

## Stormwater Management Practices

The best way to mitigate the effects of polluted stormwater is to prevent pollution in the first place. However, once stormwater has already picked up pollutants, management practices aim to capture this polluted runoff, store it, filter it, and help it soak in before it reaches our shared waterbodies. Below are some examples of stormwater management practices.

### Stormwater Ponds

Stormwater ponds store excess runoff volume, allowing time for pollutants, especially sediment, to settle out. Though they are not natural ponds, they can still be a haven for wildlife and add beauty to a neighborhood.



### Vegetated Swales

Swales capture water and hold it temporarily until it is able to naturally soak in. Often along roadsides, these management practices reduce roadway flooding and convey stormwater to downstream water bodies.

### Inverted Parking Islands

Shallow depressions in the middle of parking lots collect runoff from the lot and aid infiltration. They are often planted with native vegetation and add wildlife habitat to an otherwise sterile landscape.



### Tree Trenches

Tree trenches in urban areas collect and store large amounts of water in a limited space. Stormwater is stored in tunnels underground that trees tap into, soaking it up like a sponge.

### Iron Enhanced Sand Filters

These sand filters are enriched with iron that binds with phosphorous in stormwater, thus filtering it out. The sand also collects any larger debris and prevents it from entering a stream, river, or lake.



### Green Roofs

Green roofs replace rooftops with vegetation. They filter water, increase evaporation, and can be a food source. They can be as small as a garden shed or as large as the Target Center in Minneapolis (pictured).



## Target Pollutants

Many everyday items contribute to stormwater pollution. Reduce waste by shopping smart for environmentally safe products, using only as much as you need, and picking up after yourself. The table below depicts a few of the most common pollutants that can be conveyed to surface water through stormwater runoff. What can you do to prevent them from getting into our waterways?

Pollutant	Why is it a Problem?	Treatment Approach
Chloride (Salt)	Chloride toxicity is a stressor to aquatic life and can lead to death, especially of freshwater fish.	Removing salt from water requires distillation, an expensive process. Preventing salt from entering water is the only practical method to address chloride pollution.
Animal Waste	Animal waste from pets, farm animals, and wildlife contains bacteria that can cause illness and nutrients that can contribute to algal blooms.	Water can be disinfected through chemical or UV treatment, but this is expensive. Picking up and disposing of animal waste in a sealed bin prevents it from entering our water.
Trash	Many items that become trash, such as plastics, do not decompose for hundreds of years.	Separate recyclables and organics from other trash items. Dispose of all three in covered containers to reduce the risk of them spilling.
Organic Waste	Organic waste like grass clippings and leaves contains nutrients that encourage algae growth and lower dissolved oxygen needed by fish.	Keep mulched leaves and grass clippings on your lawn as natural fertilizer. For larger organic waste items, schedule curbside collection through your city.
Chemicals	Heavy metals, petroleum, and toxic chemicals can contaminate waters, making them unsafe to drink, recreate in, and harvest fish from.	Preventing spills and leaks through proper storage and containment is the most effective way to prevent heavy metal contamination of water.
Sediment	Sediment, like dirt and sand, contributes to water turbidity and the grains can harbor bacteria and harmful chemicals.	Erosion of fields can be prevented through use of cover crops. Extra sand used as traction in winter can be swept up and reused.
Fertilizer	Nutrients (nitrates and phosphates) in fertilizer can fuel algae growth and contaminate drinking water.	Proper and targeted application of fertilizer reduces the amount that runs off into lakes and rivers and infiltrates into groundwater.
Pesticides	Insecticides, herbicides, rodenticides, and fungicides are all pesticides designed to kill target species, but are often misused and can harm non-target species.	To reduce the amount of pesticides entering lakes and streams, limit their use and apply what is used with precision.
Microplastics	Microplastics and microfibers from synthetic textiles are ingested by aquatic organisms leading to suffocation and poor nutrition. Humans who eat these animals may be affected too.	Plastic products do not decompose, they merely degrade to smaller particles. Prevent them from entering the water by using natural fiber clothing and textiles.
Drugs	Pharmaceuticals, such as hormones, antibiotics, mood stabilizers, and other drugs negatively affect the development of aquatic life and can contaminate our drinking water.	Pharmaceuticals contaminating waterbodies is of rising concern because they cannot be filtered out. Prevent them from entering the water through proper disposal.

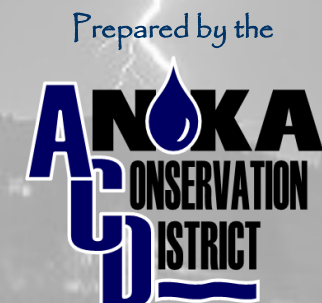
# STORMWATER MANAGEMENT

## Improving Water Quality & Reducing Runoff



Conservation Starts at Home

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## What's the Problem with Stormwater?

Cities and neighborhoods have a lot of rooftops, concrete, and asphalt that prevent stormwater from soaking into the ground, contributing to flooding and erosion. Stormwater that runs off of these areas picks up pollutants such as chemicals, grass clippings, and pet waste as it flows toward storm drains. Stormwater often drains directly to waterbodies without adequate treatment, leading to water quality degradation.

