Homeowner's Stormwater Handbook

Smart Stormwater Management: A How-to for Homeowners

PHILADELPHIA WATER

Partnership for the DELAWARE ESTUARY

A New Challenge

Thanks to smart environmental policies and major cleanup efforts, Philadelphia's rivers have improved dramatically in recent decades. Fish species are returning in healthy numbers, and more and more people are heading to the Schuylkill and Delaware Rivers for recreation. While large-scale industrial pollution was once the biggest issue, our rivers face a new challenge today—**stormwater pollution**. Runoff containing harmful pollutants picked up from lawns, pavement and other surfaces is the **number one threat** to the health of our rivers today.

The good news? Philadelphia Water and partners are fighting stormwater pollution and greening our neighborhoods with the ***Green City, Clean Waters*** program and other infrastructure investments, making a future with even healthier rivers an achievable goal.

You can help reduce stormwater pollution right from your home by following the tips in this guide, and using green tools that beautify and increase the value of your property. Whether it's by doing something simple like washing your car with ecofriendly soap or by building a beautiful home rain garden, every Philadelphian can help keep our waterways clean and reduce the number of pollutants that need to be processed and removed from our drinking water sources.

A vision of what Philadelphia could look like in the future, with many absorbent green "islands" that can soak up stormwater. For more information, visit phillywatersheds.org.

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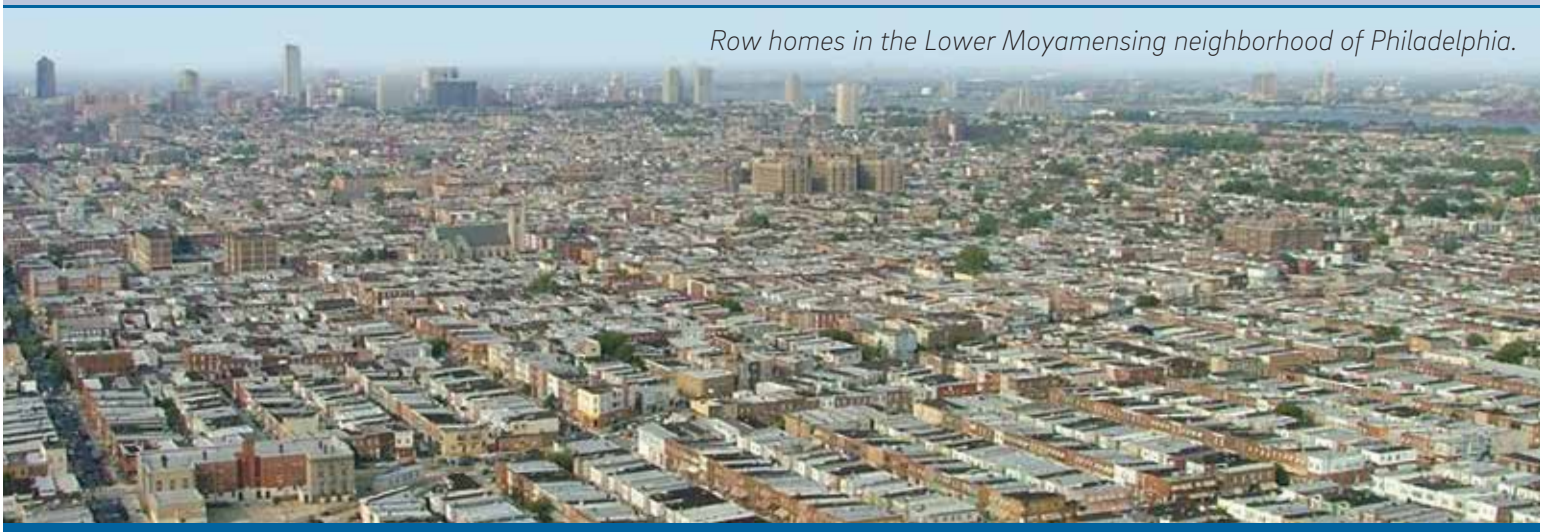


Row homes in the Lower Moyamensing neighborhood of Philadelphia.

How Does Rainwater Get Polluted?

As rain or melting snow drains off of the land, it picks up pollutants such as trash, leaky engine fluids, pet waste, and lawn fertilizers. Even with just a little rain, these pollutants are carried into storm drains or directly into the waterways that provide our drinking water. This polluted water is called **stormwater runoff**.

Across our city, hard surfaces such as roads, buildings, and parking areas prevent rain from soaking into the ground. Many roofs in Philadelphia have downspouts that funnel water directly into our sewer system, which can overwhelm the pipes. In a more natural setting, the rainwater would be able to soak into the ground, filtering out pollutants and replenishing ground water supplies. Runoff from your property may seem insignificant, but when you consider all the households in Philadelphia, you can see why stormwater runoff is a major problem.

Pollutants Found in Stormwater Runoff:

- Dog Waste
- Engine Fluids
- Fertilizers
- Herbicides
- Loose Dirt
- Motor Oil
- Pesticides
- Road Grit
- Litter

There are some small changes we can make so these items don't end up in our waterways.

Trash accumulates and clogs a storm drain. Some of this trash will end up in our local waterways.

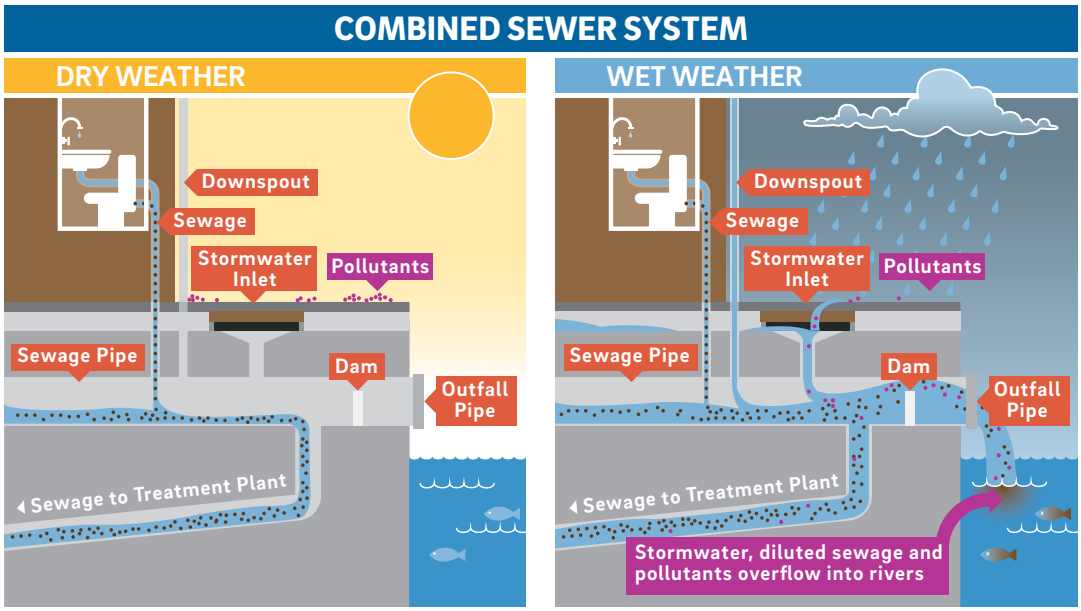
Why Is Stormwater Runoff a Problem?

