A RESIDENT'S REFERENCE GUIDE TO

STORMWATER MANAGEMENT

KANSAS CITY
MISSOURI

KCWATER
SERVICES

CONTENTS

Throughout this guide, you will notice symbols that estimate the financial cost and time commitment of various projects to help you decide which projects you want to do. These projects will not only help improve water quality in our streams, lakes, and rivers, but will also help to enhance the quality of life in our community.

FINANCIAL COST

Minimal cost 

$25–$75 

$75–$150 

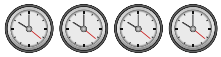
$150 + 

EFFORT OR TIME COMMITMENT

Minimal effort or time commitment 

Less than two hours of work 

Approximately one half-day of work 

Approximately one full day of work 

What is stormwater and how does it affect me?

Stormwater is simply the water created by rainfall or melting snow. Stormwater is a very necessary and important resource, but it can also cause water quality and water quantity issues in urban and suburban areas. When stormwater does not soak into the ground, it runs off, traveling down gutters and across paved surfaces, bare soil, or sloped lawns. It eventually makes its way to a ditch or storm drain in the street, collecting pollutants along the way. From there, the storm drain system carries the water untreated directly to local streams and rivers.

Stormwater affects each and every one of us. As stormwater travels across paved surfaces, it collects pollutants such as sediment, fertilizers, pesticides, pet waste, oil, de-icing products, yard waste, and litter. Ultimately, these pollutants end up in local streams and rivers. Polluted stormwater can cause many problems, including threats to human and animal health, flooding, and erosion. Stormwater runoff can threaten human and animal health as it carries toxic pollutants, such as organic compounds, bacteria, and viruses. These toxic pollutants can harm aquatic life, making some fish unsafe to eat. Polluted stormwater can contaminate drinking water supplies as well as hamper recreational opportunities. When too much stormwater runs off paved surfaces, roofs, and lawns, flooding may occur which can cause damage to property. High volumes of stormwater flowing into a stream can cause severe stream bank erosion. Erosion can cause damage to properties, harm wildlife habitats, and fill streams with sediment.

What issues are related to stormwater runoff?

The issues caused by stormwater runoff can seem overwhelming. Thankfully, there are easy steps that you can take as a homeowner to help decrease stormwater pollution right on your own property. When looking at the big picture, lots of small changes can add up to large water quality improvements and flooding reductions for Kansas City and cities downstream.

A pathway for pollution

Stormwater runoff from your property can pick up a number of pollutants and harmful materials on its way to rivers and streams. These include:

- Sediment
- Fertilizer and pesticides
- Pet waste
- Oil, grease, gasoline, and antifreeze from vehicles
- De-icing products such as salt or chemical ice melt
- Grass clippings, leaves, and other yard waste
- Litter such as fast food wrappers and cigarette butts

Because stormwater runoff is the number one way pollutants enter our local waterways, it is critical that we be aware of what ends up on the ground and ultimately, in our storm drains.

The problem with pavement

When rain soaks into the soil it is called infiltration. Infiltration helps clean and filter the water and recharge groundwater supplies. Paved, solid surfaces such as parking lots, roads, and driveways keep rain from soaking into the soil. Another term for a paved, solid surface is "impervious surface." In addition to preventing rain from soaking into the soil, impervious surfaces increase the speed and amount of water that rushes into streams. This rushing water causes stream bank erosion that can damage properties, harm wildlife habitats, and fill streams with sediment.

Solution: *An easy way to minimize negative impacts of pavement on your property is to direct the flow of water from downspouts away from paved surfaces whenever possible.*

Roof runoff

The average-sized home in our region has a 1,000 square-foot roof. A rainfall of just one inch can cause over 600 gallons of water to run off that roof! Much of this water runs from gutters through downspouts onto impervious surfaces such as streets or driveways, carrying pollutants into storm drains and eventually into our rivers and streams.

Solution: *A rain barrel can collect and store rainwater from downspouts and rooftops for future use watering lawns and gardens. It also reduces the amount of polluted stormwater that runs into our streams.*

Getting to the root of stormwater problems

The dense clay soils found in parts of our region can make it difficult for water to soak into the ground. However, native plants can help! Many native plants have deep, robust root systems that grow down into the clay, creating pathways for water to flow down into the soil. As roots come and go through a plant's life cycle, the spaces left by dead roots allow water to further soak into the soil. This natural process increases the ability of soil to absorb and retain water. When non-native plants and turf grasses that have weak, shallow roots are planted, less stormwater is absorbed into the ground, leading to more runoff and water pollution.

Solution: *Add native plants to your gardens. Next time you are at your local garden center, ask to see the native options.*

Too much water moving too fast

In the past, cities installed pipes and storm drains to move stormwater away from homes and buildings as quickly as possible and drain it in the nearest creek or stream. This approach, still practiced in many places today, can result in polluted stormwater, stream bank erosion, and flooding in communities downstream. The new and preferred way to manage stormwater is to keep it onsite, slow it down, spread it out, and soak it in, which allows the soil to filter out pollutants and encourages water to enter streams gradually. Developers and municipalities are now using green infrastructure such as rain gardens, native plantings, and porous pavements to help manage stormwater where it falls.

