

# Stormwater Best Management Practices: *A Guide for Residents*



<https://www.ces.ncsu.edu/wp-content/uploads/2014/09/RaingardenEPA.jpg>

This guide was developed in coordination with the Sustainability Commission and Stormwater Committee of the Village of Godfrey as a resource for homeowners to help educate and give practical examples of ways to help make properties stormwater-friendly.

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*The recommended stormwater best management practices in this guide are intended to assist with stormwater control and may not solve all stormwater issues.*

*Special thanks to Village of Winnetka, Illinois. The format for this guide was taken from their own BMP guide.*

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# Introduction: The Importance of Stormwater Best Management Practices (BMP)

In the past, stormwater management held that water was a problem to solve rather than a valuable resource to conserve. Stormwater Best Management Practices can be an environmentally-friendly means to moderate the effects of stormwater during rainfall events. The Village of Godfrey developed this guide to address stormwater quality and quantity issues and to help residents better manage stormwater on their property. This guide, highlighting different practices and options in managing stormwater, is intended to be a first step in addressing the challenge of better managing stormwater. Specifically, it provides guidance to residents on methods to protect our water resources by reducing the amount of stormwater draining into the stormwater sewer systems and local waterways.

Stormwater runoff from developed land, when not effectively managed, causes a number of problems. Increased stormwater runoff is caused principally by impervious (impenetrable) surfaces such as conventional rooftops, parking lots, roads, alleys, driveways and sidewalks. A combination of gutters, sewers, and channels which are designed to rapidly move stormwater away from developed sites may exacerbate downstream effects due to a large and rapid influx of water. This conventional method also does not take advantage of the opportunities for water to naturally soak into the ground, where it is stored and naturally filtered by native vegetation.

Fortunately, there are alternatives to traditional drainage techniques to emulate natural systems that can reduce quantities and rates of surface runoff and reduce pollutants under certain circumstances. These alternative drainage techniques are called Best Management Practices (BMPs) and are designed to retain rainwater where it falls. The goals of BMPs are to reduce the amounts and rates of stormwater runoff, and to use the landscape and soils to naturally move, store and filter stormwater runoff before it leaves the site.

This guide will provide residents with six specific stormwater BMPs that are small-scale and can be used by homeowners everywhere; even on small residential lots.

To the right is an example of a bioswale that is designed to effectively move water from one area to another, while filtering potentially adverse pollutants.



Pinehurst Seattle  
<http://www.pinehurstseattle.org/2008/08/15/pretty-bioswales/>

# Stormwater Best Management Practices for Residents

## I. Rain Barrels and Downspouts

**Background** - Rain barrels are a low cost and common property-level stormwater management practice that allow for collection and storage of rainwater from rooftop downspouts for uses such as irrigation. The typical volume of a rain barrel varies between 55 and 90 gallons and generally costs between \$120 and \$200.

**How it Works** - Normally, roof runoff is routed via downspouts directly across lawns or into vegetated areas. Rain barrels act as a holding tank for water directly from downspouts, and can capture and store the runoff from small storms. The stored water can then be used to irrigate lawns and landscaped areas in between storm events. This can ultimately reduce the amount of stormwater runoff during a storm event. The effectiveness of rain barrels is a function of their storage volume in comparison to the size of the roof and the size of the storm. While the volume of rainwater stored in a rain barrel will not

substantially reduce flooding from moderate or large storms, it can reduce direct runoff from smaller storms.

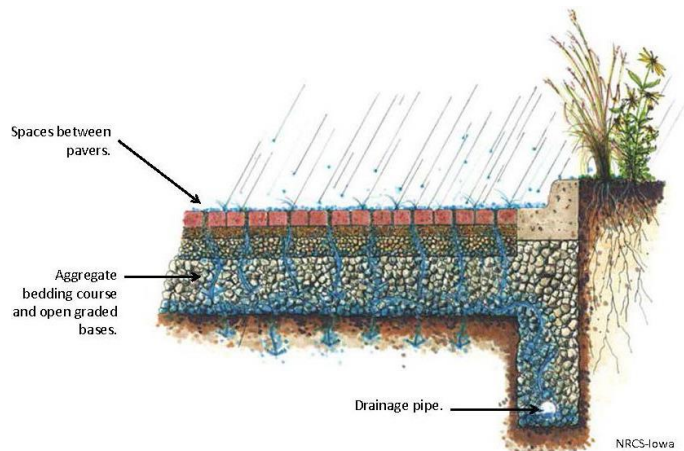
**Applicability** – Downspouts traditionally require proper grading to shed water and landscaping or vegetation available to accept the water. Rain barrels are best utilized where vegetation is limited. Rain barrels can be installed with minimal effort by residents without professional assistance.