1. Pollution

As rain or snow travels across rooftops, driveways, lawns, sidewalks, and streets, it picks up numerous contaminants. Eventually, this dirty water finds its way to local creeks and rivers, causing harm to fish and other wildlife.

2. Sewer Overflows

More than half of the city is served by a combined sewer system, which mixes wastewater from homes with water from storms. During heavy storms, a mix of untreated sewage and polluted runoff is washing into our rivers—causing serious problems. The pipes under our streets are not large enough to carry all of the stormwater and sewage to the treatment plant, so the dirty water spills into our rivers and creeks untreated, polluting our water sources.



During dry weather, all of the wastewater from our homes is cleaned at a water treatment plant. When it rains, the treatment plants are overwhelmed, and untreated water enters the river.

3. Local Flooding

When the ground can't absorb water, storm drains fill up too quickly with excess runoff and flash flooding can occur in streets and other places. This can cause damage to homes, businesses and natural spaces like creeks and river banks.

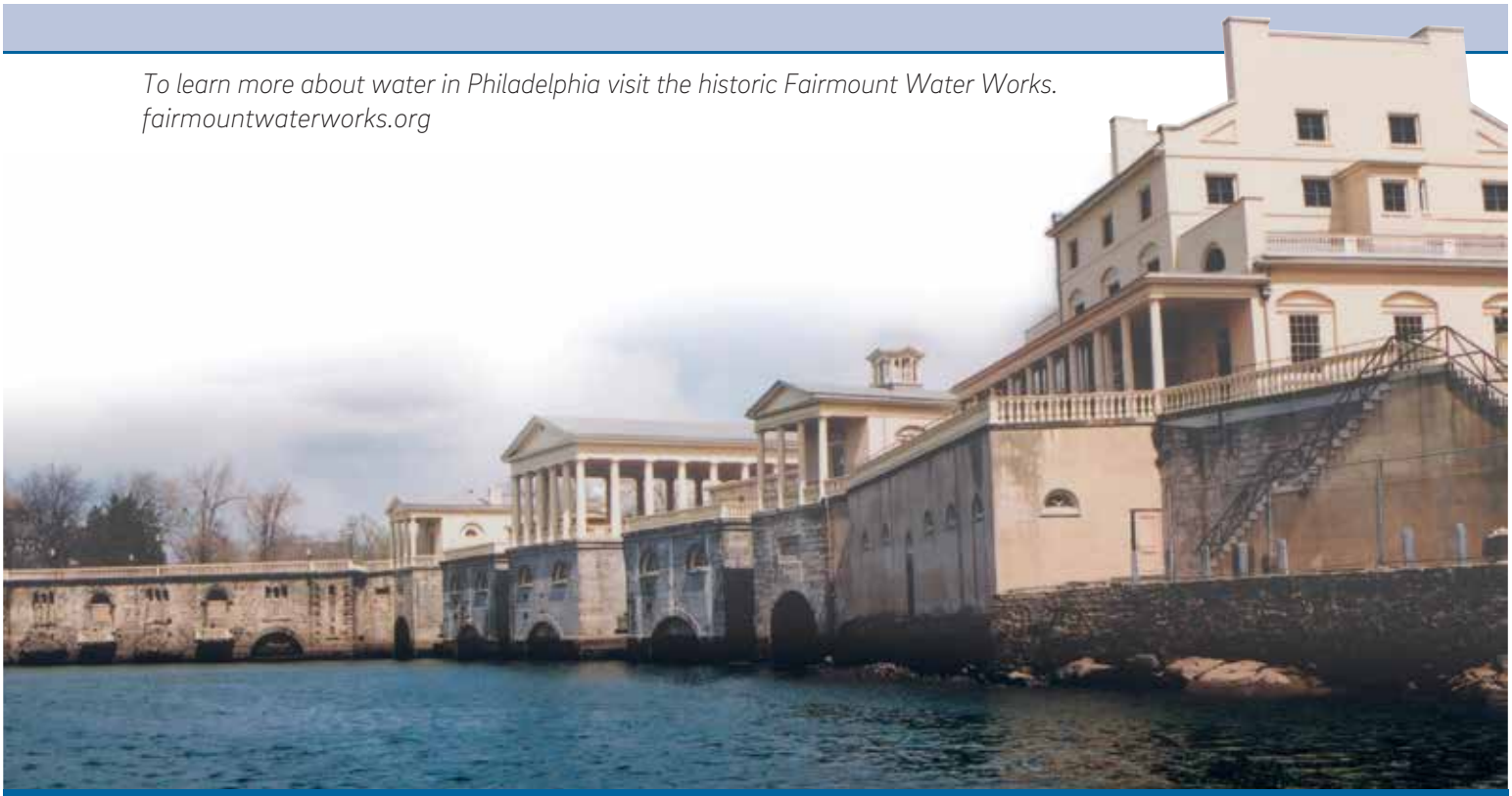
4. Threats to Human Health

Stormwater runoff can carry toxic metals, bacteria, viruses, and sometimes untreated sewage. This pollution drains directly to the Delaware and Schuylkill Rivers—our drinking water supply—which makes it more costly for Philadelphia Water and downstream communities to clean.

5. Harms Wildlife

As stormwater overflows and empties into our streams and rivers, unnaturally high volumes of rushing water can wear away the stream bottom and cause stream bank erosion. Combined with the impact of pollutants, this water damages natural wildlife habitats and degrades drinking water quality, making it more costly to treat.

To learn more about water in Philadelphia visit the historic Fairmount Water Works. fairmountwaterworks.org

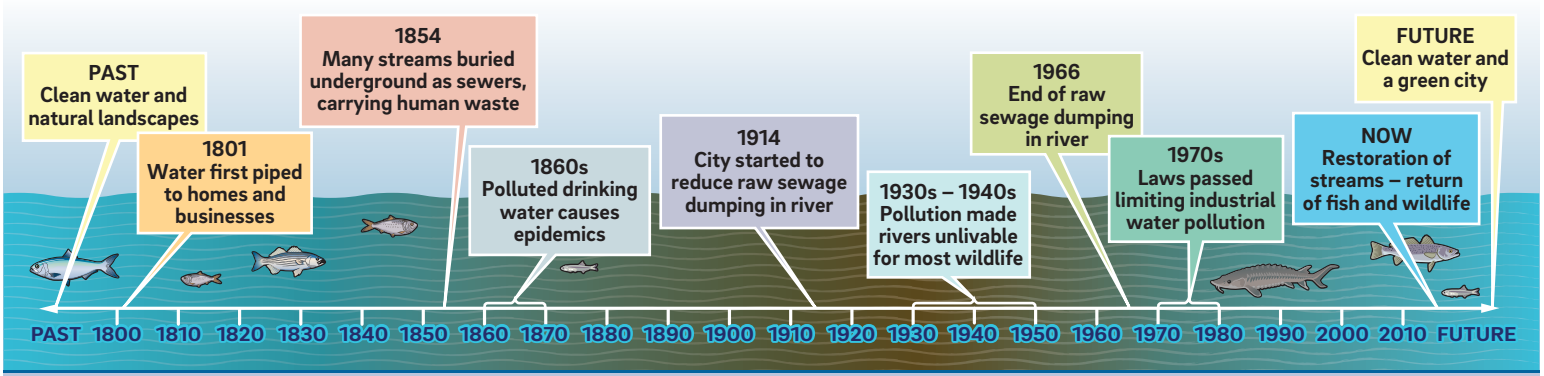


What Is Philadelphia Water Doing About It?

