stormwater pollution entering our rivers to 85 percent by 2036.



Learn more:

www.phila.gov/water

You can help: Submit flooding photos to help make our city safer

The Flood Risk Management Task Force collects photos and videos from residents to improve our response to flooding threats. Our goal is to create a more accurate picture of flooding conditions across Philadelphia by pairing data provided by sophisticated weather monitoring infrastructure with neighborhood-level images provided by residents.

What We Want from You:

- Photos of “*riverine*” flooding: overflowing creeks, rivers, and local waterways
- Photos of “*surface*” flooding: inundated streets, parking lots, and other public areas
- Exact time, date, and location of your flood photos



Submit the photos using the form at:
phillyh2o.info/flooding-photos



**Turn Around,
Don't Drown:**
*Never attempt to drive
on a flooded road.
Even water that seems
shallow can quickly
carry vehicles away.*

3

WHAT YOU CAN DO: BE PREPARED

Before, During and After

You should be ready for flooding no matter where you live, but especially if you live in a low-lying area, near water, or downstream from a dam.

Head to the **Office of Emergency Management's (OEM)** website to get started: www.phila.gov/ready

BEFORE A FLOOD

- Know your area's flood risk. To see what your flood risk and flood insurance premium might be, visit **FloodSmart.gov**, or call (800) 427-2419.
 - Make a list of what you own, including furniture, clothing, and valuables.
 - Fill out a Family Emergency Plan. Write down important names and phone numbers for you and your family in case of an emergency.
 - Have a Go Bag ready that you can grab in case you need to leave your home in a hurry.
 - Learn the safest route from your home to high ground in case you have to evacuate. This should be part of your **Family Emergency Plan**.
 - Keep materials such as sandbags, plywood, plastic sheeting, and lumber on hand to help protect your home.
 - Think about getting flood insurance. Losses due to flooding are not covered under a homeowner's policy. Flood insurance is offered through the National Flood Insurance Program (NFIP).
 - Be sure to review the **Severe Weather Safety Guide** on the Ready Philadelphia website for more information.
- If major flooding happens:**
- Turn off all utilities at the main power switch. If required, close main gas valve.
 - If you are wet or standing in water do not touch any electrical equipment because it can cause electrocution.
 - Fill bathtubs, sinks, and jugs with clean water in case you can't use tap water. You can clean these containers by rinsing them with bleach.
 - Bring outdoor lawn furniture, garbage cans, and other loose items inside the house or secure them outside.



ReadyPhiladelphia

The region's emergency text and email alert system
www.phila.gov/ready.

The alerts are free but standard text messaging rates may apply.

Flood Terms You May Encounter

Flash flood watch: A warning that flash flooding might occur due to heavy rain.

Flash flood warning: A warning that flash flooding is expected due to heavy rain

DURING A FLOOD

If you are on foot:

- Keep a battery-operated AM/FM radio set to a local station and follow emergency instructions.
- Move to higher ground if it is safe to do so.
- Move to a higher floor if you're caught inside by high waters. Take warm clothing, a flashlight, and portable radio with you. Wait for help. **Do not try to swim to safety.**
- Take your **Go Bag** and leave your current location if it is safe and you need to evacuate.
- Avoid flooded areas when moving around outside. Do not attempt to walk across flood water deeper than your knee. Water can be much deeper than it looks.

If you are in a vehicle:

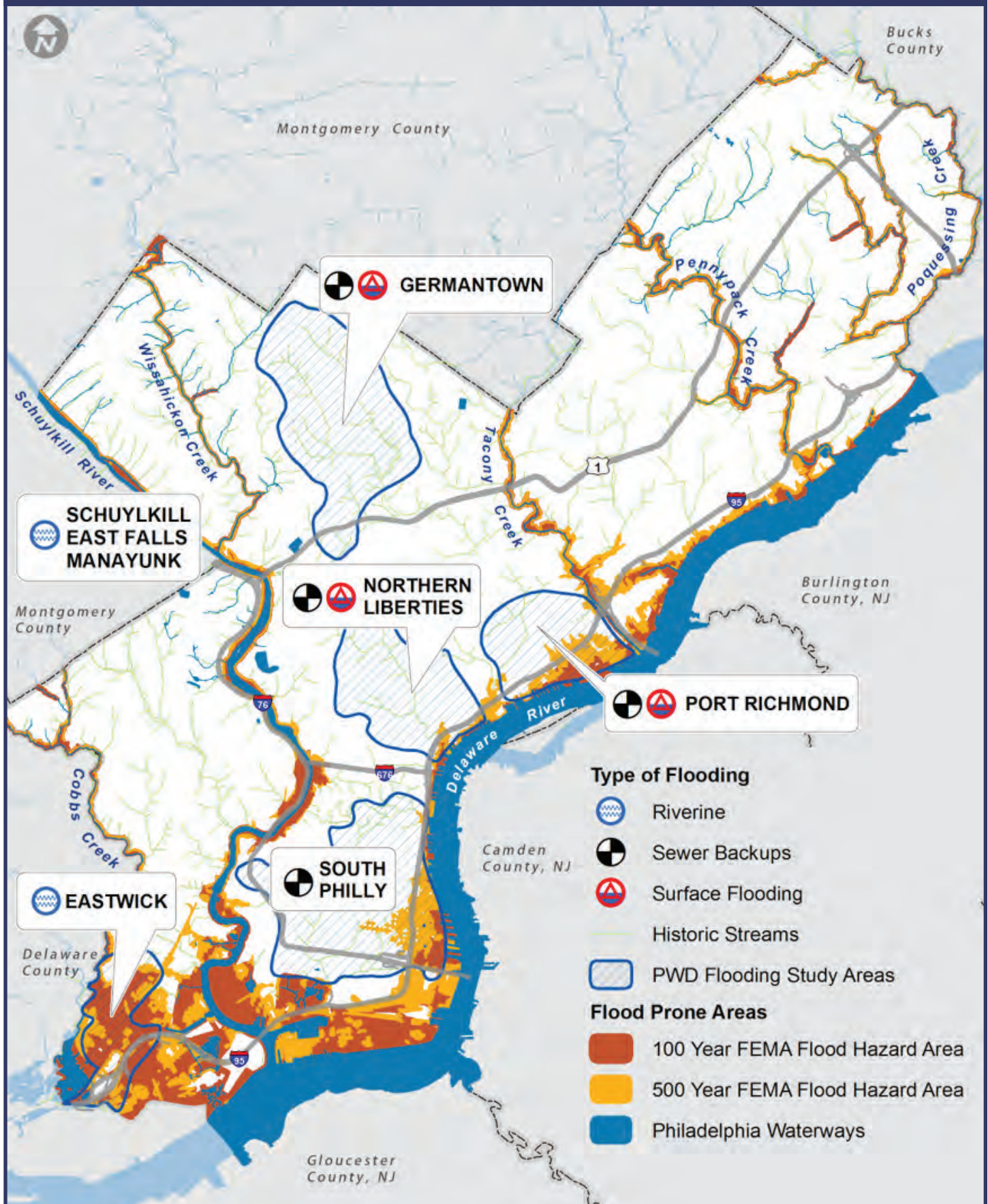
- If you see a flooded road: **Turn around, don't drown!**
- Avoid flooded roads. Just two feet of moving water can sweep a Sport Utility Vehicle (SUV) off of the road. Get out and leave your car if it stalls in a flooded area.

AFTER A FLOOD

- See the **What to Do** section of this guide (page 22) or access the Flood section of the OEM website, listed under Natural Hazards.