<https://www.hgtv.com/outdoors/gardens/planting-and-maintenance/how-to-make-a-rain-barrel-pictures>

## II. Permeable Pavement

**Background** – Permeable pavement refers to paving materials, typically pavers or stone, which promote infiltration of stormwater into a subbase reservoir. Permeable pavements involve construction of a permeable pavement surface over an underlying base that allows stormwater storage, thus reducing runoff volume. Paving blocks and grid-type geometrics are the most common and available type of permeable paving. These designs contain openings that are filled with sand and can also support grass or other suitable vegetation, thus providing a green appearance. Permeable pavement is effective in reducing the quantity of surface runoff, for moderate storms if the rain volume is equal to or less than the storage volume. Similarly, it reduces the runoff pollutants associated with these events. Permeable pavement also may have aesthetic advantages over conventional paving, depending on the materials used. Permeable concrete and asphalt surfaces can also be constructed.



**How it Works** – Permeable pavement works when a portion of rainfall infiltrates through the pavement surface into the underlying open graded sub-base reservoir, as shown in the photo above. This water would otherwise be blocked by non-permeable pavement, such as asphalt. Permeable pavement is most effective when the layout maximizes the openings between the paving blocks and provides an effective permeable sub-layer of at least 12 inches in depth.

**Applicability** –Permeable paving is particularly appropriate for driveways. Conventional driveways can be replaced with permeable pavers to allow stormwater runoff infiltration into the underlying ground. Permeable paving blocks may require occasional mowing and snow plowing may require special care due to the slightly uneven surface of the pavement. Permeable pavement also requires periodic vacuuming to maintain permeability. Permeable paving can cost two to three times more than conventional concrete of asphalt.

Right:  
Permeable Pavement  
at National Great  
Rivers Research and  
Education Center

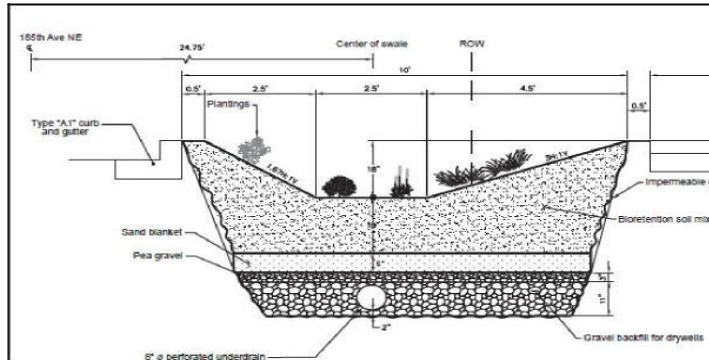


[https://www.lc.edu/uploadedImages/Pages/Community\\_and\\_Visitors/Community\\_Impact\\_and\\_Outreach/fieldstation.jpg](https://www.lc.edu/uploadedImages/Pages/Community_and_Visitors/Community_Impact_and_Outreach/fieldstation.jpg)

### III. Rain Gardens

Sightline Institute

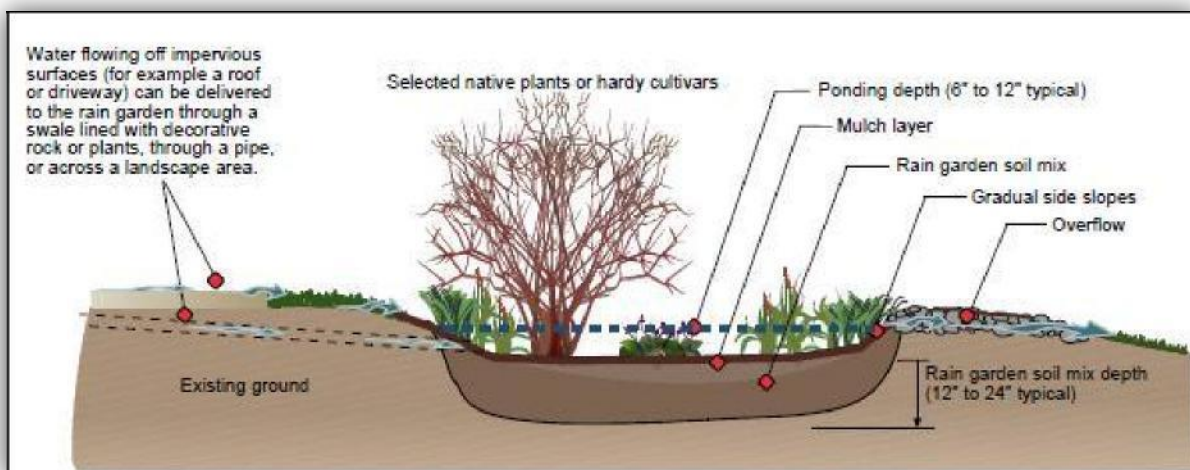
<http://www.sightline.org/2013/05/23/redmonds-rain-garden-challenge/rain-garden-cross-section/>