Solution: *Keep stormwater on your property as long as possible by installing a rain garden or rain barrel. This allows the water to soak into the ground or to be used to water your plants.*

Sewer overflows

Combined sewers are older systems that carry both stormwater and sewage (also called "wastewater") to treatment plants. Kansas City has approximately 58 square miles of combined sewers. When stormwater runoff from rain storms completely fills combined sewer pipes, the result is a "Combined Sewer Overflow," a discharge of untreated wastewater and stormwater into local streams. In areas where sanitary sewers and storm sewers are separate, sewer overflows can occur when downspouts, sump pumps, and floor drains from homes and businesses are connected directly to the sanitary sewer.

Solution: *Help keep extra water out of the system by disconnecting your downspouts and sump pumps from the sewer. Once they are disconnected, install rain barrels at the downspouts or redirect them to planted areas.*

HOW RESIDENTS CAN HELP PREVENT POLLUTION

Now that you know about the issues associated with stormwater, you can make informed decisions on how to best prevent stormwater pollution on your property and in your community. This section will provide you with a variety of actions that you can take to play an active role in protecting our waterways.

Keep Storm Drains Clean

Storm drains are the openings at the curb, sometimes covered with a metal grate, which receive stormwater draining from streets. They are part of Kansas City's storm drainage system that was designed to prevent flooding. Throughout most of Kansas City, stormwater that runs from roofs, driveways, and streets goes down the storm drains and flows through a stormwater pipe directly to a stream or river without being treated at a treatment plant.

What's the problem?

When it rains, stormwater runs through yards, down driveways, and along streets, picking up substances such as lawn chemicals, pet waste, and motor oil along the way. This stormwater runoff can pollute our rivers and streams and harm wildlife. The illegal dumping of substances down storm drains such as soaps for washing cars, household chemicals, paint, and even products labeled as "non-toxic" or "bio-degradable" is also a problem. These substances contaminate local waterways and can be harmful to people and animals. Finally, if storm drains are not kept free from yard clippings, leaves, and trash, stormwater can back up into the streets, creating a flooding hazard for vehicles and pedestrians.

What can you do?

- Don't dump or place anything in a storm drain.
- Cover recycling bins on windy days so items don't blow out prior to pick-up.
- Properly store and dispose of yard waste and chemical containers from outside projects that could end up in a storm drain after a storm.
- When cleaning driveways and sidewalks, sweep yard clippings, dirt, and excess fertilizers into your yard instead of washing them away.
- Use lawn chemicals sparingly. Always follow label instructions and never apply immediately before a rain storm.
- Pick up after your pets by flushing the waste down your toilet or bagging it up and placing it in the trash.
- Recycle used motor oil and other automotive fluids at a household hazardous waste facility or automotive shop. Never place chemicals in the trash or pour down storm drains.
- Improve car-washing practices. Wash your car at a commercial car wash or in a grassy area.

This previous list gives quick and inexpensive ways anyone can help protect our waterways. Think of the items on the list as "the basics" of preventing stormwater pollution. Just adopting these simple habits can help improve water quality in Kansas City! Once you have the mastered "the basics" of preventing stormwater pollution, consider adopting the techniques on the following pages to become even more stormwater savvy.

Reduce Pesticide, Herbicide, and Fertilizer Use

Lawn chemicals, such as pesticides, herbicides, and fertilizers are commonly used for lawn and garden care. While they may help keep our lawns green and free of weeds, and our gardens free of pests, the toxins in lawn chemicals can harm our lakes, rivers, and streams and pose a health risk to humans, wildlife, and pets.

What's the problem?

If not applied correctly, lawn chemicals may wash from yards due to rains or excess watering. The chemicals enter storm drains and flow untreated to nearby rivers and streams. These chemicals can be harmful to aquatic life and cause excessive growth of plants and algae in our waterways. Chemicals in the water also increase the burden of treating water so it's safe for drinking.

What can you do?

1. Have your soil tested to find out what type of fertilizer your lawn or garden needs to be healthy. Using the right chemicals can save you money and time while protecting our waterways. Soil testing kits can be found at nurseries, hardware, and home improvement stores.
2. More is not better when it comes to lawn care. Read product labels carefully and apply the minimum amount directed. Applying too much fertilizer, pesticide, and herbicide can harm you and your lawn and cost you money.
3. Never sweep lawn chemicals into the streets or leave them on other hard surfaces where they can wash away. Sweep excess chemicals back onto your lawn or put them back in the bag for later use.
4. Use extra caution when applying lawn chemicals to areas where water runoff is most likely to occur, such as slopes and lawn edges.
5. Never apply lawn chemicals before rain is expected. Though it may seem like a cost-effective and convenient way to "water in" your lawn chemicals, rain storms are more likely to wash the chemicals away. Always water in your chemicals gently with a sprayer hose and be careful not to over-water. Allow liquid lawn chemicals plenty of time to dry before you water your lawn or if rain is forecasted.
6. Once you have applied lawn chemicals, wash your equipment off onto your lawn, never into the street. Take all remaining chemicals to a household hazardous waste facility, share them with a neighbor, or save them for next year.
7. Don't mow too low, raise your lawn mower blade. Grass that is 2-inches to 3-inches high can reduce the need for herbicides by suppressing weed growth. Taller grass also helps shade the ground, reducing the need to water.