WHERE PHILADELPHIA FLOODS



WHAT YOU CAN DO:

4 Understanding Risk Maps + Insurance

Homes and buildings in high-risk flood areas with federally-backed mortgages must carry flood insurance!

Anyone in Philadelphia can buy flood insurance. The cost will be influenced in part by your flood zone, as determined by the Federal Emergency Management Agency (FEMA). Your property's actual flood risk is determined by many other factors, including the elevation of the building, the type of the building and more.



Current maps showing your flood zone are available at [FloodSmart.gov](https://www.floodsmart.gov) in the “Understanding Flood Maps” section. You can access the maps directly at [MSC.FEMA.gov](https://www.msc.fema.gov).

FEMA and Flood Insurance Risk Maps (FIRMs)

The Federal Emergency Management Agency (FEMA) is continuously reviewing and updating flood hazard information. That information is used to develop detailed flood hazard maps reflecting current flood risks. These maps are called Flood Insurance Rate Maps (FIRMs). Philadelphia's flood hazard maps were most recently updated in 2015. Digital versions showing current flood zones are available at [FloodSmart.gov](https://www.floodsmart.gov) and [MSC.FEMA.gov](https://www.msc.fema.gov).

What do these maps mean for you?

Reviewing these maps can help homeowners and renters determine whether or not their home is in a FEMA-identified floodplain. (Note: even if your home or property is outside of the Special Flood Hazard Area, it does not mean you are not at risk for flooding.)

Because these maps are constantly updated due to changes in geography, construction and mitigation activities, weather events, and more, you should contact your insurance agent or company for a truly accurate determination of your flood risk.

Who should have flood insurance?

Property owners in Special Flood Hazard Areas (SFHA) with mortgages from federally regulated or insured lenders are required to carry flood insurance. Flood insurance is available through the National Flood Insurance Program (NFIP), a federally underwritten program provided by nearly 100 insurance companies and written through licensed insurance agents. Contact your insurance agent to learn about lower-cost "Preferred Risk Policy" options offered by the NFIP for properties being mapped into higher-risk areas for the first time.

Even if you do not have a mortgage for a property located in the SFHA, it is still recommended that you purchase flood insurance. Over the life of a 30-year loan, there is about a three times greater chance of having a flood in your home than having a fire. And most homeowners' insurance policies do not provide coverage for damage due to flooding.



For more information on flood insurance, visit:
[floodsmart.gov](https://www.floodsmart.gov)

Understanding Flood Maps X

https://www.floodsmart.gov/floodsmart/pages/understanding_flood_maps/understanding_flood_maps.jsp

FloodSmart.gov
The official site of the NFIP

Call toll free: 1-888-379-9531 or have us call you

Search FloodSmart.gov

HOME

FLOOD RISKS

UNDERSTANDING FLOOD MAPS

- > Map Changes and Flood Insurance
- > Newly Mapped Procedure
- > Grandfathering
- > Converting Your Policy
- > Living Near a Levee
- > Flood Map Update Schedule

RESIDENTIAL COVERAGE

COMMERCIAL COVERAGE

POLICYHOLDER RESOURCES

PARTNER RESOURCES

INSURANCE AGENT RESOURCES

ABOUT THE NFIP

What are Flood Maps?

Flood maps, known officially as Flood Insurance Rate Maps (FIRMs), show areas of high and moderate to low flood risk. Communities use the maps to set minimum building requirements for coastal areas and floodplains, lenders use them to determine flood insurance requirements, and the Federal Emergency Management Agency (FEMA) uses them to help determine what you should pay for flood insurance.

Flood maps show areas of high, moderate, and low flood risk as a series of zones. High-risk zones, also known as Special Flood Hazard Areas (SFHAs), begin with the letters "A" or "V." Moderate-to low-risk zones, known as Non-Special Flood Hazard Areas (NSFHAs), begin with the letters "X", "B" or "C." There are also areas where the flood hazard is undetermined, labeled as Zone D. Learn more about [defining flood risks](#), the risks shown on [coastal flood maps](#), or the risks associated with [living behind Levees](#).

View your map now at [FEMA's Flood Map Service Center](#), or learn more about how flood maps affect your flood insurance rates.

WHAT'S MY FLOOD RISK?

Visit FEMA's [Flood Map Service Center](#) to locate your flood map to help determine your flood risk.

SEE WHAT FLOOD WATERS TOOK FROM BECKY

Watch the video >

Only a few inches of water in your home can cost tens of thousands of dollars in damage.

What Are FIRMs For?

Flood hazard maps are important tools used in the effort to protect lives and properties in Philadelphia and other cities nationwide. By showing the extent of flood risk for each area of Philadelphia, as well as, individual properties, these maps help business owners and residents make more informed decisions about personal safety and financially protecting their property.

These maps also allow community planners, local officials, engineers, builders and others to make determinations about where and how new structures and development should be built.



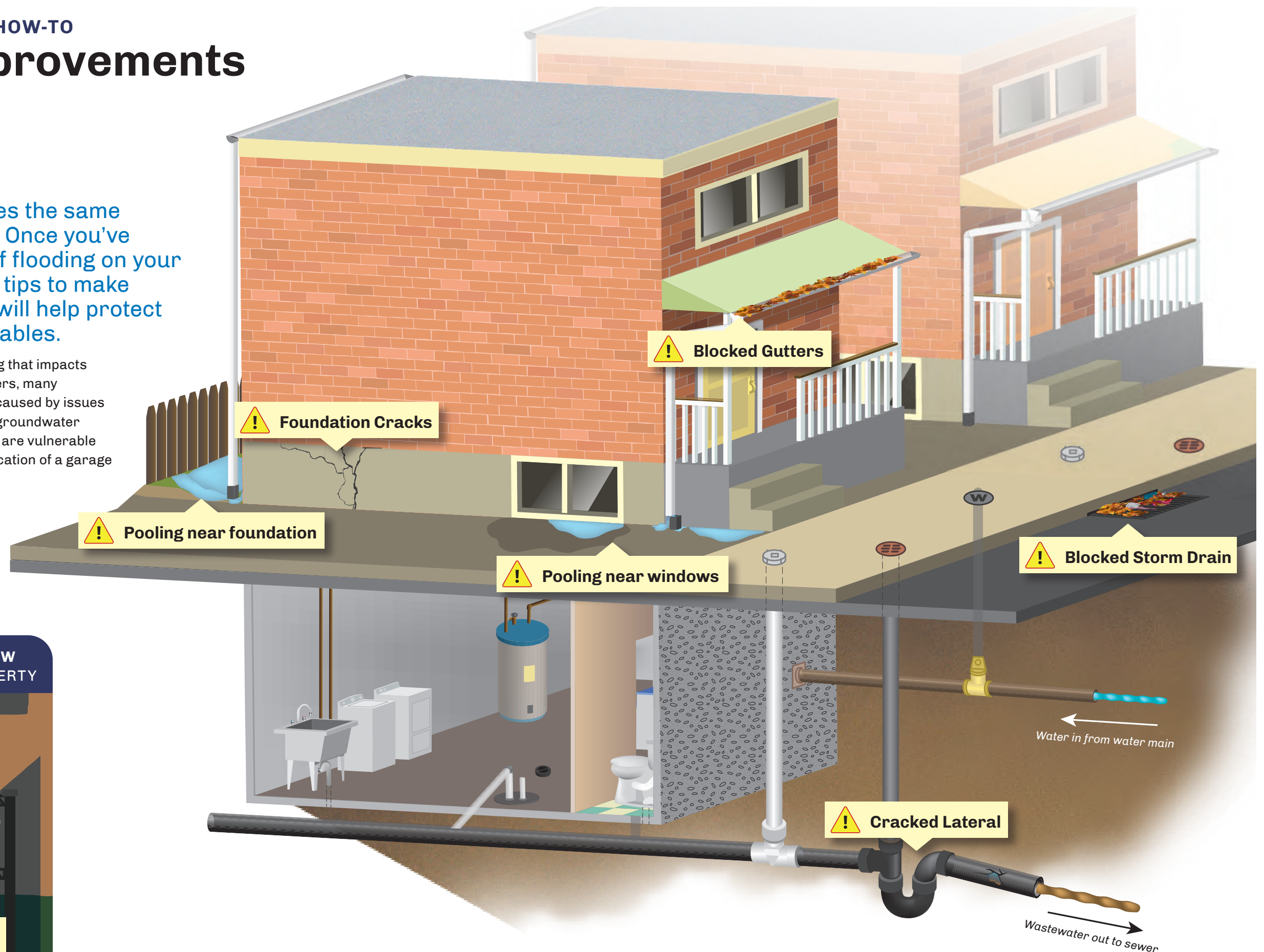
For more information about FEMA's FIRMs and programs, visit: [floodsmart.gov](https://www.floodsmart.gov)