**Background** – Rain gardens are property-level stormwater control measures that use specially-designed gardens to collect, store, and infiltrate stormwater from impervious surfaces such as rooftops, driveways, and heavily-compacted lawns. Rain gardens are typically planted with deep-rooted native vegetation such as wildflowers, sedges, rushes, ferns and shrubs that can withstand both dry Augusts and submergence by heavy June rains.

**How it Works** – Rain gardens are a type of bioinfiltration that relies on the underlying soils for drainage, where native water-tolerant plants absorb the stored water through their roots. During small to medium storm events, rain gardens allow for absorption of stormwater into the ground, diverting water from existing storm sewers. Aside from their stormwater benefits, rain gardens can be aesthetically pleasing and can provide a natural shelter and food source for wildlife and insects.

**Applicability** - When creating a rain garden, a combination of shrubs, grasses and flowering perennials are best and should consist of native wetland and prairie grasses. Suggested plants for a rain garden in the Midwest include: Black-eyed Susan, Butterfly weed, Golden Alexander, Obedient plant, Purple Coneflower, Wild Columbine and Wild Geranium. Rain gardens can be incorporated into front and back yards of residential properties. Once established, rain gardens require various amounts of annual maintenance which may include weeding and reestablishing plants as necessary.



Chesapeake Stormwater Network

<http://chesapeakestormwater.net/be-bay-friendly/rain-gardens/>

## IV. Natural Landscaping

**Background** – Natural landscaping refers to the use of native vegetation, particularly prairie, wetland and woodland species, on a residential property as a low-cost alternative to traditional landscaping with turf grass and ornamental plantings. A property that is naturally landscaped, if specially designed, emits less stormwater runoff than a conventionally landscaped yard. Additionally, natural landscaping needs less fertilization and can reduce pollutants associated with urban runoff through filtration in the ground for small rainfall events.

**How it Works** – Native vegetation enhances both absorption of rainfall and evaporation of soil moisture due to extensive root systems that extend down 3-10 feet. On the other hand, traditional landscaping that utilizes turf grasses where root systems extend only about 3-4 inches into the ground. Natural landscaping provides other benefits in addition to reducing stormwater runoff. Native plants help stabilize soils with their deep roots which helps prevent soil erosion. Also, native landscapes result in reduced maintenance needs over time.

**Applicability** – Natural landscaping can be implemented on almost every property as an alternative to traditional landscaping. Native plant species can be used to replace wood-chips in berms or outer edges of a property. Native landscaping should be tailored to individual site characteristics while factoring in topography, soils, drainage patterns and sun exposure. Once implemented, natural landscaping should require much less maintenance than traditional landscaping including less irrigation, mowing, fertilizer and pesticide application.



<http://landscaping11b.blogspot.com/2014/07/urban-front-yard-landscaping-ideas.html>



## V. Bioswales

**Background** – Bioswales are broad, vegetated channels used for the movement and temporary storage of runoff. Bioswales are designed to move a portion of runoff into the ground and filter out runoff pollutant through use of native vegetation.

**How it Works** – As an effective alternative to enclosed storm sewers and lined channels, bioswales function to move runoff from a developed site to a naturally draining area. On some sites, natural drainage courses may still be present and it is recommended that they be retained as part of the site drainage plan. Bioswales are designed to locally reduce both the rate and volume of stormwater runoff.

**Applicability** – Bioswales can be created on almost every property. Homeowners can construct bioswales to divert water from high runoff areas to more permeable areas designed to hold water, thus diverting runoff away from storm sewers. This can be done through the combined use of native vegetation, soil and aggregate.

Bioswales at Lewis and Clark Community College.