More information on sustainable lawn care can be found through the University of Missouri: http://extension.missouri.edu/p/G6749

TIP

If you don't want to perform a soil test yourself, you can send a sample of your soil to your local extension office. Contact the extension office to find out how they can assist. Typically, extension office staff will provide you with a report listing the pH, phosphorus, potassium, calcium, and magnesium levels as well as the percentage of organic matter and recommendations on how to improve your soil composition. The fee is usually less than $25.00 and results are mailed out in about two weeks. Kansas City area extension offices are listed below.

Regional Extension Offices

Cass County — University of Missouri Extension
201 West Wall Street, Harrisonville, MO 64701
816/380-8460 • http://extension.missouri.edu/cass

Clay County — University of Missouri Extension
1901 NE 48th Street, Kansas City, MO 64118
816/407-3490 • http://extension.missouri.edu/clay

Jackson County — University of Missouri Extension
105 E. 5th Street, Suite 200, Kansas City, MO 64106
816/482-5850 • http://extension.missouri.edu/jackson

Johnson County K-State Research & Extension
11811 Sunset Drive, Suite 1500, Olathe, KS 66061
913/715-7000 • www.johnson.ksu.edu

Leavenworth County K-State Research & Extension
613 Holiday Plaza, Lansing, KS 66043
913/250-2300 • www.leavenworth.ksu.edu

Marais des Cygnes District - K-State Research & Extension
104 S. Brayman Street, Paola, KS 66071
913/294-4306 • www.maraisdescygnes.ksu.edu

Platte County — University of Missouri Extension
11724 NW Plaza Circle, Suite 300, Kansas City, MO 64153
816/270-2141 • http://extension.missouri.edu/platte

Wyandotte County K-State Research & Extension
1216 N. 79th Street, Kansas City, KS 66112
913/299-9300 • www.wyandotte.ksu.edu

Wash Your Car in the Right Place

Many people wash their cars in streets and on driveways. While washing a car at home may seem like a money-saving activity, it can be harmful to our local waterways if it is not done carefully. Ultimately, it may even cost more than a commercial car wash.

What's the problem?

The phosphates in soap washed from your car, along with contaminants such as road salt, gasoline, and motor oil, flow into storm drains that transport water to our local streams, lakes, and rivers. These pollutants negatively impact water quality and harm aquatic life. Although car wash fundraisers may support good causes, they can be a major source of water pollution. Such events are often held in larger, parking lots with paved areas that do not absorb or filter the polluted water before it enters storm drains or streams. If you are planning a fundraising car wash, follow the tips below in the "What can you do?" section to protect your nearby stream.

What can you do?

Using a commercial car wash is the best way to minimize the effect washing your car has on water quality. Federal law requires commercial car washes to drain their wastewater into sewers where it travels to a wastewater plant for treatment.

If you do wash your car at home or are planning a fundraising car wash, follow these tips to minimize the negative impacts on water quality:

- Use soap sparingly or use biodegradable, phosphate-free cleaners.
- Use a hose with a nozzle that minimizes water use and runoff.
- Wash on gravel or grass, which will filter water before it enters storm drains or streams.
- Pour your buckets of soapy water into a sink or toilet, not in the street, when you are done.
- Develop a partnership with a commercial car wash facility for fundraising events.

TIP

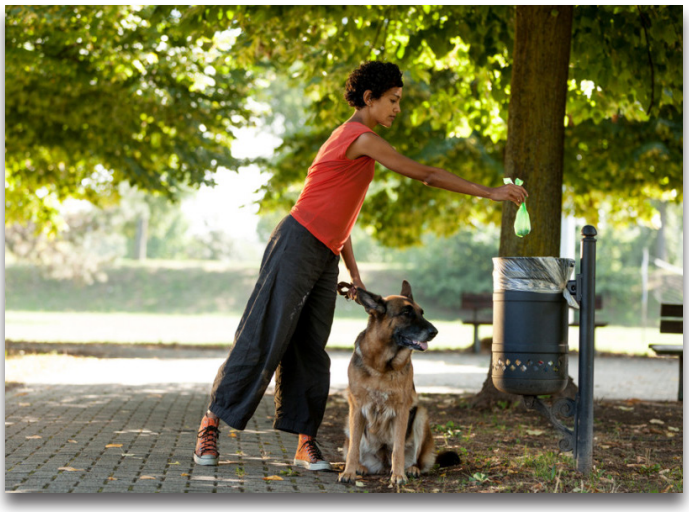
The naturally "soft" water from rain barrels works well with phosphate-free cleaners and is a low-cost alternative to using your hose to wash your car at home. For more information on how to install a rain barrel on your property, see page 15.