5 WHAT YOU CAN DO: HOW-TO Home Improvements that Help

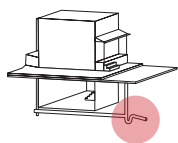
Not every home faces the same flooding challenges. Once you've identified sources of flooding on your property, use these tips to make improvements that will help protect your home and valuables.

While we work to reduce flooding that impacts roadways and overwhelms sewers, many homeowners deal with flooding caused by issues on their property, such as poor groundwater drainage. Likewise, some homes are vulnerable due structural issues, like the location of a garage or basement window.

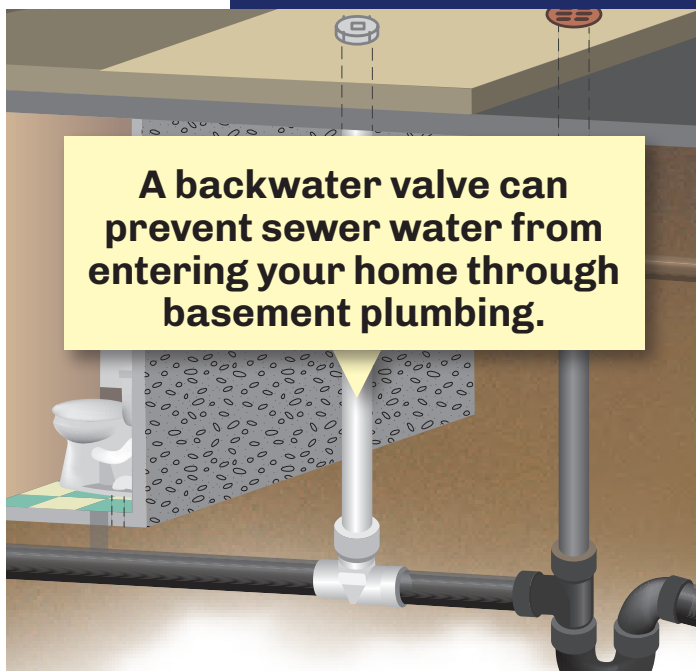
Use the following tips to guard your home against flooding caused by sewer backups and overflows, groundwater infiltration, stormwater runoff from your roof and driveway, and poor drainage.



YOUR PROPERTY'S PLUMBING



Sewer Backups & Sewer Overflows



A backwater valve can prevent sewer water from entering your home through basement plumbing.

Solutions: Install backwater valves, drain plugs. Eliminate basement plumbing fixtures.

Under heavy rain conditions where the flow in the sewer meets or exceeds the sewer's capacity, basement plumbing fixtures such as toilets, sinks and drains are vulnerable to backups.

2019 Update:
New plumbing requirements for basements!

See **page 33** for more information

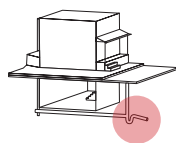
Backwater flooding issues primarily impact buildings served by the combined sewer system.

If your home is impacted by sewer overflows, you may qualify for free backwater valve installations

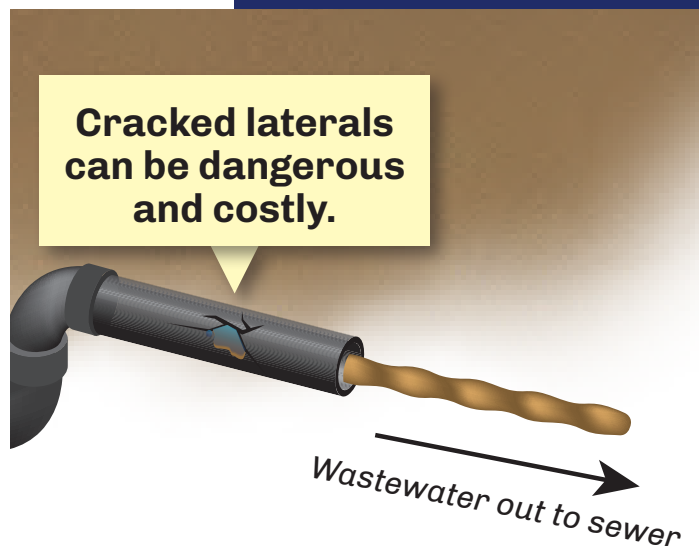
on your basement fixtures or main house drain through the Philadelphia Water Department's Basement Protection Program. Learn more at phillyh2o.info/backflow or call 215-685-6069.

If your property has floor drains, drain plugs can also help prevent sewer backups from flooding basements. A licensed master plumber can help find the best solution.

YOUR PROPERTY'S PLUMBING



Leaking or Cracked Lateral



Cracked laterals can be dangerous and costly.

Wastewater out to sewer

Solution: Inspect laterals; hire a plumber; determine if you qualify for a HELP loan.

Homeowners are responsible for sewer pipes—called laterals—that connect to the City sewers.

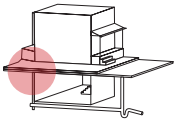
Clogged or cracked laterals prevent wastewater from flowing out of your home properly. Improper disposal of sanitary wipes, grease and cooking oil can clog laterals and cause sewer backups in your home.

For frequent basement backups: call PWD before pumping water out at 215-685-6300 to schedule an inspection. This will allow PWD to sample the water and offer the best solution.

Detection of a cracked lateral will result in a "Notice of Defect" from the Philadelphia Water Department. It is the homeowner's responsibility to fix their lateral. Licensed plumbers can offer several options.

Qualifying property owners who receive a Notice of Defect can apply for the Homeowner Emergency Loan Program (HELP). Learn more: www.phila.gov/water or 215-685-4901.

AROUND YOUR PROPERTY



Groundwater Infiltration

Sealing foundation cracks can reduce basement flooding.

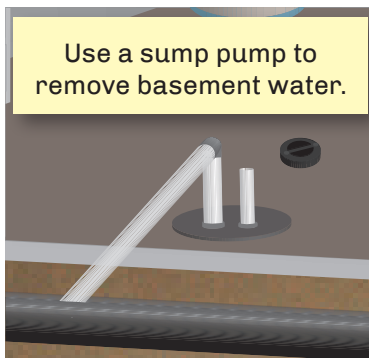


Solutions: Seal cracks, use a sump pump, and slope ground.