Philadelphia Water is working with homeowners, communities and stakeholders across the region to manage stormwater in a smart way. Those efforts include the ***Green City, Clean Waters*** program, which is primarily using green infrastructure to absorb and filter stormwater runoff naturally. By making water pollution control plant upgrades and using tools like rain gardens, rain barrels, and other green projects that you will find in this guide, we are on pace to reduce stormwater pollution in the city by 85 percent by 2036!

Green stormwater tools help reduce pollutants in our waterways, but they also beautify properties and make Philadelphia a greener place to live. See page 11 for green stormwater tools (some of which are offered for free or at a reduced cost through Rain Check) that can be added to your property.

Philadelphia Water also restores natural habitats such as stream banks and wetlands. By working with nature, damage from erosion and years of wear can be reversed to improve the quality of our drinking water sources. Find out more about our programs and initiatives at phillywatersheds.org/restoration.



How You Can Help at Home

As a homeowner or resident, you can help keep our water clean and reduce stormwater pollution by:

- Using fewer chemicals outside. There are lots of natural solutions for your lawn, car, and sidewalk that will be healthier for you, your family, and the environment.
- Reducing impervious surfaces (hard surfaces, such as concrete, that don't absorb water) so stormwater can soak into soil naturally and replenish our groundwater.
- Planting native trees and plants that soak up stormwater before it enters storm drains
- Following the practices listed in this guide. By doing many small things, you can have a big impact on our local waterways.
- Encouraging others to properly dispose of trash and waste so our streets and storm drains stay clean. Remember: **only rain goes down the storm drain!**

Volunteer to mark storm drains in your neighborhood.

Philadelphia Storm Drain Marking Project

Sign up for the Philadelphia Storm Drain Marking Project! This is a fun and easy way to give back to the environment. By signing up you commit to marking at least 15 storm drains with your team. You simply glue medallions on the curb facing the storm drains to remind people where the water drains! Great opportunity for Earth Day and other service projects.

All supplies are **FREE**, and it is easy to volunteer!
Visit phillywatersheds.org/inletmarkers to find out how.

Homeowner Maintenance

Washing Your Vehicle

Where you wash your car matters. The best option for our rivers is to take your vehicle to a commercial car wash, especially if you plan to clean the engine or the bottom of the car. Most car washes reuse water several times before sending it to one of our three water pollution control plants.

Vehicles washed in driveways and parking lots allow dirty wash water to find its way to the nearest storm drain. That water often contains oils and grease, phosphates (from the soap) and heavy metals—all substances that are unhealthy for people, fish, and other living things. If you would rather wash your car at home, protect our local streams with these tips:

Home Car Wash Tips:

- Wash your vehicle on gravel, grass, or another permeable surface so the ground can filter the water naturally.
- Use soap sparingly and try to use non-phosphate detergents. Phosphates are pollutants that can be harmful to nearby waterways and promote excess growth of algae.
- Use a hose that is high pressure and low volume. Fit your hose with a nozzle that automatically turns off, or has a pistol grip or trigger nozzle to save water. Wash one section at a time and rinse quickly.
- When you are done, empty the bucket of soapy water down the sink—**not into the street.**
- If you are hosting a car wash fundraiser, consider selling coupon books. Many car wash companies offer fundraiser savings books to nonprofit organizations and sports teams at reduced prices. The coupons can then be used anytime by the supporter.

Most car washes clean and recycle the water several times before it goes to the water pollution control plant. The plant then cleans it even more before it is returned to the Delaware River.

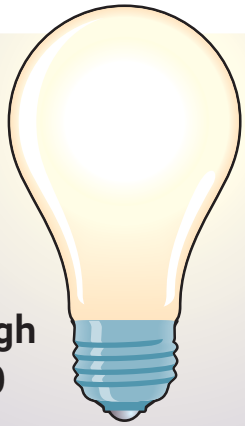
Vehicle Maintenance

Own a vehicle? You can do your part to reduce the chances of oil and other hazardous chemicals entering our drinking water supply. Oil, heavy metals and other toxic materials that leak out of your car are washed by rain into the nearest storm drains, which lead to our rivers. Whether you do vehicle maintenance at home or take it to a local car care center, you can prevent leaks by servicing your car regularly and ensuring oil and other fluids are disposed of correctly.

Vehicle Maintenance Tips:

- Check your vehicle for drips and oil leaks regularly and fix them promptly.
- If you're doing maintenance and spot a leak, use ground cloths or drip pans to collect the fluid.
- Collect used oil in a leak-proof container with a tight-fitting lid. You can recycle it for free at many auto supply stores, car care centers, and some gas stations.
- Never dump motor oil, antifreeze, transmission fluid or other engine fluids into road gutters, storm drains, ditches, soil, or inside your home sinks or drains.
- Safely store used vehicle fluids for a hazardous waste collection day. You can find a schedule of these events at: philadelphiastreets.com/hazardous-waste.

Little leaks add up!
There are over 700,000 cars in Philadelphia, if each one leaked 10 drops of oil a day that would be over 28,000 gallons of oil a year.



Each year, 200 million gallons of used oil are disposed of improperly. Recycled properly, that oil could generate enough electricity to power 100 million homes for an entire day!*

*Source: EPA, 2013 Source: http://www.epa.gov/osw/conserve/materials/usedoil/oil.htm

Winter Deicing

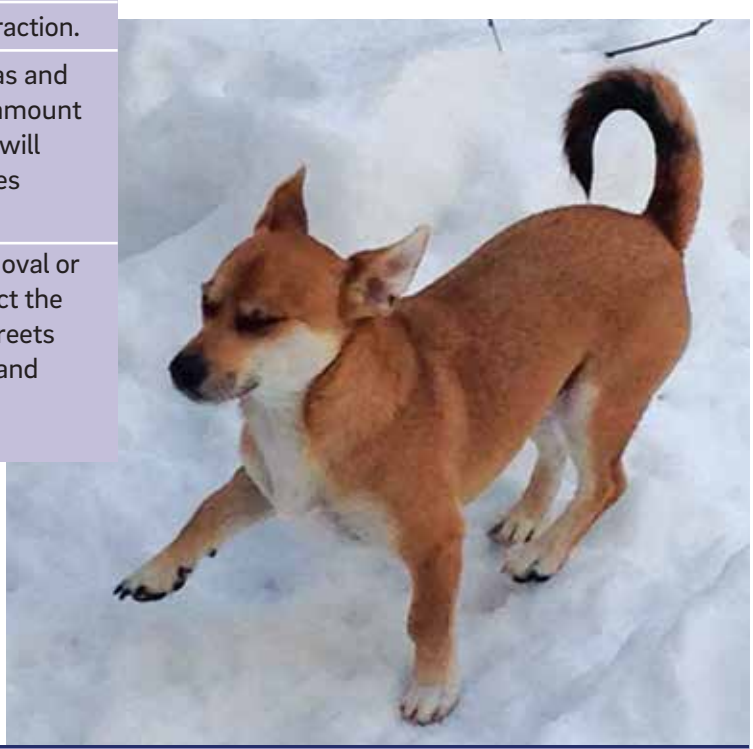
As snow piles up in the winter, we often turn to salt or other solutions to melt snow and ice. All deicers can be harmful to our drinking water supply and the environment when overused, so the best strategy is to read the labels and use as directed only when needed. High concentrations of salt can damage and kill plants and harm our local waterways, creatures and fish.

