

# **STORMWATER LEARNING RESOURCE**

**A service project for Ottawa Riverkeeper's  
Youth Water Leaders Program**

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## Acknowledgements

This resource was created as a service project for Ottawa Riverkeeper's Youth Water Leaders Program. The Youth Water Leaders Program aims to equip young people ages 17-25 with the knowledge and skills to be effective advocates for the Ottawa River watershed through hands-on learning and volunteer experience. During the program, youth have the opportunity to engage with experts from a variety of fields with connections to the watershed, including scientists, Indigenous Traditional Knowledge holders, and communications experts.



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The Youth Water Leaders Program is funded by the Canada Service Corps, a national movement that empowers youth aged 15–30 to gain experience and build important skills while giving back to their community. Learn more at [Canada.ca/CanadaServiceCorps](http://Canada.ca/CanadaServiceCorps).

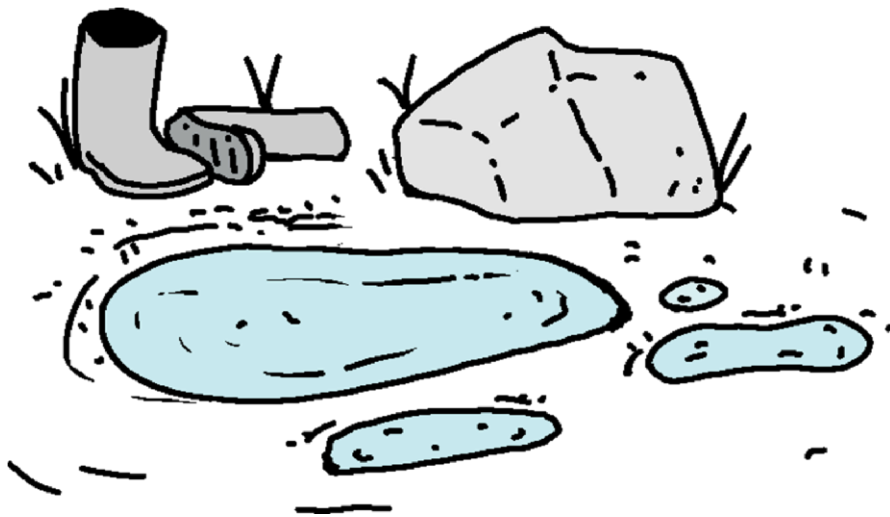
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## What is stormwater?

Simply put, stormwater is precipitation that does not evaporate or infiltrate the ground. Instead, stormwater runoff flows as surface water to areas of low elevation and nearby water bodies. In places where most precipitation becomes stormwater, the volume of runoff can lead to flooding in low lying areas, an increase in soil erosion, and the spread of pollutants carried by the runoff.

Urbanization has required the implementation of stormwater management systems to deal with all of the runoff on paved surfaces. Municipal stormwater management systems direct runoff into streets and ditches and then through a complicated system of underground sewers that carry it to storage facilities, water treatment plants, or directly into local water bodies. In the Ottawa River watershed, stormwater is managed by municipalities with guidance from provincial governments. However, there are also many ways individuals can directly impact stormwater at home.

As growing urban centres increase both the risk of pollution to waterways and the demand for fresh water, while a changing climate intensifies the frequency and severity of extreme weather, treating stormwater as a resource to carefully manage has become more important than ever.



## Introduction

It's a rainy day. You look outside and watch a car drive through a large puddle forming in the middle of your street. A small stream of water rushes down the sidewalk until it disappears down a catch basin. Have you ever wondered what happens to rainwater after it falls from the sky? In undeveloped and rural areas, most precipitation is absorbed by soil and vegetation. In urban areas where the ground is covered by streets, parking lots, and buildings, impermeable materials like asphalt prevent the ground from absorbing water and the situation gets a little more complicated. In the Ottawa River watershed, all of this precipitation will eventually make its way to the Ottawa River, so its important to understand how stormwater impacts water quality.