Groundwater flooding results when the ground around your home is saturated. When this happens, water can seep into your basement.

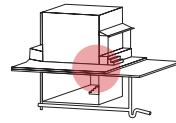
Be sure to use a waterproof sealant to seal cracks inside and outside of your home. Take measures to address drainage around your home and in your basement. When outside, note where the water pools in the low-lying areas.

Walk around your home's exterior and ensure the ground is higher around the foundation walls and slopes down away from your home. Low areas at the walls or foundation should be addressed by hiring a contractor to slope the ground away from your home. If you have chronic flooding, you may also want to consider stacking sandbags temporarily to help divert the water.



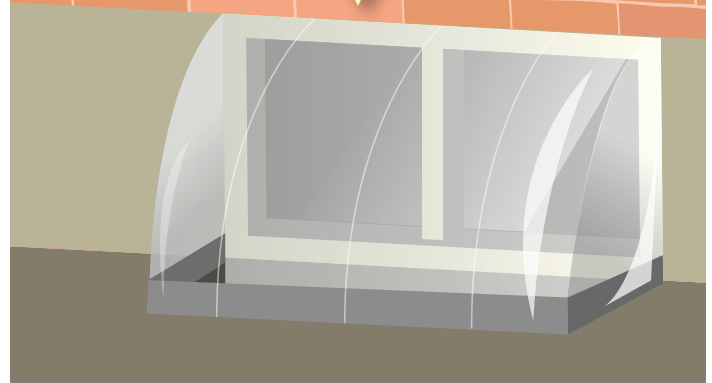
Use a sump pump to remove basement water.

AROUND YOUR PROPERTY



Stormwater Runoff

A window well can block water flowing from the sidewalk or street.



Solutions: Identify where you can capture and divert water from storms; install a window well; sign up for Rain Check.

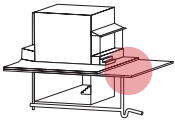
Visually inspect your property to see where water flows. Make sure the ground does not slope towards your home and that the windows are protected. Plant shrubs and other vegetation to capture and slow water on property.

Rain Check is a Philadelphia Water Department program that provides City residents with free rain barrels and discounted landscaping designed to manage stormwater. Rain Check can help with some runoff issues, but shouldn't be considered as program for preventing flooding in your home.

Rain gardens, for example, may help in yards where water ponds or pools during rain events.

Learn more and sign up at pwdraincheck.org

AROUND YOUR PROPERTY



Blocked Storm Drain



Solution: Clear storm drains of trash, leaves, snow and debris.

The Philadelphia Water Department is constantly working to maintain our 3,200-mile network of sewers, which includes nearly 75,000 storm drains. Blocked storm drains prevent stormwater from entering the sewer and can lead to flooded streets and homes.

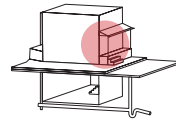
PWD cleans and maintains storm drains on a regular cycle, but trash and leaves can accumulate quickly.

Help sewers function at their best by keeping storm drains clear of litter, leaves, snow and debris.

If you see a clogged storm drain near your home and there's rain in the forecast, consider removing the debris and placing it in the trash. Trash and leaves left in the street will clog the drain again when rain falls.

Get free "Keep It Clean" storm drain marking kits to promote clear storm drains in your neighborhood:
water.phila.gov/stormdrain-app

AROUND YOUR PROPERTY



Roof Runoff



Solution: Clean your gutters regularly; ensure proper downspout placement and roof drainage; install a rain barrel or downspout planter with Rain Check.

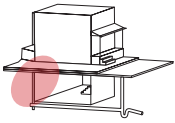
Roofs drains that are directed toward your home can cause flooding. Directing stormwater from your roof away from the foundation walls of your home is critical in keeping your basement dry.

Clean your gutters regularly to prevent stormwater from overflowing onto walls and ensure downspouts drain to the sewer or other appropriate drainage area.

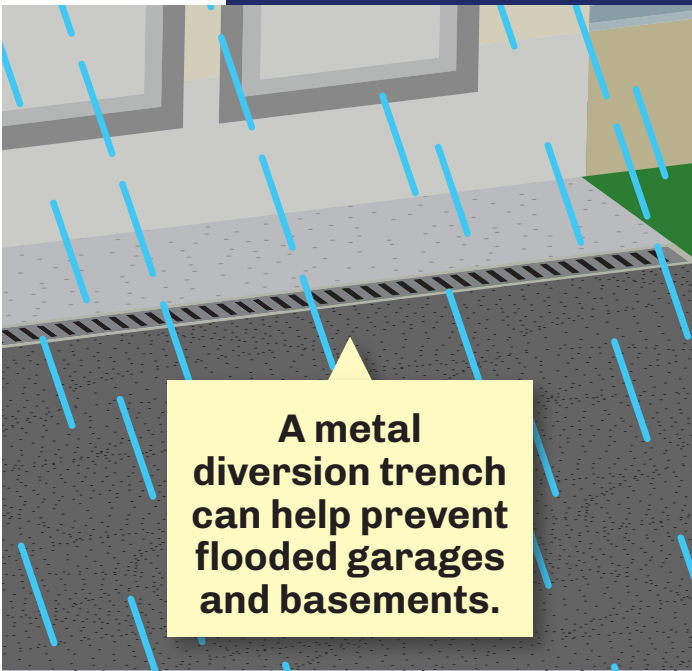
Consider getting a free rain barrel or a reduced cost downspout planter through Rain Check at pwdraincheck.org. You can use water from the rain barrel for activities such as watering the lawn.

Extra water should be drained from the barrel after it rains using a hose that reaches at least 10 feet from your foundation.

IN THE BASEMENT



Inundated Basements

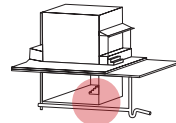


A metal diversion trench can help prevent flooded garages and basements.

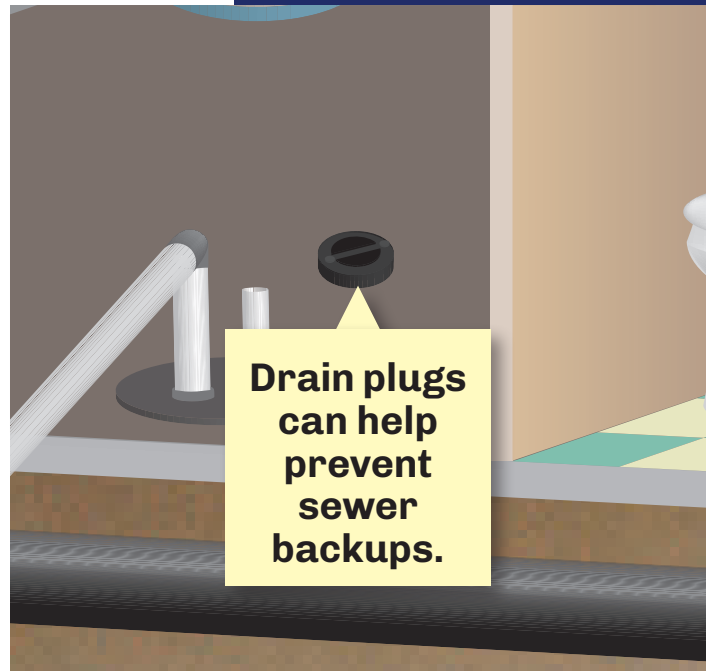
Solution: Installing a diversion trench in your driveway helps redirect rainwater.