Pick Up After Your Pet

Another harmful contaminant found in our streams, lakes, and rivers comes from stormwater runoff polluted with pet waste.

What's the problem?

Every time it rains, the potential exists for thousands of pounds of pet waste to wash from sidewalks and yards into storm drains and ditches. From there it flows directly to local streams, lakes, and rivers, taking harmful bacteria with it. Even if your pet is not sick, bacteria and viruses in pet waste can threaten the health of other animals and people, especially children. This is why pet waste does not make good lawn fertilizer! Pet waste in waterways will decay, which uses oxygen and sometimes releases ammonia. This chemical reaction combined with warm temperatures can kill fish and other aquatic life. Pet waste also contains nutrients that encourage excess plant and algae growth in waterways.



What can you do?

Fortunately, it is easy for pet owners to help prevent pet waste from entering storm drains and waterways. Follow these tips to help keep your pet a good citizen:

- Pick up pet waste from your yard to keep your lawn, family, and pets healthy.
- Carry disposable bags while walking your dog to pick up pet waste. If going to the dog park, carry some extra bags for others.
- Flush dog waste down the toilet so it can be treated at a treatment plant or bag it up and throw it in the trash.
- If you dispose of pet waste in the trash, be sure to wrap it carefully to avoid spillage during trash collection.

HOW RESIDENTS CAN HELP REDUCE RUNOFF

Now that you know about the issues associated with stormwater, you can make informed decisions on how to best manage stormwater on your property. This section will provide you with a variety of steps that you can take to play an active role in reducing stormwater runoff.

Reducing stormwater runoff means adopting practices that keep stormwater on your property for as long as possible. No one wants water ponding in their yard for extended periods of time, but allowing stormwater to spread out and soak in is beneficial for your plants, yard, and even the foundation of your home. The following practices, which are later described in further detail, are some beneficial ways to manage your stormwater.

- Redirect your downspouts to a garden or grassy area to allow stormwater to soak in.
- Disconnect any downspouts that are connected to a sewer or disappear underground.
- Add rain barrel(s) to capture roof water for use during dry times
- Plant a rain garden in areas that typically pond or receives rushing stormwater.
- Use native plants to break up clay soils and allow more water to soak into the ground.
- Plant trees on your property for stormwater and air quality benefits.
- Install permeable pavers instead of impervious surfaces such as concrete when landscaping.

Redirect or disconnect your downspout

Did you know that the average rainfall of one inch can produce more than 600 gallons of runoff from a typical roof? Most downspouts send rainwater down driveways, sidewalks, or underground pipes that lead to storm drains or sanitary sewer lines.

Why should you disconnect?

- Helps keep stormwater out of the sewer system.
- Provides a big benefit at a relatively inexpensive cost.
- Reduces occurrences of basement back-ups and sewer overflows.
- Runoff from your downspouts will supply your lawn or flower beds with a natural source of soft water.

How do I know if my downspout is connected to the sewer system?

A quick look at your downspout should let you know if it connected. Downspouts that disappear into the ground are most likely connected to the city sewer system.

Disconnecting Your Downspout

Materials and costs

To disconnect your downspout from the sewer system you will need the supplies listed below. All of these items can be purchased from your local hardware store.

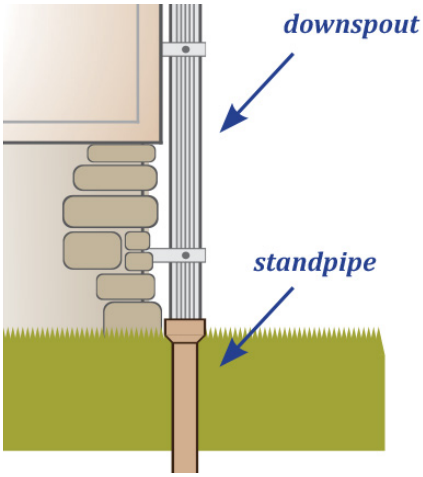
You will need the following tools

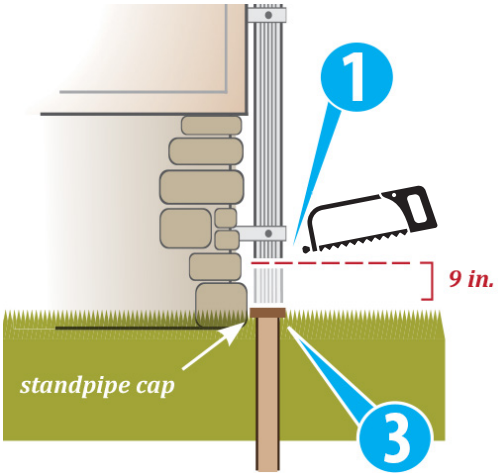
- Hacksaw
- Drill (may need to be cordless)
- Tape measure
- Pliers
- Sheet metal screws
- Downspout elbow
- Downspout extension
- Standpipe cap
- Splash block (optional)