Photos courtesy of Nate Keener

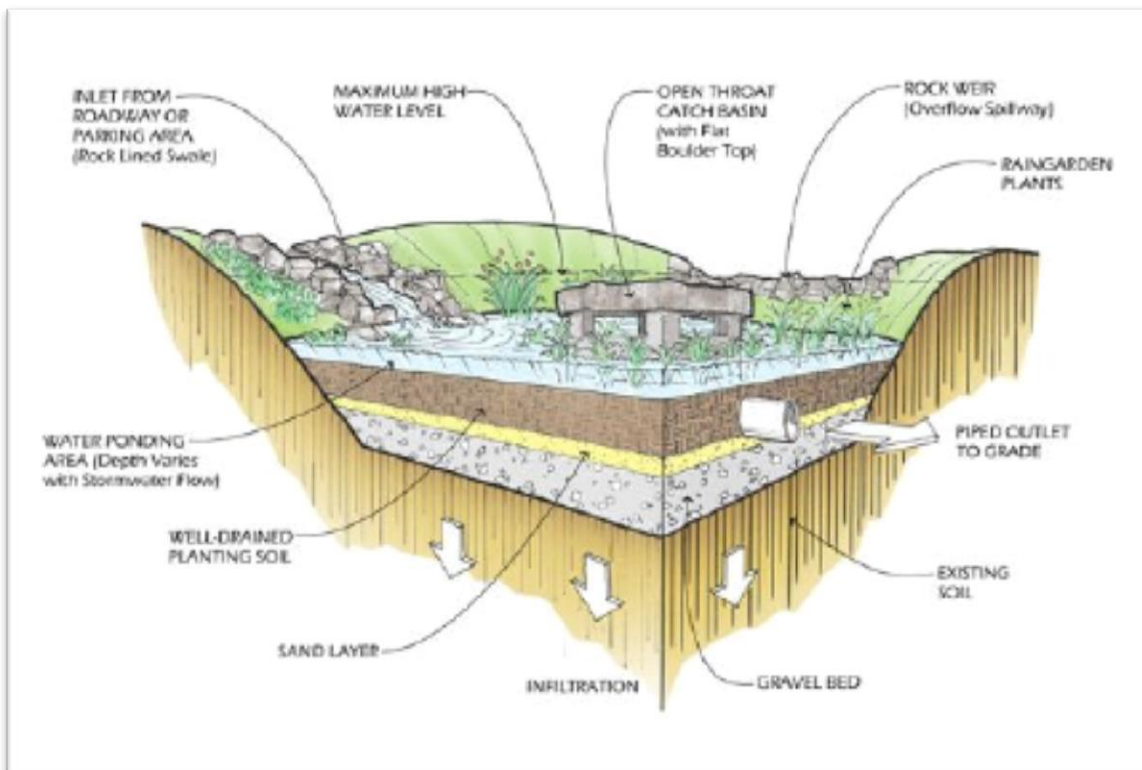
## VI. Bio-Retention Basins

**Background** – Bio-retention basins are infiltration devices used for the treatment and infiltration of stormwater runoff. A bio-retention basin is typically made up of multiple layers, which treat stormwater as it is filtered. These basins can, under certain circumstances, remove pollutants in stormwater and reduce runoff volumes. Bio-retention basins are designed to prevent flooding by temporarily storing stormwater runoff and releasing it gradually to the downstream drainage system. Thus they must provide larger amounts of storage and volume. In addition to flood prevention, bio-retention basins can also remove pollutants and create wildlife habitat.



**How it Works** – Bio-retention basins can reduce runoff rates and mitigate some of the stormwater runoff increases in developed areas. Bio-retention basins allow runoff water to enter into the underlying soil, reducing runoff to storm sewers.

**Applicability** – Although more involved, bio-retention basins are suitable for most properties and development types. Maintenance of these basins include establishment of vegetation within the basin, regular mowing, and control of invasive species. Proper construction will require professional assistance.



Bluegrass Landscaping & Maintenance  
<http://bluegrasslawn.com/the-importance-of-bioretenion-systems/>

# Stormwater-Friendly Lawn Care

The following are actions homeowners can take to make their lawns stormwater-friendly:

- Reduce or eliminate the use of fertilizers. When it rains, fertilizers and pesticides are swept away by stormwater runoff and deposited into surrounding watersheds. If you choose to use fertilizer, be sure to immediately sweep off any fertilizer that lands on a paved surface. If you choose to use pesticides, apply the minimum amount necessary to accomplish the desired result.
- When applicable, use natural or organic fertilizers. High levels of fertilizer lead to polluted stormwater and increased algae-blooms. A soil test can be completed to help determine the nutrient needs of your lawn.
- Keep grass clippings and leaves on the lawn and out of the street and storm drains. Landscape waste in the street will end up in storm drains, leading to possible drain back-ups and flooding.
- Set lawnmower height to 3 inches or taller. Maintaining a taller grass produces a deeper and more extensive root system which allows for increased nutrient uptake and less lawn runoff volume.
- Use rain gardens or natural landscaping where possible. Rain gardens filled with native plants help absorb and store rain water. Native plants also require less watering and maintenance.
- Use rain barrels to catch and store rainwater during storms and use the stored water to irrigate your lawn at a later time.
- Minimize the non-permeable pavement in your yard to allow stormwater runoff to soak into the ground.