Rain that is not absorbed when it falls to the ground is called runoff. Runoff, controlled by gravity, will flow from areas of high elevation to low elevation. This process is why you can sometimes find large puddles in low-lying parking lots after a heavy rainstorm. A severe thunderstorm can even cause localized flooding! But if all the impermeable surfaces in cities prevent rainwater from being absorbed into the ground, why isn't there flooding every time it rains? The practice of controlling runoff is referred to as stormwater management. Stormwater management is an important part of protecting the health of local waterways.



# Terms

Throughout this text you will learn about steps we can all take to help keep the Ottawa River watershed healthy by paying attention to our impacts on stormwater. You may come across terms you are unfamiliar with as you read through this resource or do your own research online, be sure to come back to this page to check for definitions of new words!

## Biofilter

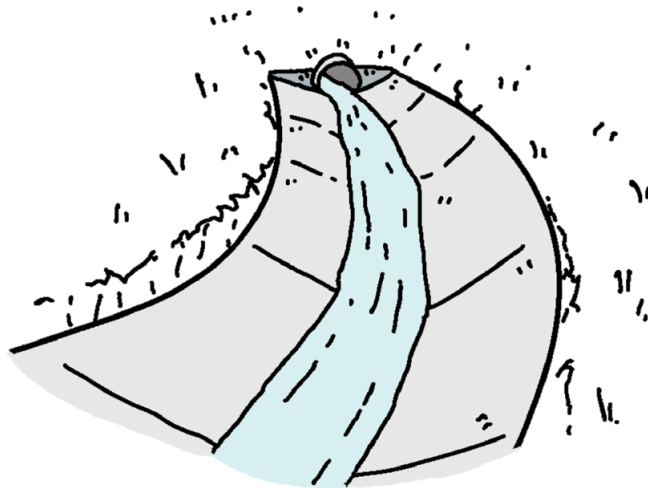
A biofilter is a collection of live grasses and dense plants that filter particles from stormwater as it passes through.

## Bioswales

A system of channels used to convey stormwater downstream while also removing debris and pollutants.

## Ditch

A long narrow channel in the ground that is used for drainage beside roads and at the edges of properties.



## Dry well

A dry well releases the water collected in it to the surrounding soil instead of redirecting it. Similar in design to a catch basin, dry wells are small, excavated pits that contain layers of rock and gravel to filter sediment from stormwater.<sup>1</sup>

## Infiltration

Infiltration describes the movement of water from a surface into the ground. The rate of infiltration measures how quickly or slowly water is absorbed by the ground.

1. S, Paul. "Catch Basins 101." MT Drains Plumbing LTD, MT Drains & Plumbing, 13 Apr. 2021, <https://mtdrain.com/catchbasins-101/>.

## **Pollutant**

A harmful substance introduced into an environment. Pollutants can be natural, or human-made. Natural pollutants include silt and trace metals. Pesticides and fertilizers are human-made pollutants.

## **Porosity**

A word used to describe a material, which like a sponge, contains small holes, or pores. Porous materials have high permeability.

## **Rain barrel**

A ground level container that collects and stores rainwater from roofs.

## **Rain garden**

A garden planted with native grasses and shrubs located in a slight depression with gentle slopes. A rain garden is a landscaping feature designed to slow down and collect rainwater.

## **Runoff**

Water travelling over a surface from an area of higher elevation to lower elevation. Uncontrolled runoff can contribute to soil erosion and the movement of pollutants into local waterways.

## **Watershed**

An area of land in which all precipitation and bodies of water drain to a common location. Watersheds are defined by their geography and vary widely in size. We all live in a watershed. This [interactive map](#) on Ontario Geo Hub can help you locate watershed boundaries within Ontario. The Ottawa River watershed is 146,300 km<sup>2</sup> and is itself a part of the St. Lawrence River Watershed.



# Contaminants of Concern

Contaminants of concern are pollutants that pose an elevated risk to water quality, local ecology, and even human health. These contaminants come from many sources such as agricultural runoff, urban runoff, wastewater treatment plants and sewer overflows, and improper disposal of toxic substances or pharmaceuticals. Surface contaminants dissolved in stormwater can be carried far from their source, which is why it's so important to take a watershed-level approach to protecting a river.