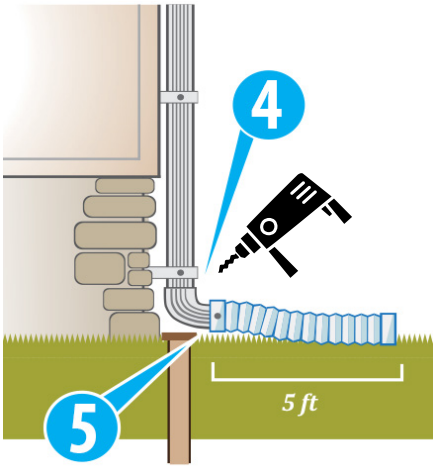
Downspout extensions come in all shapes and sizes. If you don't like the look of flexible downspout extensions, you could install a decorative splash block and route water to gardens though a rock channel. Visit your local lawn and garden store or search online for ideas on how to make downspouts a part of your landscaping.

TIP

Be sure to get the most out of your rainwater by directing your new downspout extension towards gardens, grassy lawns, rain barrels, and other areas that allow water to soak into the ground. The more water absorbed or put to good use on your property, the less water goes into storm drains.







Steps to disconnect your downspout

1. Cut the existing downspout approximately nine inches above the sewer standpipe with a hacksaw.
2. Pull the cut standpipe out of the ground and dispose of it.
3. Cap the hole in the ground where the standpipe used to be placed. This prevents water from going in and keeps pests from entering the pipe.
4. Attach one opening on the new downspout elbow to the existing downspout coming down from the roof by crimping the downspout with pliers to ensure a good fit. Connect the new downspout elbow to existing downspout using sheet metal screws. It may be necessary to pre-drill holes.
5. Attach the open end of the new downspout elbow INTO the new downspout extension and secure with sheet metal screws. Water should drain at least five feet away from the house, so direct the extension accordingly.
6. A splash block may help direct water further away from the house.

Rain Barrels

A rain barrel is a container that holds rainwater from downspouts and rooftops and stores it for future use, such as watering lawns, trees, shrubs, or gardens. The average rainfall of one inch can produce more than 600 gallons of runoff from a typical roof; that means you can install several rain barrels on your property to maximize your benefits!

Why use a rain barrel?

- Using rain barrels correctly can reduce the amount of stormwater runoff leaving your property.
- During the summer months it is estimated that 40% or more of household water is used for lawn and garden maintenance. A rain barrel collects water and stores it for those times that you need it most — during the dry summer months, which can save you money on your water bill.
- Though rainwater collected in a rain barrel is not safe for you to drink, plants prefer naturally "soft" rainwater over water from your tap. It is also great for washing your car.
- Water collected from the roofs of houses picks up very little contamination compared to runoff from roads and parking lots. You can safely use water from rain barrels on food-producing gardens as long as you wash vegetables and fruits thoroughly before eating them.

Commercially available rain barrels

Rain barrels can be purchased at most home improvement stores or online between $80 and $150. Commercially available rain barrels are primarily pre-assembled. They come in a variety of shapes, sizes, and colors, so you can pick one that fits your style, landscape, or homeowner's association requirements. Most pre-assembled rain barrels come with the hardware and instructions needed to connect them, which can save you time during the installation process.

Recycled rain barrels

There are several local organizations that sell recycled 55-gallon barrels pre-assembled and in kits for reduced prices. More information about where to purchase pre-assembled rain barrels can be found below.

Bridging The Gap
816/561-1087
www.bridgingthegap.org

Habitat ReStore
816/231-6889
www.restorekc.org

Little Blue River Watershed Coalition
816/356-4040
www.littleblueriverwc.org

Build your own rain barrel

You can easily construct your own rain barrel with a clean 55-gallon plastic barrel (new or recycled) and a few parts or a kit. Information about where to purchase pre-assembled, recycled rain barrels can be found on page 15.

Here are the supplies you'll need:

- A 55-gallon plastic barrel
- Two ¾ inch faucets
- A ¾ inch female coupling
- Skimmer basket (like those found in garden ponds and pools)
- Roll of Teflon tape
- All-purpose caulk or plumbing sealant
- 5 ft. section of garden hose
- 4-hose couplers
- 12-inch x 12-inch piece of fiberglass window screen
- Downspout "Y" diverter (sometimes called a splitter)
- 3 or 4 concrete blocks or decorative stones large enough to hold the rain barrel and allow the water to drain out. Blocks 8" x 8" x 16" in size work well.
- Duct tape or weatherproof tape

Construction will require the following tools:

- 1" spade drill bit
- Electric jigsaw
- Electric drill
- Utility knife
- Marker

TIPS

Depending on the shape and size of your roof, some of your downspouts may receive more water than others. To determine which downspout receives the most water, look for the one that has the largest area of roof draining to it. Install your rain barrel(s) on the downspouts that drain the most water for maximum benefit.

Be sure to clean off the top of your skimmer basket if fallen leaves gather on the top. This will help you collect the most water possible.