You can effectively control ice and keep surfaces safe by using less road salt. In addition, many safer alternatives can be found at local hardware stores. Check the labels for products containing potassium chloride, calcium chloride and magnesium chloride, corn processing byproducts, and calcium magnesium acetate (CMA). These alternatives can be spread in a dry form or sprayed as a liquid and work best when used with salt. Together, they work more efficiently so you can use less.

If you have pets, you should consider using reduced amounts of traditional road salts or alternatives that are less harmful to paws. Keep these products out of reach of pets and children.

Winter Deicing Tips:

- The first line of defense should always be shoveling sidewalks and pathways to keep them clear and prevent ice from forming. **Salt and deicers are not effective when more than 3 inches of snow have accumulated.**
- Consider the temperature. Salt and calcium magnesium acetate (CMA) are much more effective at melting snow and ice at temperatures above 25 degrees.
- Reduce salt and other chemicals by adding sand for traction.
- Focus your use of deicing products on high use areas and slopes where traction is critical. By using the least amount necessary to get the job done, you save money and will minimize property damage to paved surfaces, vehicles and plants.
- If you observe ongoing issues with snow and ice removal or excess piles of road salt in your neighborhood, contact the appropriate property manager or the Philadelphia Streets Department. The Streets hotline is 215-686-5560, and you can find them online at www.phila.gov/streets.



Philadelphia Water's spokesdog, Shorty, says too much salt hurts his paws. Find an ecofriendly, pet friendly deicer.

Pet Waste

When animal waste is left on the ground, rainwater or melting snow breaks it down and washes it into storm drains or directly into our creeks. This contaminated water contains disease-causing bacteria, which is unsafe for everyone, and causes larger environmental issues. Pet waste increases algae blooms and excessive aquatic plant growth, which can rob the water of vital oxygen needed for fish and other animals to live.

Scoop the Poop Tips:

- Bag it! When going for dog walks reuse a plastic bag or take a compostable baggie. After your dog does its business, turn the baggie inside out over your hand and use it as a glove to pick up the waste.
- Treat pet waste like human waste—flush it down the toilet so it can be treated appropriately. Be sure not to flush the baggie!
- If you can't flush your pet's waste, throwing the filled baggie in the trash is an alternative. **Never put waste into storm drains!**
- Check to see if your neighborhood and local parks have baggies available. If not, talk to your local civic association about installing a pet waste station to reduce "poo-lution" in your area.

Dog waste carries disease causing bacteria and worms. Pick it up!

Lawn & Garden Care

When fertilizing lawns and/or using pesticides and herbicides, you're not just spraying the lawn. When it rains, the fertilizers, pesticides and herbicides wash off your property and into storm drains. This not only contaminates the water in our streams, but these chemicals can harm wildlife.

The most effective way of keeping your lawn green and healthy is not only good for the environment, but it will also save you money. Before you fertilize, get a soil testing kit from your local hardware store. The soil test will help you determine what type and how much fertilizer your property requires. For best results, you do not need to fertilize all year round. Fertilizing in the spring just makes the grass grow taller and quicker so that it needs to be mowed more. Instead, concentrate your efforts on the fall. Fertilizing in the fall helps the roots grow deeply enough to last through the winter and thrive during the spring and summer.

You may also consider adding native plants in place of some of your grass. Native plants often require less water and can capture and filter more pollutants than grass alone. They also won't require as much fertilizer, saving you money in the long run while making your yard cleaner and healthier.

Keep your lawn healthy and your family safe. Test your soil so you can find out exactly what nutrients your lawn needs, if any, before fertilizing.

Lawn Care Tips

- Use fertilizers sparingly. Testing your soil will save you time and money.
- Do not fertilize or treat your lawn before a rain storm. It won't help your lawn, and those pollutants will be washed into our drinking water supply.
- Let grass clippings lay! They can act as free, natural fertilizer for your lawn. Use a mulching lawnmower to cut one-third of the blade height each week and leave the clippings.
- Fertilizers don't help your sidewalk or driveway. If fertilizer gets onto paved surfaces, sweep it back on the lawn or collect it for later use.
- Consider using organic fertilizers that release nutrients more slowly.
- Never use fertilizer near a stream, it can kill fish and other wildlife.

Greening Your Property with Rain Check

Rain Check is a Philadelphia Water program that helps residents in Philadelphia manage stormwater and beautify their homes. Participants can get a free rain barrel as well as reduced-cost downspout planters, rain gardens or permeable paving.

Which tool is right for you?

Each type of Rain Check project will bring different benefits to your home. These tools are great if...

Rain Barrels

- You want to use the water you collect for other purposes.
- You have limited space.

Your Cost: FREE!!!
Valued at: $150

Downspout Planters

- You want to add some greenery in a small space.

Your Cost: $100
Valued at: $800

Permeable Paving

- You have a patio in need of repair.
- You have a lot of paved surfaces.
- You are willing to spend more.

Your Cost: $30-$35/sq. ft.
PWD pays up to $2,000

Rain Gardens

- You have some yard space.
- You want a beautiful garden for your home.
- You are willing to spend more.

Your Cost: $17-$20/sq. ft.
PWD pays up to $2,000

Get Started

Interested in Rain Check? Visit phillywatersheds.org/raincheck to sign up for a Rain Check workshop. To be eligible, you must be a Philadelphia resident and you are required to attend one workshop, which will cover all the need-to-know information and get you started towards greening your home!

Rain Check is funded by Philadelphia Water and managed by the Pennsylvania Horticultural Society in partnership with the Sustainable Business Network.