## Road salt

In colder climates de-icing road salt may be added to roads to improve driving conditions when ice is expected to build up. The application of road salt makes it possible to walk safely on sidewalks and around the entrances of buildings. Excess salt has a negative effect on water quality and aquatic plants and animals. In some urban creeks, elevated levels of chloride from road salt are chronic or even acutely toxic during the winter. You can read more about the negative impacts of [road salt](#) on Ottawa Riverkeeper's website.

## Fertilizer

Excessive application of fertilizers on gardens and lawns can be washed away by stormwater runoff and carried to rivers and lakes resulting in eutrophication. The same nutrients in fertilizer that help lawns grow greener also accelerate algae growth. When there is an abundance of nutrients in fresh water, algae blooms are likely to occur. These blooms can produce toxins that can be dangerous to animals and humans. Algal blooms can also decrease levels of dissolved oxygen in the water, which aquatic organisms need to survive, posing a threat to biodiversity.



Conductivity meters are used to measure the amount of salt in aquatic environments.



Runoff containing fertilizer can result in harmful algal blooms that damage aquatic environments. Blue-green algal blooms (above) also release toxins

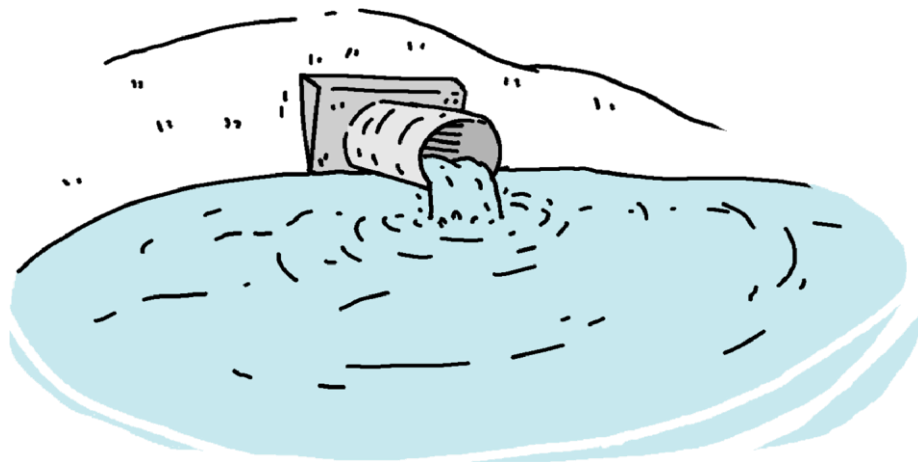


# Stormwater Management

In urban and suburban areas stormwater management is integrated with municipal infrastructure. Common features like catch basins, ditches and storm sewers can be found in abundance in cities. Stormwater management systems reduce the risk of uncontrolled runoff, flooding associated with heavy rain and spring snowmelt, and when properly maintained and implemented, also keep our local waterways healthy. In this section you will find some common elements of stormwater management systems.

## Stormwater ponds

Stormwater ponds are human-made bodies of water that collect run-off which has drained from the surrounding area. Ponds slow down runoff, allowing suspended dirt and pollutants to settle and collect at the bottom of the pond. Additionally, slow moving water has a lower impact on soil erosion, a serious side effect of uncontrolled runoff.<sup>2</sup> Stormwater ponds can be built into the landscape to look like a naturally occurring feature. These ponds can also provide habitat for fish, insects, and birds in urban areas.