Make sure to drain your rain barrel before storms are expected to refresh the water in your barrel and maximize the water captured from your roof.

To prepare your rain barrel for winter, there are four simple steps to prepare your rain barrel:

- Drain your rain barrel.
- Remove or open your faucet and filter screen.
- Remove the diverter from the downspout.
- Place your barrel in a dry location. If a dry location is not available, then turn the barrel upside down, remove the concrete blocks, and use duct tape or weather proof tape to cover the faucet openings. Be sure to secure your empty barrel so it will not blow over during a blustery winter day.

Assembling a rain barrel

Create a hole in the top of the barrel:

Use the skimmer basket to trace a circle outline on the barrel. Pre-drill a small hole inside the circle using the 1-inch spade bit. Next, use a jigsaw to cut along the inside of the circle outline. Then, pop out the middle and discard.

Prepare the skimmer basket:

Cut a fiberglass window screen to fit across the top of the basket. Then, affix the screen to the lip of the basket using caulk or plumbing sealant. Allow several hours for it to dry before placing it in the top hole.

Install the water faucet:

Mark a hole at least two inches from the bottom of the barrel. Use a 1-inch drill bit to drill the hole. Next, screw the faucet into the hole. You may need to use a utility knife to increase the hole size as needed. Then, remove the faucet, wrap threads in tape, caulk threads, and replace the faucet. Finally, caulk the area where the faucet and the barrel meet to ensure a firm seal.

Adjust downspout to pour into rain barrel

First, adjust the downspout to pour into the rain barrel. Using a hacksaw, cut the gutter so that a "Y" diverter can be attached. Attach the "Y" diverter, reattaching the downspout to half of the Y, and flipping the rudder so the water flows down the barrel side of the diverter.

Prepare hoses:

Cut a 3-foot long piece of hose and also a 2-foot section of hose. Add the hose couplers to all ends of the hoses (4 total). Follow coupler instructions.

Install the overflow faucet:

Mark the location of the overflow faucet hole at least two inches from the top of the barrel. Use a 1-inch drill bit to drill hole. Next, screw the faucet into the hole. You may need to use a utility knife to increase the hole size as needed. Then, remove the faucet, wrap threads in tape, caulk threads, and replace the faucet. Caulk the area where the faucet and the barrel meet to ensure a firm seal.

Install hoses:

Screw the 3-foot section of hose onto the overflow faucet and the 2-foot section of hose to the water faucet.

Build a Base:

Build a base by placing three concrete blocks in a triangle shape to elevate the rain barrel (for increased pressure and flow). Make sure the blocks are level and stabilized to prevent tipping.

And remember to always keep the overflow faucet open!

Native Plants

Native plants occurred naturally in a given geographic area long before humans introduced other plants from distant places. Their local heritage gives native plants an advantage over introduced species because they are better adapted to our region's climate. Most lawns in the Kansas City region are planted with non-native turf grasses like fescue. While these grasses are considered attractive, their short roots do not absorb and filter water effectively. On the other hand, deep roots from native plants are great for soaking up stormwater, reducing runoff, and helping protect the environment by filtering pollutants from our air and water. Native plants include flowers, shrubs, grasses, and trees and come in a variety of types. Their costs depend on the type of plant and the size of the plant when you purchase it.

Why should I plant native plants?

- Deep rooted native plants break up clay soils and improve soil condition.
- Native plants do not need to be fertilized and require minimal watering after the first growing season.
- They provide habitat and food for birds, butterflies, and beneficial insects.
- The deep roots of native plants allow water to create pathways for water to flow down to the soil, recharging groundwater and filtering pollutants from stormwater runoff.

Where to get native plants

Native plants are available at most nurseries and garden stores throughout the region. You can call your local nursery to find out if they stock them or are willing to order them in for you. If you have the need for a large number of native plants for a project, or know exactly what plants you want to buy, it can be more economical to order your plants online or through the mail. For more information about native plants including nearby retail locations, please visit the Grow Native! website at www.grownative.org.

TIP

Native plants, like non-native plants, have varying needs for water and sun. Always check the plant tags or consult with your local nursery to ensure you are planting your native plants in the proper growing conditions.

Rain Gardens

A rain garden is a shallow depression in your yard that is planted with native vegetation. Rain gardens are typically bowl-shaped and placed in areas that receive a lot of water when it rains. When designed properly, they capture and hold rainwater until it soaks into the ground (typically 24-48 hours later). Native plants are ideal for rain gardens because their deep roots are adapted to our region's soil and assist with water infiltration. Rain gardens can be designed in many shapes and sizes. The general steps below can help you design a garden that will effectively manage the rainwater that falls onto your property. Please note that this section provides only general information about building a rain garden. To find out which plants are right for your garden and receive more detailed instructions on installation, view the handout found at: www.kcwaterservices.org/raingarden.pdf.

Why should I plant a rain garden?