Examples for Greening Your Home

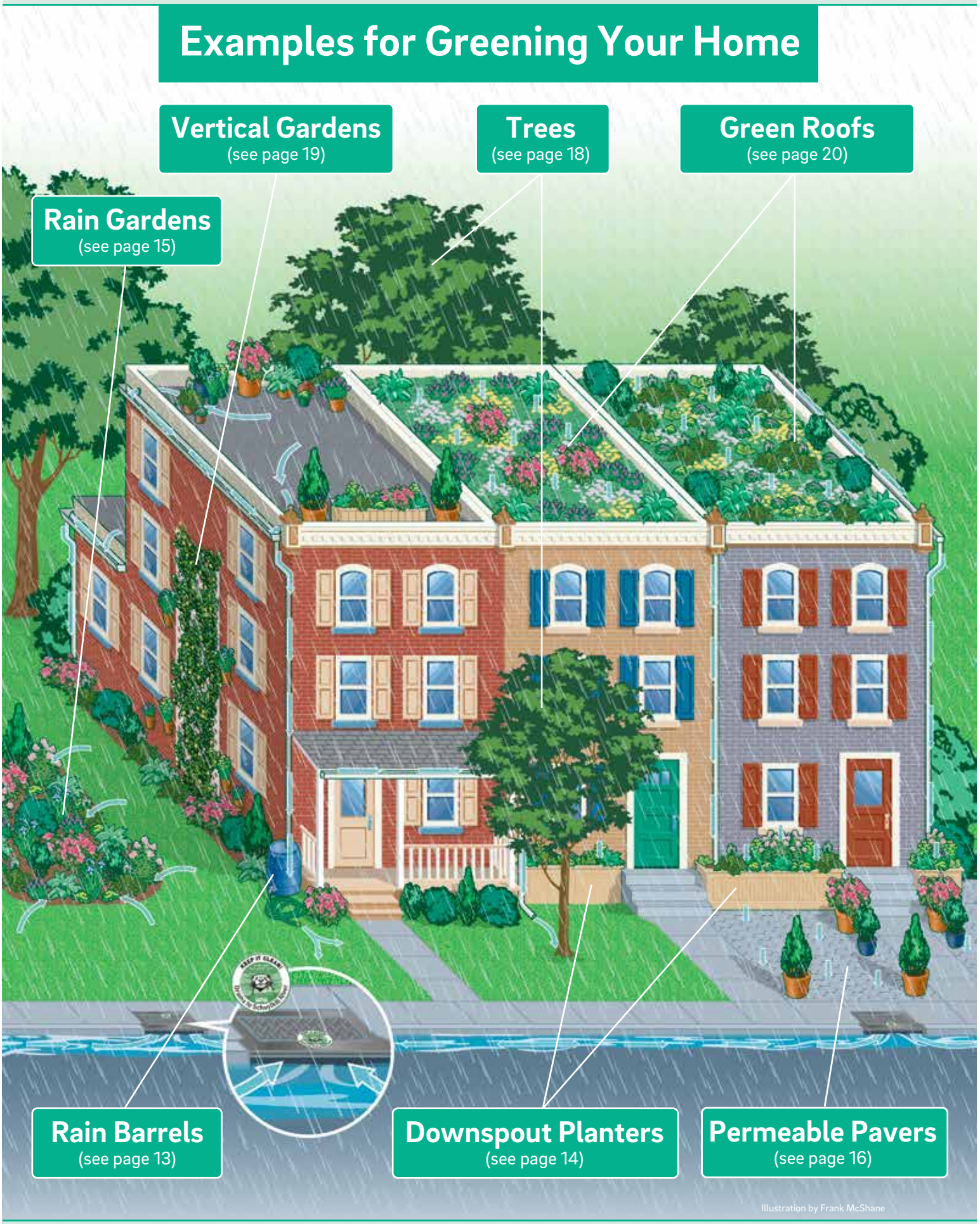


Illustration by Frank McShane

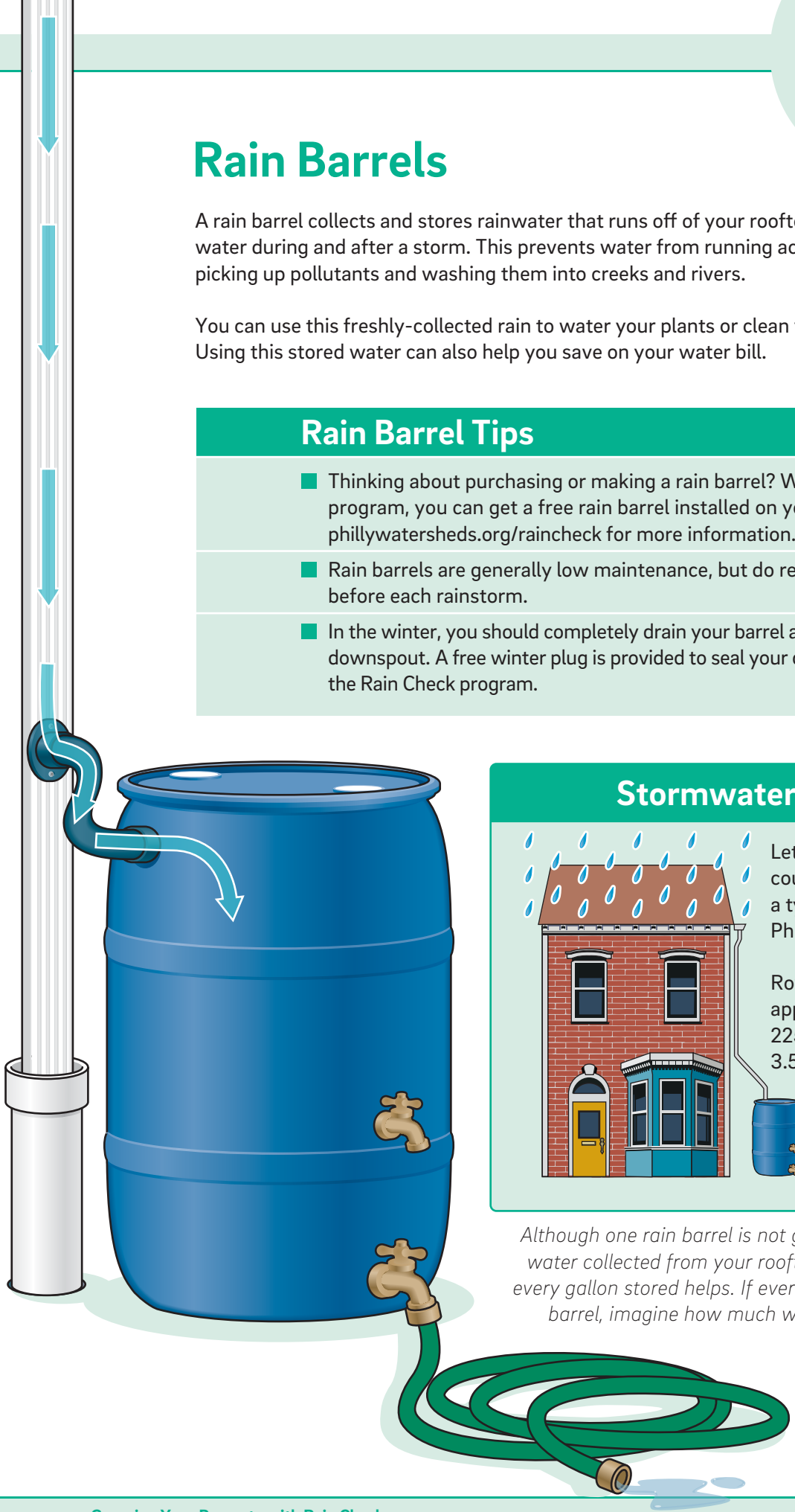
Rain Barrels

A rain barrel collects and stores rainwater that runs off of your rooftop. It temporarily holds water during and after a storm. This prevents water from running across urban surfaces, picking up pollutants and washing them into creeks and rivers.

You can use this freshly-collected rain to water your plants or clean your outdoor spaces. Using this stored water can also help you save on your water bill.

Rain Barrel Tips

- Thinking about purchasing or making a rain barrel? With the Rain Check program, you can get a free rain barrel installed on your property! Visit phillywatersheds.org/raincheck for more information.
- Rain barrels are generally low maintenance, but do require being emptied before each rainstorm.
- In the winter, you should completely drain your barrel and detach it from the downspout. A free winter plug is provided to seal your downspout as part of the Rain Check program.



Stormwater Runoff

Let's see how much water could be collected during a typical ½" storm from a Philadelphia row home:

Row home roof is approx. 800 sq. feet = 225 gallons stored or 3.5 rain barrels.