A trench drain is a good idea for redirecting rainwater away from the foundation of a house, especially where driveways slope toward the house. Trenches can be as deep as four feet and made from a variety of materials. Grates covering the trench must be kept clear of leaves and debris, and should be made of metal for durability. Consult a professional contractor to get the proper trench size and location for your driveway.

IN THE BASEMENT



Inundated Basements



Drain plugs can help prevent sewer backups.

Solution: Do not store valuables in the basement; install window wells; hire a contractor to install barriers at property/driveway entrances; stack sandbags.

Below street level spaces like underground garages are flood prone. Do not store valuables in the basement or other areas below street level. If you must use these spaces, keep items off the floor using shelves or rafter storage.

Visually inspect your property to determine how rainwater flows. Make sure area drains are open and functioning, and direct stormwater away from low-lying spaces with barriers or slope changes.

If water often goes to certain area, such as a basement door, sandbags can be a cost-effective option.

Other options include window wells, flood walls around doors, and flood gates at driveway entrances. Consider installing a small concrete or asphalt curb (like a speedbump) at your property or driveway entrance. A licensed professional engineer or architect can help you find solutions.

6

WHAT YOU CAN DO: AFTER A FLOOD

What to Do

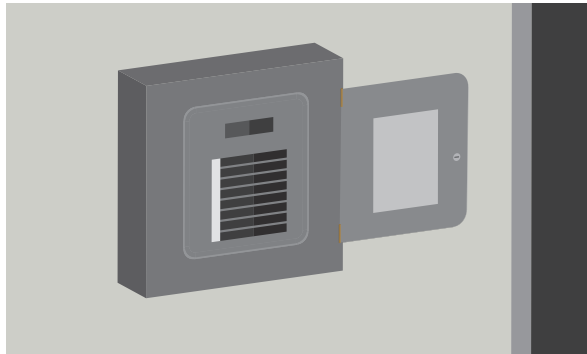


Rushing into a recently flooded building can create **serious health risks**.



Avoid electrical shocks!

Do not stand in pools of water unless you know the electricity is turned off.



The first thing you should do in any flood event is to **turn off the electricity to the affected area**. If you can safely access it, find your circuit breaker and turn off the electricity.

MEDICINES, FOODS, and KITCHEN ITEMS



- Discard all medicines and foods in contact with floodwater. Throw out all perishable foods that have been out of refrigeration for more than six hours. Do not refreeze frozen foods that have been thawed.
- All cooking and eating utensils, food preparation surfaces, counters and work surfaces that were touched or splashed by floodwater should be washed with soap and water and wiped with a diluted bleach solution.

PROTECTING YOUR HEALTH

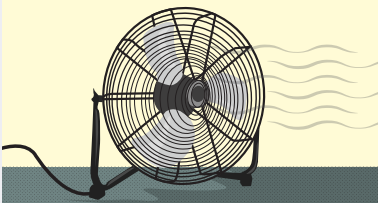
- Do not let children play with wet toys or other items until these have been cleaned and disinfected. Wipe these items with a diluted bleach solution or by washing the toys in a dishwasher using hot water.
- Those performing the cleanup should practice good personal hygiene by washing their hands after completing cleanup and before touching food or beverages, or smoking. Wear waterproof gloves and protective clothing. Protective gear should be discarded or washed after cleanup is completed each day.

- Keep children from playing on lawns and fields until the ground surface has dried.
- Contact your physician or health care provider if you or a family member develops any of the following symptoms within five days: fever greater than 100 degrees, vomiting, diarrhea, and/or severe stomach cramps.
- If you receive a puncture wound or other injury during the flood or while you perform flood cleanup, talk with your health care provider about the need for treatment and/or a tetanus shot.

CLEANING YOUR HOME OR BUSINESS

- Remove all standing water by pumping, mopping, and opening clogged drains.
- If possible, open windows and doors during cleaning and for at least 24 hours after the cleaning to allow surfaces to thoroughly dry and prevent mold. Use fans and/or dehumidifiers to shorten drying times.
- After turning off the electricity, all wet light fixtures should be cleaned and dried thoroughly before turning the electricity back on.

CLEANING THE CARPET



Carpets can be saved by wet vacuuming, shampooing, and taking steps to assure that the carpet is totally dry.

DISINFECTING SOLUTION

- $\frac{1}{4}$ cup bleach
- 1 gallon of clean water



Cabinets and household equipment should first be cleaned with soap and water, then make a disinfecting solution and wipe down all areas touched by the floodwater. Disinfect all contaminated floors and other surfaces and allow them to dry.

- Remove and dispose of all wet ceiling tiles, paper products, baseboards, and gypsum board (also known as dry wall) to a level approximately four feet above the flood water line. Remove wet insulation and materials that absorb water.
- Wood and metal studs should be wiped with the bleach solution twice and allowed to air dry.
- Clothing and bedding exposed to flood water should be soaked in clean water to remove any mud, and then washed in hot water. If hot water is not available, add a disinfectant such as bleach to the rinse water. Mattresses or other large items soaked with floodwater will probably have to be discarded. However, if they are made of foam rubber, it may be possible to wash, disinfect and air dry these items.



Philadelphia's Strategy

In September 2014, the City of Philadelphia held a flooding symposium that brought multiple City agencies together to explore ways to improve the City's flood mitigation planning.

The forum was hosted by the American Society of Civil Engineers, which had recently issued *Flood Risk Management: Call for a National Strategy*, a report urging communities to aggressively move ahead with making emergency preparations, strengthen existing flood-protection systems, and find new ways to reduce present and future vulnerability to flooding. From that convening, the **City of Philadelphia Flood Risk Management Task Force** was established.

The mission of the Task Force is to develop and implement an improved strategy for flood management and mitigation planning. To serve this mission, the City chartered this inter-agency Task Force to foster collaboration and maximize available resources and expertise within City Government. The Task Force is pursuing the following goals and objectives:

Goals

1. Increase inter-agency coordination of citywide flood risk management strategies
2. Improve coordination of neighborhood-level strategies for flood risk management
3. Foster sustainable, sensible city planning and development

Objectives

- Develop and implement a citywide strategy that prioritizes initiatives and establishes projects with defined timelines.
- Research and identify funding opportunities to pursue projects.
- Develop community risk profiles and level-of-service standards for high-risk areas.
- Raise community awareness of flood hazards based on risk analyses.
- Review and recommend changes to flood-related ordinances and regulations.
- Incorporate climate change data and into flood risk management planning.



Task Force Members



*Department of
Public Health*



*Philadelphia Parks and
Recreation (PPR)*



*Philadelphia Streets
Department*



*Philadelphia Water
Department (PWD)*



*Department of
Public Property*



*Philadelphia City Planning
Commission (PCPC)*



*The Office of Emergency
Management (OEM)*



*Office of
Sustainability*



*Licenses and
Inspection (L&I)*

8

FLOOD STRATEGY NOW + OUR FUTURE

Climate & Flooding

Changing Extremes and Rising Seas

Climate change is projected to make Philadelphia hotter and wetter, with more frequent extreme weather that includes intense rainstorms, hurricanes, and winter snowstorms—all of which can cause flooding.

Sea level rise will also increase local flood risk. Although Philadelphia is 90 miles inland from the mouth of the Delaware Bay, sea level rise will increase water levels in our tidal rivers. Higher baseline river levels may permanently inundate parts of Philadelphia, and higher river levels coupled with increased precipitation and storm surge may increase the frequency, depth, and extent of flooding.