- These bowl-shaped gardens capture stormwater and keeps excess water out of the sewer system, which reduces flooding.
- Grasses and flowering plants can provide an attractive landscaping feature in your yard.
- Rain gardens planted with native vegetation do not need fertilizer and only require minimal watering after the first growing season.
- Water that is captured in a rain garden infiltrates into the ground or taken up by plant roots, which helps to improve water quality. After two to three years, a rain garden located near problem areas in your yard can reduce the time that low spots stay muddy or retain water.

What plants should go in a rain garden?

Plants should be able to tolerate short periods of ponding, but should not require constant, high moisture. Your rain garden will be dry most of the time. Select plants with moderate moisture requirements for areas that will have moist, well-drained soil. For drier sites like the edge of your rain garden, use plants that have low or moderate moisture requirements. A nursery should be able to help you choose rain garden plants if you have questions.

How to build a rain garden

1. Choose a naturally low spot in your yard that is at least 10 feet away from your house. You can choose a site that often receives the most water during a rain or you can direct water from your downspout or sump pump into it. During heavy rains, your rain garden may fill up and overflow. Make sure this overflow drainage follows the drainage pattern originally designed for your yard. Test this by filling your depression with a garden hose and watch the overflow. If needed, dig a shallow swale to direct overflow water toward the street, road, or other downhill areas away from your home.
2. Start by digging a 6-inch to 12-inch depression with gradually sloping sides as large in circumference as you like. A good rule of thumb is to size your garden at 30% of the area of the roof from which it will collect water. A 6-inch to 12-inch depth will allow water to be captured, but will dry between rains.
3. Select the appropriate vegetation. When selecting your native plants, it is important to keep in mind that native plants can tolerate periods of heavy rain as well as dry periods. Think about where in the bowl shape of your garden the plants will go. Plants near the rim will receive less water than those at the bottom of the bowl. Native plants have a variety of tolerance levels for sun, so make sure to choose plants that fit those sun levels.
4. Add a 3-inch layer of untreated, shredded hardwood mulch on all of the bare soil around the plants to prevent erosion while your natives establish themselves.

Rain garden costs

The costs for building a rain garden can vary. A general rule of thumb for residential rain gardens is about $5 to $10 per square foot (2014 dollars). This cost depends on soil conditions, garden size, the level of preparation needed for the site, and the density and size of plants selected. Determine your needs for your rain garden and contact local sources for pricing before starting the project.

Materials and services to consider:

- Native plants
- Soil amendments / compost
- Mulch
- Tools
- Labor
- Debris removal
- Excavation costs

TIPS

- You can save money on plants by purchasing them in smaller containers, such as deep cell plugs, 4-inch pots, or quarts.
- Do not fertilize your native plants. Fertilizer can cause them to grow too tall and topple over. It also stimulates weed growth, which creates competition for your native plants.
- Water your newly transplanted native plants regularly through the first growing season. Afterwards, natural rainfall should maintain your plants if you've planted them in suitable growing conditions.

Plant a Tree

Everyone realizes the benefit of a shade tree on a hot summer day, but trees are also complex systems for stormwater management. During a rain storm, a tree catches water on its leaves and bark. From there, the rainwater will evaporate, soak in, or fall to the ground more slowly. Water that remains on the leaves helps to cool the air as it evaporates off. Once the rainwater reaches the ground, it is absorbed by the roots of the tree, resulting in reduced runoff. This process also improves water quality as the roots filter out harmful pollutants.

Why plant a tree?

A properly placed tree can provide multiple benefits to your property beyond stormwater management:

- Water evaporates more slowly on lawns shaded by trees, reducing the need to water in the summer.
- The extensive root systems of trees help to prevent erosion in sloped areas.
- Trees add curb appeal to your home and well-maintained trees can increase your property value.
- Trees improve air quality by absorbing carbon dioxide and pollutant gases from the air and releasing oxygen we need to breathe.
- Strategically placing trees around your home can reduce your electric bill by shading your home during the hot summer months.

Selecting the right tree

Trees should be selected based on the size of your property and the benefits you are looking to receive from them. If you have overhead utilities on or near your property, you want to make sure that the tree will not grow tall enough to interfere with the lines. Make sure that the tree you choose can grow in the climate of this region and in the soil type by your home.

How much will a tree cost?

Trees vary in cost by species and size. Generally, buying a bigger tree up front will cost more than buying a smaller tree and waiting for it to grow larger. In many cases, the smaller tree will outgrow the bigger tree over a period of ten years, because the smaller tree is typically more adaptable and will suffer less shock during planting.

TIPS

Information on selecting, purchasing, and planting the right tree for your property can be found on the Arbor Day Foundation website at www.arborday.org.

Low-cost tree saplings may be ordered between November 1 and April 15 each year from the Missouri Department of Conservation. Information on how to order may be found on their website at http://mdc.mo.gov/your-property/seedling-orders-and-planting-guide/seedling-order-how

Sometimes free tree saplings are given out in the spring or fall during special events at local Missouri Conservation Department facilities, botanical gardens, zoos, clubs, or schools. Watch events calendars for these types of organizations to find out when free saplings may be available.