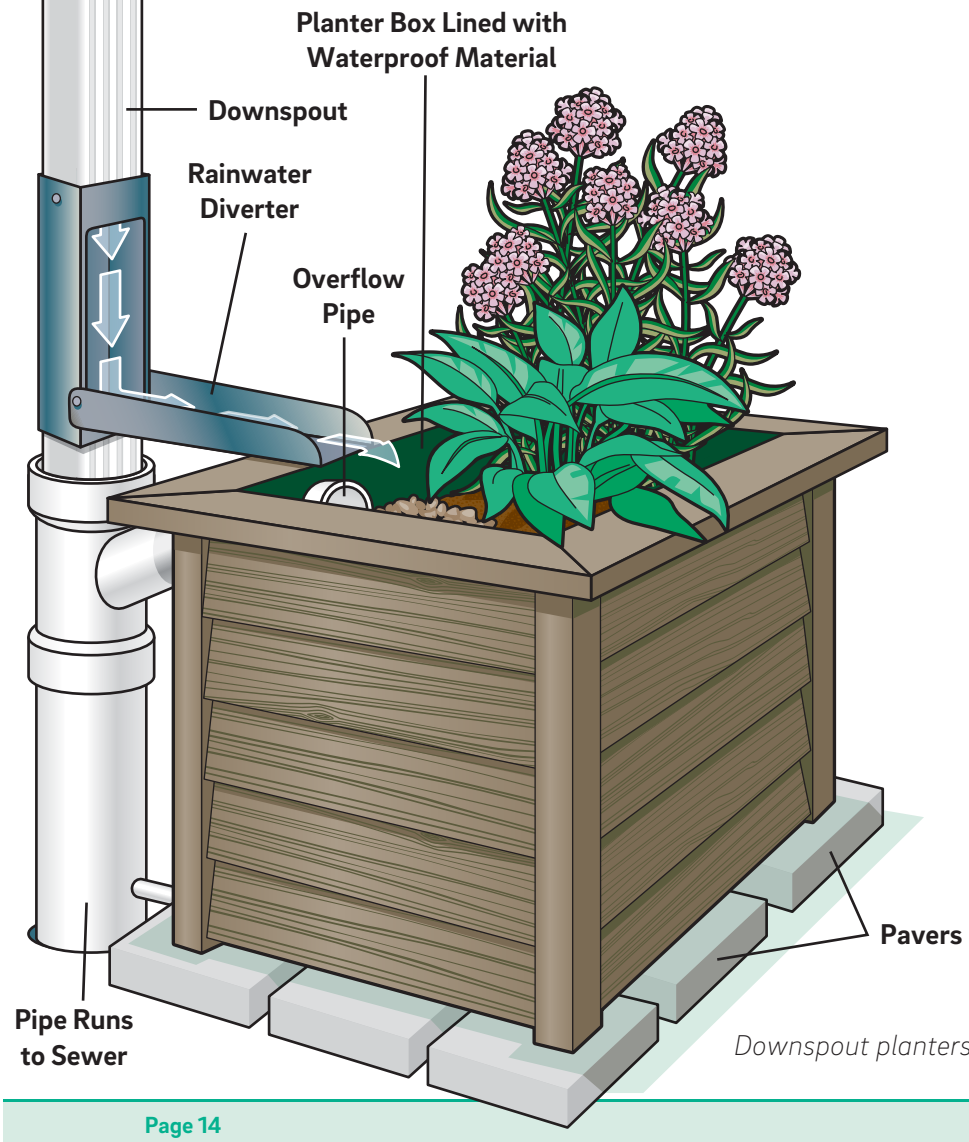
Although one rain barrel is not going to capture all the water collected from your rooftop every time it rains, every gallon stored helps. If every house installed a rain barrel, imagine how much water we could save.

Planters

Even if you don't have space to plant flowers, trees or shrubs, you can create your own garden in a planter. Planters come in all shapes and sizes, ranging from large concrete containers to potted plants arranged along a building or in a yard. They'll look beautiful while helping to capture stormwater that would otherwise wash into nearby storm drains. Container gardens are the perfect way to green your property and can be made or purchased to fit any yard or patio.

Rain Check offers a cost-sharing program for installing **downspout planters**, which are specially designed container gardens that collect rain directly from your roof's downspout. The process includes installation, planting, and a quality assurance inspection.

You can find out more at phillywatersheds.org/raincheck.



Downspout planters look beautiful and manage stormwater.

Planter Tips

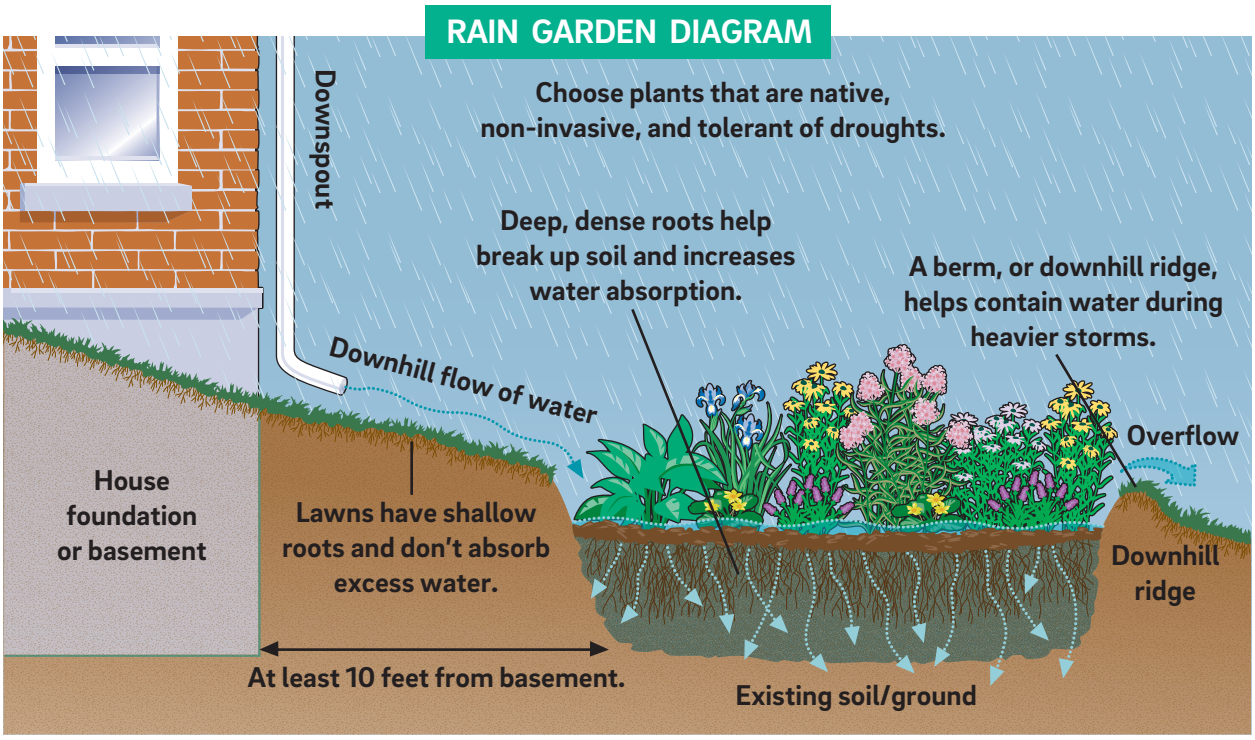
- Choose hardy, self-sustaining, native plants. These require less care and will retain more rainwater.
- If you would rather build or purchase your own planter, you can find materials at your local hardware or landscaping store. Drill holes in the bottom of the container if they are not already there.
- Fill the planter with soil, leaving a few inches from the top of the soil to the top of the planter.
- Occasionally turning or tilling the soil can improve water absorption.

Rain Gardens

Rain gardens are shallow, planted depressions that are designed to absorb water from your roof, allowing it to drain directly into the soil. Typically, a downspout from your home is disconnected from the sewer system and diverted into the rain garden, which can prevent hundreds of gallons per year from entering the sewer system. Rain gardens are one of the most cost effective ways to manage stormwater runoff and can be a beautiful addition to your existing landscape design.