Some climate-related projections are already becoming a reality: Philadelphia has experienced an increase in extreme storm events over the last decade, which has, on occasion, resulted in significant flooding.

Philadelphia's Response

The City of Philadelphia's Office of Sustainability is helping to prepare other departments so that they can provide services and manage assets as the climate gets hotter and wetter. The City is also actively working with state and federal authorities to address the potential impacts of climate-related flooding.

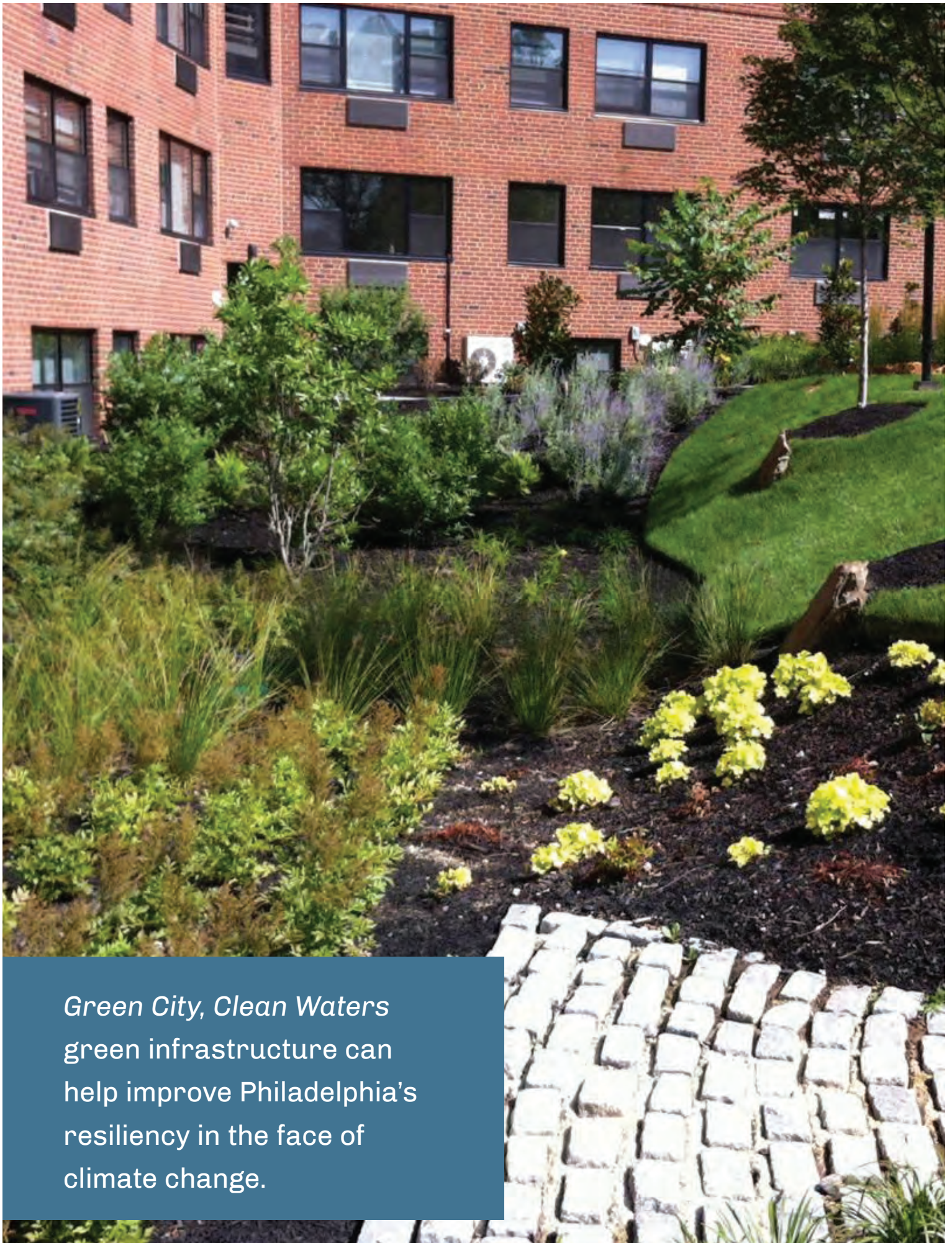
The Office of Sustainability released two reports that address climate change in Philadelphia:

- *Greenworks: A Vision for a Sustainable Philadelphia*, which outlines goals and strategies to make sure all Philadelphians are prepared for climate change and reduce carbon pollution.
- *Growing Stronger: Toward a Climate-Ready Philadelphia*, which focuses specifically on climate change impacts and adaptation.

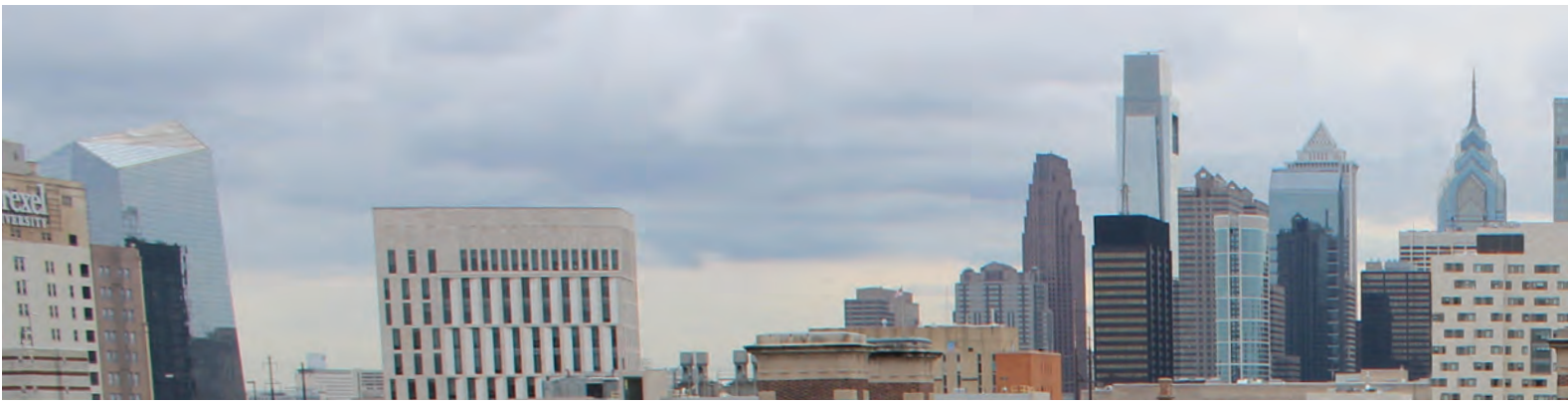
Growing Stronger details climate projections for Philadelphia, assesses the vulnerability of municipal assets and programs, and outlines early implementation adaptation strategies. It also provides valuable information about flooding for all Philadelphia residents and businesses.



To see results from the analysis and view flood risk maps, view the **Growing Stronger Report** at:
<http://bit.ly/PHLClimate2015>



Green City, Clean Waters
green infrastructure can
help improve Philadelphia's
resiliency in the face of
climate change.