Smaller trees (one-inch trunk diameter or less) at garden centers usually range in price from $100 to $150 each (2014 dollars). Homeowners can easily plant this size of tree on their own. If you purchase a tree taller than ten feet, you should have a professional plant the tree. As trees increase in size, planting care needs also increase. The lowest cost planting option is to plant saplings (sometimes called seedlings), which are very small trees that look like a short stick and cost between $1 to $5 (2014 dollars). With saplings, it will take longer to enjoy the benefits of the tree, and you will need to prune it to get the shape you want.

Install Permeable Pavers

Permeable pavers

Permeable pavers are an environmentally friendly option for patios and walkways around your home. Stormwater will run off of traditional impervious surfaces such as concrete or asphalt. However, permeable pavers create a porous pavement that allows stormwater to infiltrate through the spaces between pavers and into the ground. You can install permeable pavers without professional assistance. Many permeable paver manufacturers have how-to instructions and videos to view online. Although you may want to consult with a landscape contractor to ensure proper installation. To guarantee that your paver project conforms to local ordinances and standards, particularly for a driveway project, contact your city's plannng and development department before installing pavers or other porous materials.

Types and costs

The cost of pavers varies depending on the type of paver selected. Below are several common paver types.

	TYPE OF PAVER	APPROXIMATE COSTS
	Grass / gravel pavers	Grass and gravel pavers can range in price from $1.50 to $5.75 per square foot of installed pavement.
	Interlocking concrete paver blocks	Interlocking concrete paver blocks range in price from $5 to $10 per square foot of installed pavement.
	Block and brick pavers	Costs run around $10 per square foot of concrete paver blocks.

Install pavers yourself

Installation of pavers varies depending on the type and brand of paver selected. Always follow the manufacturer's installation instructions, but general steps may include:

1. Preparing the site to ensure that the pavers will be flush with the surrounding landscape. Subgrade preparation will vary depending on type of pavers used and the intended use for the pavement.
2. Installing a layer of gravel to provide space for water to soak in underground and a bed for the pavers.
3. Filling in spaces between the pavers with gravel or plants depending on the type of pavers used.
4. Compacting the pavers for a solid surface. Compaction could occur by hand or with a mechanical compactor depending on the type of paver.

Why use permeable pavers?

- Provide an attractive alternative to hard surface areas on your property.
- Reduce stormwater runoff, flooding, and erosion to streams and rivers.
- Improve water quality

What are Stormwater Fees?

Most homeowners pay a stormwater fee that helps the community maintain its stormwater system. This fee is often collected monthly, included in a water or other city utility bill, or paid once annually along with property taxes. Stormwater fees vary across the region but are generally either a flat or tiered rate, which is based on the amount of impervious surface (such as roofs and driveways) on each property. If you are a resident of Kansas City, Missouri, your stormwater fee is included in your monthly water bill.

Due to aging infrastructure, there is a demonstrated need to repair Kansas City's deteriorating stormwater system. The combination of inadequate infrastructure and increasing development may result in more rapid flood events and more severe harm to property and people. However, improvements to the system do not come without a cost, which means that stormwater fees across the region are likely to increase in the future. Currently, the average Kansas City resident pays a stormwater fee of approximately $2.50. This small fee is used to support a number of municipal activities such as, leaf and brush removal, street sweeping, household hazardous waste disposal, catch basin cleaning, floodwall and levee inspections, and pipe and inlet maintenance. With such a minimal fee, there is only enough funding to maintain the current stormwater system, but not enough to replace or expand existing stormwater infrastructure.

Stormwater Credits

Many communities give stormwater fee credits to households that demonstrate efforts to reduce stormwater runoff by using best management practices because they reduce stress on the stormwater system. Kansas City Water Services offers two types of stormwater fee credits for property owners that use best management practices on their property.

The first is a ratio credit for properties that have a large pervious area to help absorb stormwater and prevent it from entering storm drains. Property owners can receive a credit if the ratio of the total property area to the runoff surface area is at least 30:1. For example, if a property totals thirty acres and paved or roofed areas make up only one acre of the property, it qualifies for the credit. Properties that qualify are granted a 50% stormwater fee credit.

The second type of stormwater fee credit is a detention credit for the installation of stormwater detention structures on your property. Stormwater detention structures are installed and maintained to hold stormwater on your property during the heaviest parts of a storm, thereby reducing flooding and erosion downstream. Typically, detention basins are professionally designed stormwater management systems that are carefully built to ensure that they catch the required amount of water per rain storm for a given area.

For both types of stormwater fee credits, the property owner is responsible for applying. For more information on stormwater credits, please call 816-513-1313.

Kansas City Water Services is committed to managing stormwater in a comprehensive way. Working with homeowners, stormwater management can address flooding problems, reduce sewer overflows, improve water quality, and create private property amenities.

Slow it down, spread it out, soak it in.

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Kansas City Water Services
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www.kcwaterservices.org

For more information, please contact
water.communications@kcmo.org or call 816-513-0582.