City of Coralville, Iowa

<http://www.coralville.org/121/Stormwater-Management-Funds>

# Summary

As outlined in this guide, there are many benefits and advantages to implementing stormwater Best Management Practices on your property. This guide is intended to be a starting point for homeowners interested in creating a stormwater-friendly property. The Best Management Practices outlined in this guide can be implemented at the homeowner-level on almost any property. Stormwater Best Management Practices are meant to impede and direct excess stormwater runoff by natural means while at the same time promote filtering of the water naturally. Slowing stormwater runoff on its trip to storm sewers is beneficial during high-volume storm events. Stormwater mitigation starts at the homeowner level beginning with the Best Management Practices outlined in this guide.

The following BMPs are ranked lowest to highest in terms of cost, complexity and need for professional assistance:

| Best Management Practice  | Description  | Cost and Complexity |
|---------------------------|--|---------------------|
| Rain Barrels & Downspouts | A water tank used to collect and store rain water runoff directly from rooftops via downspouts.  | Low                 |
| Natural Landscaping       | The use of native plants, including trees, shrubs, groundcover, and grasses which are indigenous to the geographic area, and promote greater infiltration.   | Medium              |
| Bioswales                 | Landscape elements designed to channel water so as to slow flow and direct water to other areas.   | Medium              |
| Rain Gardens              | A planted depression that retains rainwater runoff from impervious areas and allows it to be absorbed and pollutants to be filtered out.   | Medium              |
| Permeable Pavement        | Sustainable materials, usually block-shaped pieces, which allow the movement of stormwater through the surface and into the underlying ground. This consists of open-work gravel with sufficient void to store water volume. | High                |
| Bio-Retention Basins      | Large naturally landscaped areas design to filter stormwater runoff  | High                |



Pavers at Lewis and Clark Community College  
Photo courtesy of Nate Keener



Plant It Wild  
<http://plantitwild.com/2016-plant-wild/>

# Additional Resources

*Village of Godfrey Sustainability Commission homepage:*

<https://godfreyil.org/boards-and-committees/climate-protection-and-energy-efficiency-committee/>

*Village of Godfrey Stormwater Committee homepage:*

<https://godfreyil.org/boards-and-committees/stormwater-committee/>

*Madison County Watershed Plans:*

[https://www.co.madison.il.us/departments/planning\\_and\\_development/stormwater\\_management\\_and\\_watershed\\_plans.php](https://www.co.madison.il.us/departments/planning_and_development/stormwater_management_and_watershed_plans.php)

*Chicago Botanic garden Natural landscaping:*

<https://www.chicago.gov/city/en/progs/env.html>

*Missouri Botanical Garden Sustainable Gardening:*

<https://www.missouribotanicalgarden.org/gardens-gardening/your-garden/help-for-the-home-gardener/sustainable-gardening.aspx>

*Missouri Botanical Garden Native Landscaping:*

<https://www.missouribotanicalgarden.org/visit/family-of-attractions/shaw-nature-reserve/gardens-gardening-at-shaw-nature-reserve/native-landscaping-for-the-home-gardener.aspx>

*Metropolitan St. Louis Sewer District (MSD) BMPs:*

<https://msdprojectclear.org/what-we-do/stormwater-management/bmp-toolbox/>

*Rainscaping - Deer Creek Watershed Alliance:*

<https://www.deercreekalliance.org/rainscaping>

*EPA Green Infrastructure:*

<https://www.epa.gov/green-infrastructure/what-green-infrastructure>

*Permeable Pavement:*

<http://www.perviouspavement.org/>

<https://msdprojectclear.org/what-we-do/stormwater-management/bmp-toolbox/stormwater-quality/permeable-pavement/>

*Rain Gardens:*

<https://wmeac.org/raingardens/>

*Bioswales:*

[https://www.nrcs.usda.gov/Internet/FSE\\_DOCUMENTS/nrcs144p2\\_029251.pdf](https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs144p2_029251.pdf)

*Bio-Retention Basins:*

<http://www.lakesuperiorstreams.org/stormwater/toolkit/bioretention.html>

*Easy Landscape Plans:*

<https://grownative.org/learn/native-landscape-plans/>