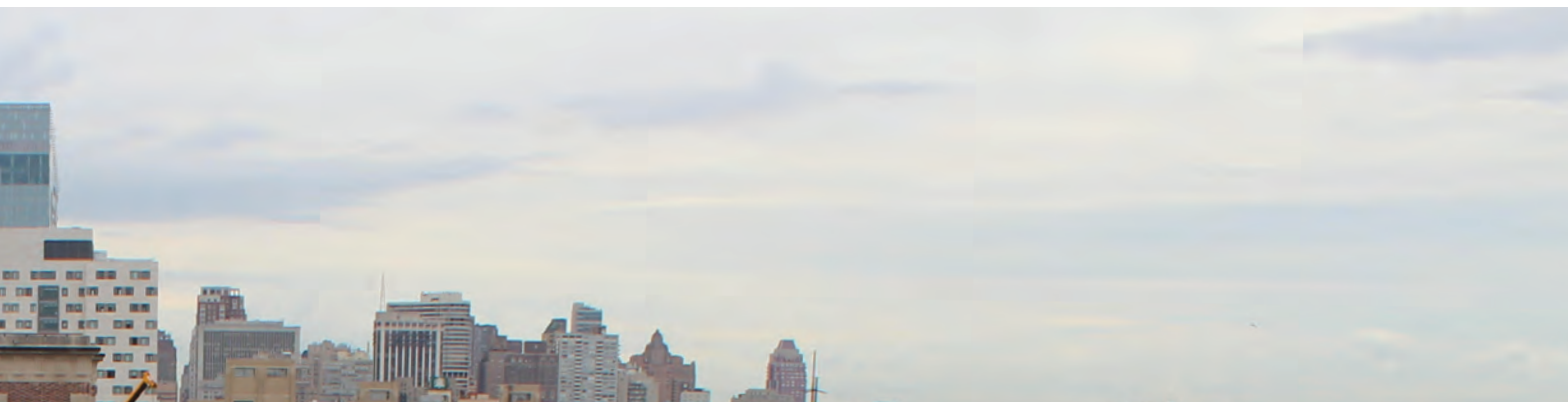
Neighborhoods Impacted by Climate Change

Philadelphia areas most vulnerable to sea level rise, storm surge and riverine flooding include south and southwest Philadelphia, low-lying points along the Delaware and Schuylkill Rivers, and all communities in the floodplains of Philadelphia's creeks and rivers.

The Citywide Flood Risk Management Task Force continues to assess flooding risks and climate change by building on the work of the Growing Stronger report. Member agencies of the task force continue to work with local, state and federal agencies to build resiliency and identify adaptation strategies for Philadelphia.

Building Resiliency

Philadelphia is already building resiliency and adapting to a hotter, wetter future with its *Green City, Clean Waters* program. *Green City, Clean Waters* is a 25-year primarily Green Stormwater Infrastructure (GSI) program that increases the city's capacity to manage stormwater runoff and handle extreme precipitation. GSI uses vegetation like trees and plants, soils, and natural processes to capture rain where it falls, allowing it to infiltrate into the soil. *Green City, Clean Waters* is improving water quality by preventing combined sewer overflows while also helping reduce localized flooding.



Additional Climate Change Resources

Climate change adds urgency to the recommendations in this guide, and all residents should stay informed as weather patterns shift over time. Arm yourself with knowledge to help you prepare for a wetter future.

Learn more about climate change and how to reduce carbon pollution:

- The Office of Sustainability's Growing Stronger report:
<http://bit.ly/PHLClimate2015>
- The National Climate Assessment FAQs page:
<http://bit.ly/PHLClimateFAQs>
- The United States Environmental Protection Agency page on climate change:
<http://bit.ly/PHLClimateEPAtips>

Understand if you live in an area at risk of flooding now or in the future:

- To understand your current risk of flooding, visit [FloodSmart.gov](https://www.floodsmart.gov) and read the *FEMA Maps: What They Mean* section of this guide
- To see if your home or neighborhood is at risk of flooding due to sea level rise (note: this does not take storm surge into account), check out visualization tools offered at Climate Central: <http://sealevel.climatecentral.org/maps>

Prepare for flooding by following the steps outlined on Philadelphia's Natural Hazards - Flood webpage: <https://beta.phila.gov/services/safety-emergency-preparedness/natural-hazards/flood/>



Learn more about the Office of Sustainability's work on climate change in Philadelphia at :
www.Phila.gov/Green

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FLOOD PRONE AREAS IN PHILADELPHIA

Do You Live in a Floodplain?

What Is Flooding and the Flood Plain

Floods occur when rivers and streams overflow and submerge surrounding land that is traditionally dry. The most common cause of a flooding event is excessive rain. When the rivers and streams are overwhelmed, water will overflow the banks and spread over the adjacent land and into nearby low-lying areas, called floodplains.

Areas of Philadelphia Typically Impacted By River Flooding

Special Flood Hazard Areas

Special Flood Hazard Areas (SFHA) have been designated by the Federal Emergency Management Agency (FEMA) along the Delaware and Schuylkill Rivers and the following creeks: Byberry, Cobbs, Darby, Indian, Pennypack, Poquessing, Tacony-Frankford, Wissahickon and Wooden Bridge Run. Please keep in mind that there are other areas of the city that may also be prone to flooding due to other conditions.

A flood warning means that flash flooding is imminent or expected due to heavy rain. The Office of Emergency Management monitors river and creek levels and will make evacuation recommendations and open shelters as necessary.

Flood Zones

Floods are classified by their likelihood of occurring in a given time period. A hundred-year flood is an extremely large, destructive event that actually means that there is a one-percent chance that such a flood could happen in any given year (not once every hundred years). Over recent decades, there has been an increase in these flood events.



ReadyPhiladelphia

ReadyPhiladelphia Alerts from the Philadelphia Office of Emergency Management bring real-time Flood Warnings from the National Weather Service to your phone.



To create a FEMA map (firmette) for your property:

<http://msc.fema.gov/portal>



FloodSmart.gov FAQs:

<https://www.floodsmart.gov/floodsmart/pages/faqs.jsp>



Office of Emergency Management Evacuation and Shelter information:

<http://bit.ly/PreparedPHL>

Special Flood Hazard Areas

Floodway: The channel of a river or stream and the parts of the floodplain adjoining the channel that are reasonably required to efficiently carry and discharge the floodwater or flood flow of a river or stream.

- **Zone A:** These are high-potential Special Flood Hazard Areas (SFHA) for One-Percent Floods that are subject to rising waters and are usually near a body of water. There are no base flood elevations or depths available within these zones.
- **Zone AE:** These are high-potential Special Flood Hazard Areas (SFHA) for One-Percent Floods that are subject to rising waters and are usually near a body of water. FEMA has determined the Base Flood Elevation for these zones and they are included on Flood Insurance Rate Maps. <https://www.floodsmart.gov/floodsmart/pages/faqs/what-is-a-flood-insurance-rate-map-and-how-do-i-use-it.jsp>

Other Mapped Areas:

- **Zone X Shaded:** Has a moderate flood risk and is traditionally called the 500-year floodplain, meaning the area has a .02 percent chance of such a flood happening each year.

Flood Maps

To identify a community's flood risk, FEMA conducts a Flood Insurance Study. The study includes statistical data for river flow, storm tides, hydrologic/hydraulic analyses, rainfall and topographic surveys. FEMA uses this data to create the flood hazard maps that outline your community's different flood risk areas. Floodplains and areas subject to coastal storm

surge are shown as high-risk areas. Some parts of floodplains may experience frequent flooding while others are only impacted by severe storms. However, areas directly outside of high-risk areas may also find themselves at considerable risk.

If you are within a high risk area, know the evacuation routes and where to find shelter information if you should have to evacuate. Philadelphia Office of Emergency Management will publish that information through the city's mass notification system, ReadyPhiladelphia, their website www.phila.gov/ready, @PhilaOEM on Twitter, and local news outlets.