If your yard qualifies, participating in Rain Check may significantly reduce the costs of installing a rain garden.

You can find out more at phillywatersheds.org/raincheck.



Rain Garden Tips

- Check your soil first! Rain gardens require well-draining soil.
- Rain gardens must be planted at least 10 feet from any below-ground basement.
- Rain gardens can be designed to suit your landscaping preferences by using a variety of native, perennial plant species.
- This is not a vegetable or herb garden. Rain gardens are designed to absorb stormwater and filter out pollutants—not for growing food.

Rain gardens are beautiful and help our sewers from being overburdened during rainy days.

Permeable surfaces allow rainwater to soak back int the ground, like it would naturally, replenishing our ground water.

Permeable Paving

Removing impervious (hard) surfaces like concrete or asphalt allows stormwater to soak back into the ground naturally. There are many permeable surfaces available, including paving stones, bricks, pavers, or a special mix of concrete and asphalt that has pores for water to soak through. De-paving or installing permeable pavers will prevent stormwater from running off your property while making your driveway or pathway customized, unique and beautiful. Expert contractors are available through the Rain Check program, which can reduce your expense when renovating your property.

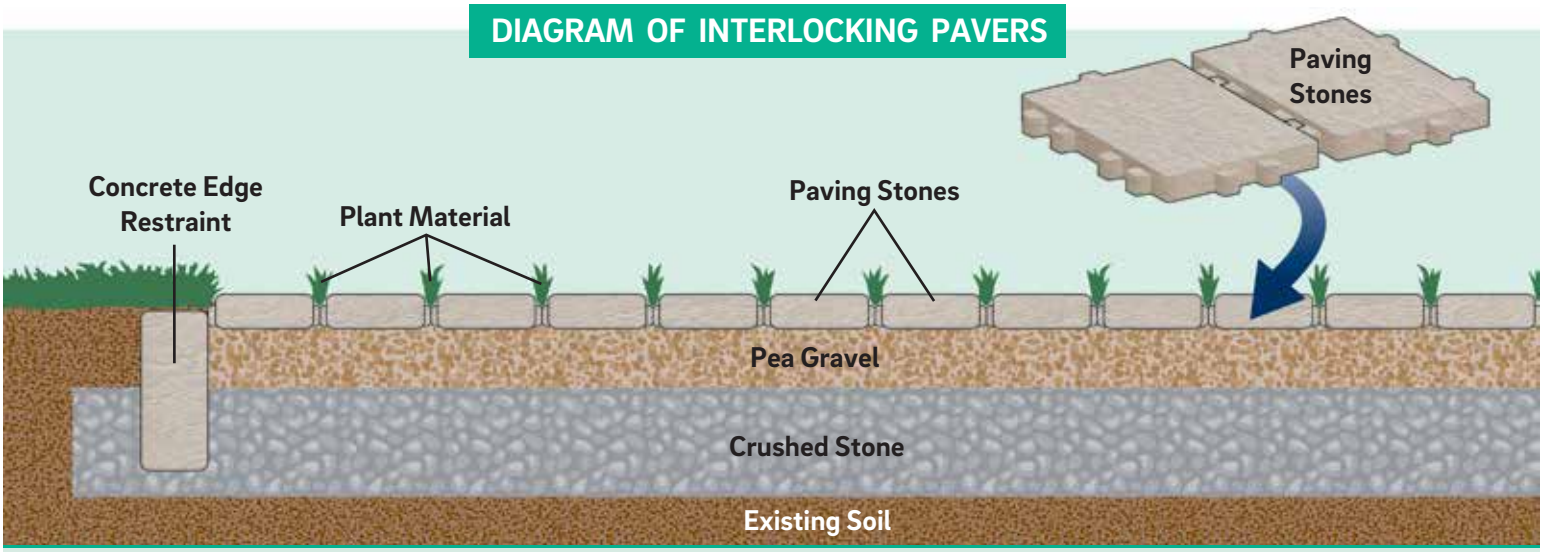
Permeable Paving Tips

- There are lots of options after de-paving your property, including landscaping, a rain garden, a lawn, permeable pavers, and more. As long as you are turning an impervious surface into a pervious surface, you qualify for the Rain Check program.
- All de-paving projects require that you dial 811 for the PA One Call ("Call Before You Dig") hotline. This will ensure that no underground wires or utilities are disturbed. Rain Check participants will have this taken care of for them.
- Worried about water in your basement? A liner can be installed against your exterior foundation wall to prevent potential water seepage, especially if there are existing signs of moisture.

  All projects must be on your property. Rain Check will not de-pave public sidewalks or areas.

You can find out more at phillywatersheds.org/raincheck.

DIAGRAM OF INTERLOCKING PAVERS



Sample Rain Check Projects

RAIN GARDEN

DOWNSPOUT PLANTER

DOWNSPOUT PLANTER

AN EXAMPLE OF PERMEABLE PAVING

DE-PAVING BY INSTALLING A RAIN GARDEN

RAIN GARDEN

More Greening for Homeowners: Take It Up a Notch

Trees

Trees are beautiful additions to your yard or sidewalk and provide many benefits to neighborhoods and properties. They cool and shade homes during the hot summer months, which can help fight the urban heat island effect and decrease your energy bill. They also can increase your property value and act as a neighborhood noise buffer. Trees are great for both our health and the environment. They remove pollutants from the air we breathe and they help reduce the amount of polluted stormwater that goes into storm drains. Philadelphia Water is planting thousands of trees through ***Green City, Clean Waters***, and we encourage homeowners to get in on the greening movement too.

If you're thinking about planting trees on your property, keep in mind these helpful hints:

- The Pennsylvania Horticultural Society offers a basic training course called **Tree Tenders** to help you learn how to best plant trees for your property or community. Find out more at phsonline.org/greening/tree-tenders.
- Pick the best spot for your tree or trees. **TreePhilly**, a Philadelphia Parks and Recreation program, provides free trees to Philadelphia property owners. **Learn more at treephilly.org** and check out the great resources for picking the best tree locations.
- Your choice of tree matters. Plant only native trees that will thrive in an urban environment to ensure they will grow healthy and strong. See the chart below for suggestions.
- Give your tree a good start! Make sure to water young trees so they establish a good root system.

Recommended Street Tree List for Philadelphia:

Apply for a free tree through the TreePhilly Program! Visit treephilly.org.