## Dry ponds

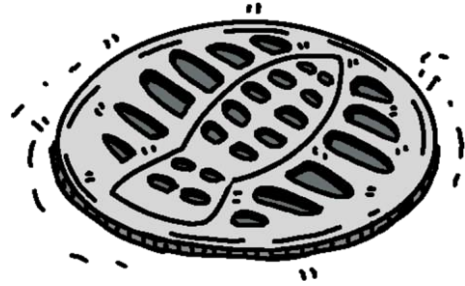
Dry ponds, as the name implies, are designed to be dry most of the time. Unlike stormwater ponds, which remain filled with water year-round, dry ponds only retain water during heavy rainfall to prevent an overload of downstream stormwater systems that could result in flooding. Stormwater in a dry pond drains quickly after heavy storm events have passed. Most of the time, a dry pond exists as a depression in the landscape of city parks or along roadways.

2. Services, Infrastructure and Water. "Drinking Water, Stormwater and Wastewater." *City of Ottawa*, 19 June 2022, <https://ottawa.ca/en/living-ottawa/drinking-water-stormwater-and-wastewater>.

## Storm Sewers

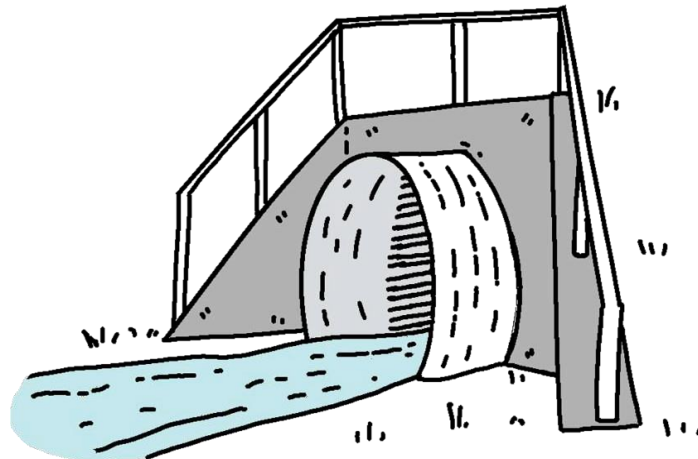
Wastewater sewer systems collect sewage directly from buildings and carry it to treatment plants where it is cleaned before being released into the environment. In contrast, storm sewer systems collect runoff, transporting it through underground pipes that discharge directly into the river. Because stormwater isn't treated before flowing into the river, it's important to reduce the amount of pollution present in stormwater.

Combined sewer and stormwater systems aren't built anymore, but are often found in older neighbourhoods. In areas where there are separate stormwater and wastewater systems, stormwater and wastewater are separated at the source. For combined sewers, stormwater and wastewater are transported in the same sewer system to a water treatment plant. Combined systems are vulnerable to overload during periods of heavy rain and snowmelt due to the dual function of these pipes.<sup>3</sup> In an overflow event, untreated waste and stormwater is discharged into nearby water bodies. This is one reason why contaminants like the bacteria *E. coli*, found in human and animal waste, can make water bodies unsafe for swimming following heavy rain. Combined sewer overflows are also very bad for the water quality and the environment. You can read the City of Ottawa's [Ottawa River Action Plan](#) to learn more about how the city is tackling this issue.



## Culverts

A culvert is a tunnel that passes under a road allowing water to flow under the road rather than over it. They help to protect against erosion, provide pathways for runoff, and minimize flooding. Culverts are typically made from metal pipes or reinforced concrete and can vary in size: small culverts may allow a small stream of water to flow under a driveway or single lane road, while larger culverts spanning multilane highways are large enough to stand in.