## History of Stormwater Management in Minneapolis

We have come a long way in the realm of stormwater management, but still have much to do. Below is a timeline of the major milestones in how Minneapolis has managed stormwater over the past century. Each city has its own story, but Minneapolis is a good representation of stormwater management in urban and suburban Minnesota.

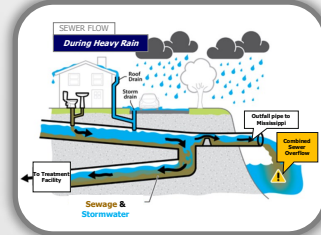
### Pre-1938

Combined storm and wastewater sewer drains to the Mississippi river without treatment.



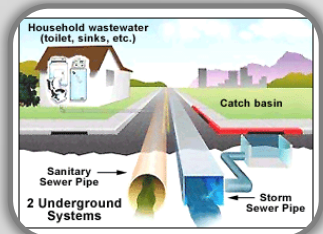
### 1938-1960

Combined storm and wastewater sewer is diverted to treatment facility with overflow to Mississippi during heavy rain events.



### 1960-1972

City begins separation of sewer system into Storm Sewer and Sanitary (Wastewater) Sewer.



### 1972-1983

Passage of the Clean Water Act and creation of the National Pollutant Discharge Elimination System (NPDES) regulates stormwater discharges to waterbodies.

### 1983-1996

Additional research reveals how to better treat stormwater, leading to management regulations and the widespread adoption of treatment standards and use of stormwater treatment ponds and other practices.

### 1996-Present

Upon becoming an MS4 (Municipal Separate Storm Sewer System) permittee in 2011, Minneapolis is now required to treat stormwater runoff using methods that mimic the natural hydrologic cycle (see below).

## How do we treat Stormwater?

<b>Slow it down</b>	Slowing down runoff reduces the likelihood of erosion and gives it an opportunity to soak into the ground.
<b>Filter it</b>	Filtering runoff through soil and plants removes pollutants and excess nutrients.
<b>Store it</b>	Storing excess water volume allows pollutants, especially sediment, to settle out and reduces downstream flooding.
<b>Soak it in</b>	Infiltration of stormwater helps recharge groundwater.
<b>Vaporize it</b>	Breaking down chemical compounds through irradiation, volatilization, and evaporation reduces their toxicity.

## What can you do at home?

Municipalities are required by law to treat polluted stormwater before it reaches waterbodies. This is done with stormwater ponds, infiltration basins, sumps, and other devices. Practices like street sweeping that stop pollution from getting into waterbodies in the first place are even better. There are many options for landowners to do their part at home as well.

### Keep Storm Drains Clear

Storm drains lead to our waterbodies, so anything that flows down them can end up in the water. Check the drain on your street and clean out any debris you see. Only rain should go down the drain!



### Install a Rain Garden

Rain gardens are shallow depressions that collect stormwater and allow it to soak into the ground instead of flowing down the street. They drain within 48 hours, so plants stay healthy and mosquitos won't hatch.



### Install a Rain Barrel

Rain barrels collect rain water from downspouts connected to your gutter. The collected water can be used to irrigate lawns, planting beds, or gardens.



### Install Permeable Pavers

Permeable pavers provide spaces for water to soak into the ground, unlike traditional concrete or asphalt. They can be an attractive alternative to traditional driveways, walkways, and patios.



### Keep Grass Clippings on Lawn

Grass clippings contain nitrogen and phosphorous that serve as natural fertilizer if left on your lawn. If those clippings end up in the street, they are carried to waterbodies where they promote algae growth.



### Mulch or Compost Fallen Leaves

Like grass clippings, leaves contain nutrients that can naturally fertilize your lawn. Mulch them with your lawn mower or compost them. Even large amounts of leaves can be mulched away, eliminating the need to rake.



### Pick Up after Pets

Pet waste is a major source of harmful bacteria and nitrogen, a nutrient that contributes to algae growth in lakes and streams. Pick it up and throw away in a sealed trashcan, even when no one is watching!



### Shovel Often and Salt Sparingly

Shoveling during storms or shortly after prevents ice from forming. If ice does form, remember to salt sparingly and sweep up extra. Salt won't melt ice below 15° F, so use an alternative deicer or sand for traction.



### Wash Car on Lawn or at a Car Wash

Soap and gunk from washing your car on your driveway is carried to waterbodies. Your lawn can help filter those chemicals and absorb extra water. If you don't wash your own car, bring it to a car wash where water is treated and reused.



### Properly Dispose of Oils and Chemicals

A leaky truck or accidental spill can have a large impact. Carefully clean up spills and ensure chemicals are contained and stored properly. Never pour oils or other chemicals down a storm drain!



### Core Aerate Lawn to Aid Infiltration

Core aeration is a simple way to help rain water penetrate your lawn and soak in rather than ending up in the street. It may also help your lawn grow more lush and green!



### Fertilize Only as Needed

Fertilizer helps plants grow, but also helps algae grow! Stop rain water from carrying away your fertilizer by applying it to targeted areas, mixing it with the soil when possible, and sweeping it up from driveways and roads.



### Plant Native Plants

Native Minnesota plants suited to your site's conditions will require less watering and provide habitat for pollinators. Additionally, the deep roots of prairie plants encourage infiltration and help absorb nutrients.