SMALL TREES — UNDER 30'
Acer buergeranum — Trident Maple
Acer campestre — Hedge Maple
Acer ginnala — Amur Maple
Acer tataricum — Tartarian Maple
Crataegus crus-galli 'Inermis' — Thornless Hawthorn, tree form
Crataegus laevigata 'Superba' — Crimson Cloud Hawthorn tree form
Crataegus phaenopyrum — Washington Hawthorn, tree form
Crataegus viridis — Winter King Hawthorne
Prunus triloba — Flowering Plum
Malus (selected varieties) — Crabapple
Syringa reticulata — Japanese Tree Lilac

MEDIUM TREES 30'– 46'
Aesculus x carnea 'Briotii' — Ruby Red Horsechestnut
Cercidiphyllum japonica — Katsura tree
Cladrastis lutea — Yellowwood
Crataegus lavallei — Lavalle Hawthorn
Koelreuteria paniculata — Golden Rain Tree
Malus (selected varieties) — Crabapple
Ostrya virginiana — Hop Hornbeam
Phellodendron amurense — Amur Cork Tree
Prunus x yedoensis — Yoshino Cherry
Ulmus parvifolia — Chinese Elm
Quercus acutissima — Sawtooth Oak

LARGE TREES OVER 47'
Acer rubrum (selected cultivars) — Red Maple
Celtis occidentalis — Hackberry
Corylus colurna — Turkish Filbert
Fraxinus pennsylvanica 'Patmore' — Patmore Green Ash
Gleditsia triacanthos (selected cultivars) — Honey Locust,
a) Halka, b) Moraine, c) Shademaster
Ginkgo biloba (male selections only) — Ginkgo
Liquidambar styraciflua — Sweetgum
Quercus rubra — Red Oak
Quercus macrocarpa — Bur Oak
Quercus palustris — Pin Oak
Sophora japonica — Japanese Pagoda Tree
Tilia cordata — Little Leaf Linden
Zelkova serrata (selected cultivars) — Japanese Zelkova,
a) Green Vase, b) Village Green

TREES FOR NARROW STREETS
Acer rubrum 'Armstrong' — Armstrong Columnar Red Maple
Carpinus betulus fastigiata — Pyramidal European Hornbeam
Ginkgo biloba 'Princeton Sentry' — Princeton Sentry Ginkgo Grafted Male Variety
Prunus sargentii 'Columnaris' — Columnar Sargent Cherry
Quercus robur 'Rose Hill' — Rose Hill English Oak

*Source: treephilly.org

Vertical Gardens

Looking to add some green to your property and capture stormwater, but don't have much space? A vertical garden might be the perfect DIY project for you. You can create one with potted plants placed on A-frame shelves, grow vines or climbing plants, or go totally vertical by creating or purchasing a wall planter. In addition to beautifying your space, vertical gardens can capture some rainwater, reduce noise and air pollution and even help reduce heating and cooling costs if placed against a building. The options are endless and allow for your creative style to show through.

Vertical Garden Tips:

- There are lots of DIY resources available online to create your own green living wall or vertical garden. Search "green living wall DIY" and "vertical gardens DIY" to find easy, fun ways to get started.
- If you don't want to start completely from scratch, purchase inexpensive pots and planters at a hardware store and incorporate them into your design.
- When possible, use recycled materials. Simple planters can be created by reusing wooden shipping crates or pallets. (Search "pallet vertical garden" for some great step by step guides.)
- Choose hardy, native flowers and plants. These will look great, last longer and can retain more rainwater than their dainty counterparts.

Green walls, also called living walls, clean our air and water and they look amazing!

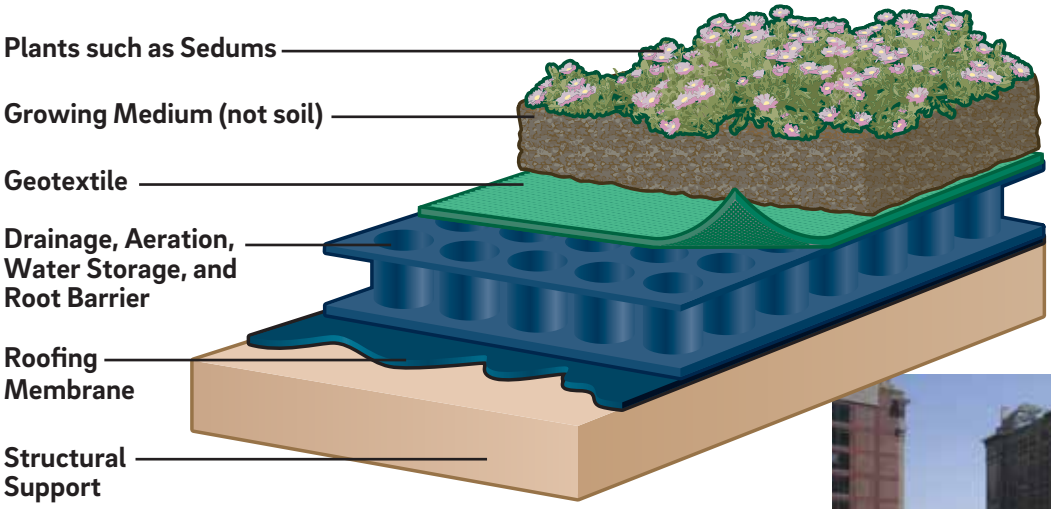
Green Roofs

A green roof is a roof of a building that is partially or completely covered with plants. Green roofs are an excellent way to manage stormwater, as they can absorb and retain up to 50 percent of the rainfall they receive. Rain that doesn't get absorbed is slowed down and filtered by plant roots and soil. Green roofs also provide a lush oasis in the city, produce fresh oxygen, serve as natural habitats and significantly reduce heating and cooling costs by acting as an additional layer of insulation. Green roofs look great, require very little maintenance and can help extend the lifetime of your roof!

Green Roof Tips:

- For most people, the best option is to hire a contractor who can help you design a green roof to meet your needs and budget, and also help you through the permitting process. Green roofs typically range in cost from $10-$25 per square foot.
- The most cost-effective time to construct a green roof is when your roof already needs repairs or when a building is being constructed.
- Like the idea of a green roof but don't like the price tag? Try a rooftop garden as a simple and low-maintenance alternative. Drought-resistant potted plants can also help absorb stormwater on your roof, as long as you have easy roof access and consider the weight your roof can hold.

DIAGRAM OF GREEN ROOF LAYERS



Green roofs absorb water, produce fresh oxygen, reduce HVAC costs and create a lush oasis in the city.

Our Water

DELAWARE RIVER BASIN

The rivers and creeks of the Delaware and Schuylkill River Basins provide drinking water to 15,000,000 people in New Jersey, Pennsylvania, Delaware and New York. The aquifers that lie under the ground provide drinking water to millions more. These surface and underground water sources also fuel agriculture and industry in our region. Thank you for taking action at your home to sustain our clean water for current and future generations.

DELAWARE ESTUARY

All of us are connected to the Delaware Estuary, whether we live in Philadelphia, far upstream in Hancock, New York, or right on the Bay at Cape May, New Jersey, or Lewes, Delaware.

Estuaries are areas partially surrounded by land where rivers meet the sea. They are characterized by varying degrees of salinity and complex water movements affected by ocean tides and river currents. Estuaries are living places hosting more wildlife births than any other ecosystem in the world, with a wide range of habitats for many different species of plants and animals. These nurseries are not only vital to animal populations, but also to the human population that relies upon them for drinking water, industry, food production and recreation. Estuaries are lined with vital wetlands that strain stormwater runoff from the land, absorbing a great deal of pollution from the water before it meets with rivers and bays.

The Delaware Estuary faces many environmental challenges. Thus, it is vitally important for ecology and industry to continually work together to protect the Delaware Estuary: a precious resource that means so much to so many.

Find out more about Philadelphia Water and initiatives that keep our drinking water clean at phillywatersheds.org.

Front and back cover illustrations by Frank McShane

PHILADELPHIA WATER
EST. 1801

Philadelphia Water
Philadelphia, PA
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Partnership for the DELAWARE ESTUARY
Connecting people, science, and nature for a healthy Delaware River and Bay

Partnership for the Delaware Estuary
Wilmington, DE
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The Philadelphia Water Department and Water Revenue Bureau serve the Greater Philadelphia region by providing integrated water, wastewater, and stormwater services.

www.phila.gov/water

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