The City of Philadelphia Planning Commission has FEMA Floodplain maps available for public inspection at 1515 Arch Street, 13th Floor, 215-683-4615 upon request.

Reservoirs and Flooding: A Drop in the Bucket

There are seven reservoirs in Pennsylvania and three in New York working together to maintain top-quality drinking water for Philadelphia and other communities depending on the Schuylkill and Delaware Rivers. These reservoirs constantly release water at rates calculated to support ideal drinking water supply levels, aquatic habitats, drought management and recreation.

While releasing water during dry weather maintains healthy water levels in our rivers, stopping releases during heavy precipitation events does not reduce flooding in Philadelphia.

Upstream reservoirs are only designed to provide flood relief in communities immediately downstream of dams, and are too far away to impact flood levels in Philadelphia.

The closest flood control reservoir to Philadelphia is Blue Marsh Lake, located roughly 50 miles northwest of the city. The drainage area to Blue Marsh dam is less than 10 percent of the entire Schuylkill River watershed. Runoff from the remaining 90 percent of the Schuylkill River watershed is not managed by a flood control dam during large storms.

It is this large, unmanaged area that contributes to flooding in Philadelphia's riverfront neighborhoods.



MORE INFORMATION: SMART DEVELOPMENT

Zoning and Plumbing Codes

Get approval for construction in the floodplain

Construction projects in Special Flood Hazard Areas (SFHA) areas defined by the Federal Emergency Management Agency (FEMA) have special requirements.



Determine if a project is in the SFHA floodplain using a designated floodplain map:

phillyh2o.info/floodplain-permits

When building in the floodplain, you must:

- Submit floodplain documents with all zoning or building permit applications for construction in the SFHA. For construction in the floodplain, refer to the code bulletin (available on the website above) for development in Special Flood Hazard Areas.
- For projects where costs are \$50,000 or more, attend a floodplain scoping meeting before submitting your building permit application. The form for these meetings is available on the website above.

What Are You Allowed To Build

Please review Zoning/Building Codes with your design professional.



Find more information about building in flood-prone areas at:

<https://www.phila.gov/services/zoning-planning-development/>

Finished Basements and Low-Level Plumbing

The City of Philadelphia adopted a new Plumbing Code in 2019 requiring a backwater valve when any new plumbing fixtures are installed below your fresh air inlet termination.

See page 18 of this guide for more information about backwater valves.



Learn about a City program that installs free backflow prevention devices and downspout modifications that can help with basement flooding:

phillyh2o.info/backflow

If you are installing a backflow device without help from the City, make sure you hire a licensed plumber who can obtain required Department of Licenses and Inspection permits.



Get a Plumbing Permit:

phillyh2o.info/plumbing-permits

New Construction

If your home was built after June 2019 and has plumbing fixtures below the fresh air inlet, you are also required to have a backwater valve.

Other tips for basements and low-lying areas:

- Avoid storing valuable possessions such as irreplaceable photo albums, art and important papers in your basement.
- Store items in plastic bins
- Store items up on shelves
- When your furnace or hot water tank need replacement, consider relocating them to a higher floor or placing them on platforms
- Appliances like washers/dryers should be relocated to a floor above street level
- If you improve a low-lying space like your basement, use flood damage-resistant building materials (like flooring) that can withstand a few days of being underwater (materials that can be inundated by 72 hours of water contact.)



Visit for a listing on damage resistant materials:

phillyh2o.info/FEMA-materials



MORE INFORMATION:

Common Terms You'll Hear + Definitions

Base Flood is a flood having a one-percent chance of being equaled or exceeded in any given year. "Base Flood" may also be referred to as "100-Year Flood" or "One Percent Annual Chance Flood."

Regulatory Flood Elevation is the Base Flood Elevation (BFE) determined by the U.S. Department of Homeland Security Federal Emergency Management Agency (FEMA) or the estimated flood height as determined using simplified methods; plus a freeboard safety factor of one and one-half feet.

Floodplain Area a relatively flat or low land area, which is subject to partial or complete inundation from an adjoining or nearby stream, river, or watercourse; or any area subject to the unusual and rapid accumulation or runoff of surface waters from any source.

Floodway is the channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than one foot at any point. The floodway is identified as "Floodway" in the Flood Insurance Study (FIS) and accompanying Flood Insurance Rate Map (FIRM) issued by the Federal Emergency Management Agency (FEMA) or the most recent revision thereof, including all digital data developed as part of the Flood Insurance Study.

ReadyPhiladelphia is the City of Philadelphia's mass notification system. Free alerts with information direct from the National Weather Service regarding Flood Watches and Warnings are sent to your phone or laptop as a text or email. Home phone calls are also made in an absolute emergency. Important information such as evacuations or shelters will also be published through ReadyPhiladelphia as well as OEM's website (www.phila.gov/ready) and @PhilaOEM on Twitter. To sign up, visit OEM's website.



MORE INFORMATION: CLIMATE IMPACTS ON FLOODING

Sea Levels, Rivers and Storm Surges

Sea Level Rise

In the last century, sea levels around Philadelphia have risen by roughly one foot; this is higher than the global average by around eight inches due to land subsidence in our region. *Growing Stronger* evaluates the risk of sea level rise using a future scenario with moderate greenhouse gas emissions where sea levels in our region are projected to increase two feet by 2050 and four feet by 2100 . The report also considers the impacts of six feet of sea level rise, which could be the potential flooding risk at the end of this century under a high carbon emissions scenario.

Riverine/Waterway Flooding

Riverine flooding occurs when heavy rainfall causes water in rivers or creeks to overtop its banks. The *Growing Stronger* report analyzed the risk of two “riverine,” or waterway flooding scenarios—a 100-year and 500-year flood—based on FEMA floodplain maps. These maps depict areas that have a 1% and 2% chance of flooding annually, based on historical precipitation extremes. They do not incorporate potential changes in the frequency or severity of heavy precipitation associated with climate change and therefore, the associated flooding may be more likely to occur in the future. In general, increasingly frequent heavy rain events resulting from climate change are expected to significantly impact flooding in rivers, streams and surrounding floodplains.

Storm Surge

Storm surge is the rise of coastal waters above the predicted tide levels due to a storm event. Storm surge is determined by a number of factors, including the angle at which a storm approaches the coast, storm intensity, and local features. *Growing Stronger* modeled the impact of storm surges by adding the elevated base sea levels described above (two and four feet) on top of the storm surge associated with a Category 1 hurricane, which is the strongest storm to have ever directly hit the Philadelphia region. A Category 1 hurricane has sustained winds reaching 74-95 mph and has the potential to significantly increase flooding impacts when considered in conjunction with sea level rise.

¹These levels refer to the projected sea level above the average higher high water level between 1983 and 2001



Citywide Flood Risk Management Task Force: Who We Are

The Flood Risk Management Task Force was created by the City of Philadelphia in 2014 to encourage collaboration between departments and agencies and to maximize the City's resources for addressing flooding issues. The mission of the task force is to develop an improved strategy for flood management and to inform smart planning as we address evolving flooding challenges.

Task force members include: the Philadelphia Water Department (PWD), Philadelphia City Planning Commission (PCPC) the Office of Emergency Management (OEM), the Office of Sustainability, Philadelphia Streets Department, Philadelphia Parks and Recreation (PPR), Licenses and Inspection (L&I), and Health Department.

Version 1.2