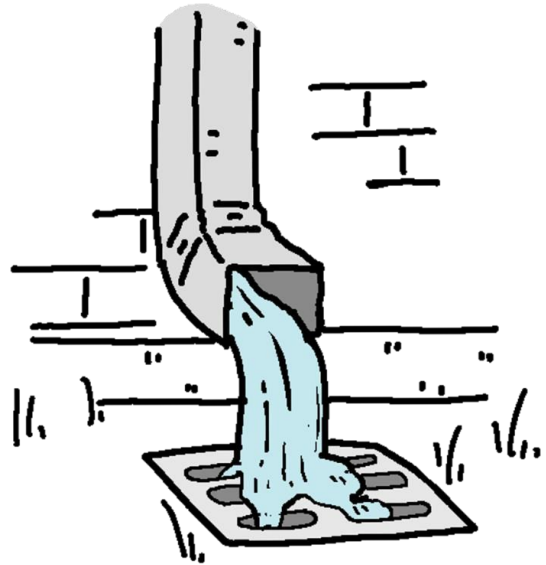


3. "Réseaux D'égout, Refoulements D'égout, Eaux Usées, Eaux De Ruissellement Et Infiltrations D'eau." Ville De Gatineau, 26 Feb. 2022, [https://www.gatineau.ca/portail/default.aspx?p=guichet\\_municipal%2Freseaux\\_egout\\_refoulements\\_egout\\_eaux\\_usees\\_eaux\\_ruissellement\\_infiltrations\\_eau&ref=haut-de-page](https://www.gatineau.ca/portail/default.aspx?p=guichet_municipal%2Freseaux_egout_refoulements_egout_eaux_usees_eaux_ruissellement_infiltrations_eau&ref=haut-de-page).

## Catch basins

Catch basins collect surface level stormwater on roads and transport it to underground storm sewers. The grates on catch basins filter out large debris such as branches and trash. Keeping catch basin grates free of accumulated leaves, snow, and ice is critical to prevent street level flooding during spring thaws.

You can use this [resource](#) to see where the City of Ottawa's 100,000 catch basins are located.



## Low impact development (LID)

Low impact development (LID) is a method of construction that mimics the natural environment to filter, slow down, and store runoff. Traditional stormwater management systems were built to rapidly move stormwater from impermeable surfaces to surface level ditches and underground storm sewer systems. LID slows down stormwater to allow for greater infiltration onsite and reduced rates of soil erosion.

When LIDs are combined with the planting of native plant species, sensitive ecological areas are better protected from pollution and habitat degradation, increasing the amount of suitable habitat for local wildlife. Examples of LID include the use of biofilters, bioswales, dry wells, and infiltration trenches. By moving away from traditional stormwater management strategies to LID we can better protect our local watersheds and sustainably manage stormwater. Finally, including LID like rain gardens in landscaping projects not only protects the environment, but it can also make our green spaces even more beautiful.



# What You Can Do

Keeping our watershed healthy is a shared responsibility we all have. Best practices for stormwater can take place at home, right in your own backyard!

For instance, planting hardy native plants reduces the need for extra fertilizer, leading to less contaminated runoff from your property. Native plants can be used to create a rain garden, a great way to be environmentally friendly while landscaping a property. For tips and tricks on building rain gardens and other low impact developments, the City of Ottawa has lots of information in their [Rain Ready Ottawa](#) resource. You can also read some more tips below.

## 1. Empty pools responsibly

Do not empty pools into catch basins, ditches, or roads. Pool water is treated with chemicals that are harmful to the environment and must be properly disposed of. Gently remind your friends and family with pools that improperly releasing pool water is harmful to the environment and contact your municipality to determine what environmentally friendly alternatives are available.

## 2. Reduce runoff

Take steps to slow down runoff on your property. Low impact development like rain barrels, infiltration trenches and infiltration pits reduce the peak stormwater flow allowing storm water to better infiltrate the soil and recharge groundwater. An added benefit of collecting stormwater is that it reduces the need to water your lawns and gardens with treated tap water.

## 3. Increase permeable surfaces

Where possible, reduce the total area and number of impermeable surfaces on your property. These surfaces include patios, paving stones, and asphalt. Consider alternative options available such as grass, gravel, and special permeable pavement.

## 4. Prevent pollution

Paints, adhesives, and solvents contain chemicals that are especially harmful to aquatic life. When using these materials outside make sure any spills are cleaned up immediately. It's also important to make sure these substances are disposed of properly as hazardous waste when they can no longer be used, be sure to check your municipality's website for more instructions.

## 5. Call your councillor

Get in touch with your municipal leaders. Telling you local council and government officials that the responsible management of stormwater is important to your community is a great way to bring the issue to the attention of a larger audience.