

Stormwater treatment on properties



In southern Finland, it rains on average 650 mm per year, which amounts to 650 litres per square metre. This means that a 1,000 m² detached house plot receives an average rainfall of 650,000 litres per year. Some of this water evaporates or infiltrates into the soil if there are permeable surfaces on the plot. Water running off impervious surfaces, such as roofs or asphalted yards, is called stormwater. The property owner is responsible for managing stormwater on their property. If left unmanaged, stormwater can cause flooding and moisture damage to buildings. Climate change is causing even heavier rains, increasing the risk of urban flooding.

To reduce the negative effects of stormwater on water bodies, both the city and private properties must manage stormwater in their areas.

Stormwater affects water bodies

In built areas, the amount of water that infiltrates into the soil or is used and evaporated by vegetation has decreased. This has increased surface runoff that ends up in water bodies.

Stormwater running off streets and industrial areas collects debris and harmful substances along the way. In built areas, stormwater may also contain high concentrations of nutrients that increase the eutrophication of water bodies. An efficient ditch and stormwater sewer system quickly conveys untreated stormwater into the nearest water bodies. Thus, stormwater and its treatment affect the state of local waters.



The easiest way to prevent stormwater from polluting water bodies is to prevent the formation of stormwater and to increase its detention and treatment at the source, i.e. in your own yard.

In densely built areas, it is difficult to build stormwater treatment and detention basins that are sufficiently large and efficient for entire residential areas.

What are the harmful substances in stormwater?

Stormwater picks up harmful substances from various sources, including air, traffic, vehicles, construction sites, road slipperiness prevention, fertilization, sewer overflows, and the materials of different structures. Stormwater may contain solid matter, heavy metals, nutrients, oils, fats, chloride, and enteric bacteria. Construction sites are especially problematic, as large quantities of harmful substances, solid matter in particular, may end up in water bodies in a short period of time through inadequately managed stormwater. Washing cars in yard areas also has negative effects, as the washing water may enter water bodies through the stormwater sewer.

Several of the harmful substances in stormwater are bound to solid matter. Reducing the solid matter content of stormwater can also reduce its polluting effects.

How can I prevent harmful substances from ending up in water bodies?

- Avoid fertilizing the yard and using pesticides.
- Wash your car in an official car washing area.
- Make sure you store and dispose of harmful substances in an appropriate way.
- Pick up your pets' poop.
- Do not litter.
- Choose natural surface materials.

What can I do on my own property?

1. Reduce the formation of stormwater

Preserve and take care of the natural topsoil and vegetation on your property; this will increase the infiltration and evaporation of rainwater in your yard. Favour perennial plants, trees, and bushes that absorb and evaporate a lot of water. A large birch tree absorbs and evaporates from 500 to 1,000 litres of water a day.

- Instead of asphalt, use permeable surface materials, such as gravel or concrete/natural stones with wide joints in between. This will reduce the formation of stormwater.
- Install a green roof on top of your garage or garden shed. The roof will help treat stormwater and reduce its formation. A 5 cm thick green roof retains about half of the annual rainfall. The thicker and the more gently sloping the roof is, the more water it retains. Vegetation also extends the lifespan of the roof by protecting it from UV radiation and temperature variation.

- Collect rainwater and use it to irrigate the garden. This way, you will have free irrigation water for your garden also on rainless summer days. You can collect rainwater, for example, in rainwater barrels, roof water tanks or basins.
- Use structures that retain and treat stormwater, such as detention and infiltration structures, basins and wetlands. Preserve the natural depressions that collect surface water in the yard. This will reduce the need to convey stormwater away from the yard.



Green roof.



Permeable surfaces.

2. Detain and treat stormwater

There are several ways to treat stormwater and suitable solutions for every yard. Natural methods are recommended, as these will improve the quality of stormwater and regulate the moisture conditions in the yard.

Stormwater can be conveyed into detention and biofiltration depressions for treatment. The depressions are ideal for growing plants that thrive in moist conditions. In a depression, the solid matter contained in the stormwater settles, water is purified as it filters through the soil layer, and the vegetation effectively captures nutrients from the stormwater. Depending on the soil characteristics, part of the water may also infiltrate into the ground. Water can be conveyed through shallow stone-lined channels into several vegetation-covered depressions or basins. Small dams and meandering routes will slow down the water flow and make its treatment more efficient. This kind of garden feature designed for natural stormwater treatment is called a rain garden. Plants suitable for a rain garden tolerate moisture and flooding but also occasional drought.

Stormwater should be seen above all as an opportunity to diversify the yard environment. Various moisture-retaining and vegetation-covered garden elements also provide a habitat for diverse species and increase biodiversity.

Stormwater structures always require some level of care or maintenance. You can ask the designer of the stormwater treatment system for maintenance instructions.



Stormwater can be conveyed through a shallow stone-lined and vegetated channel.



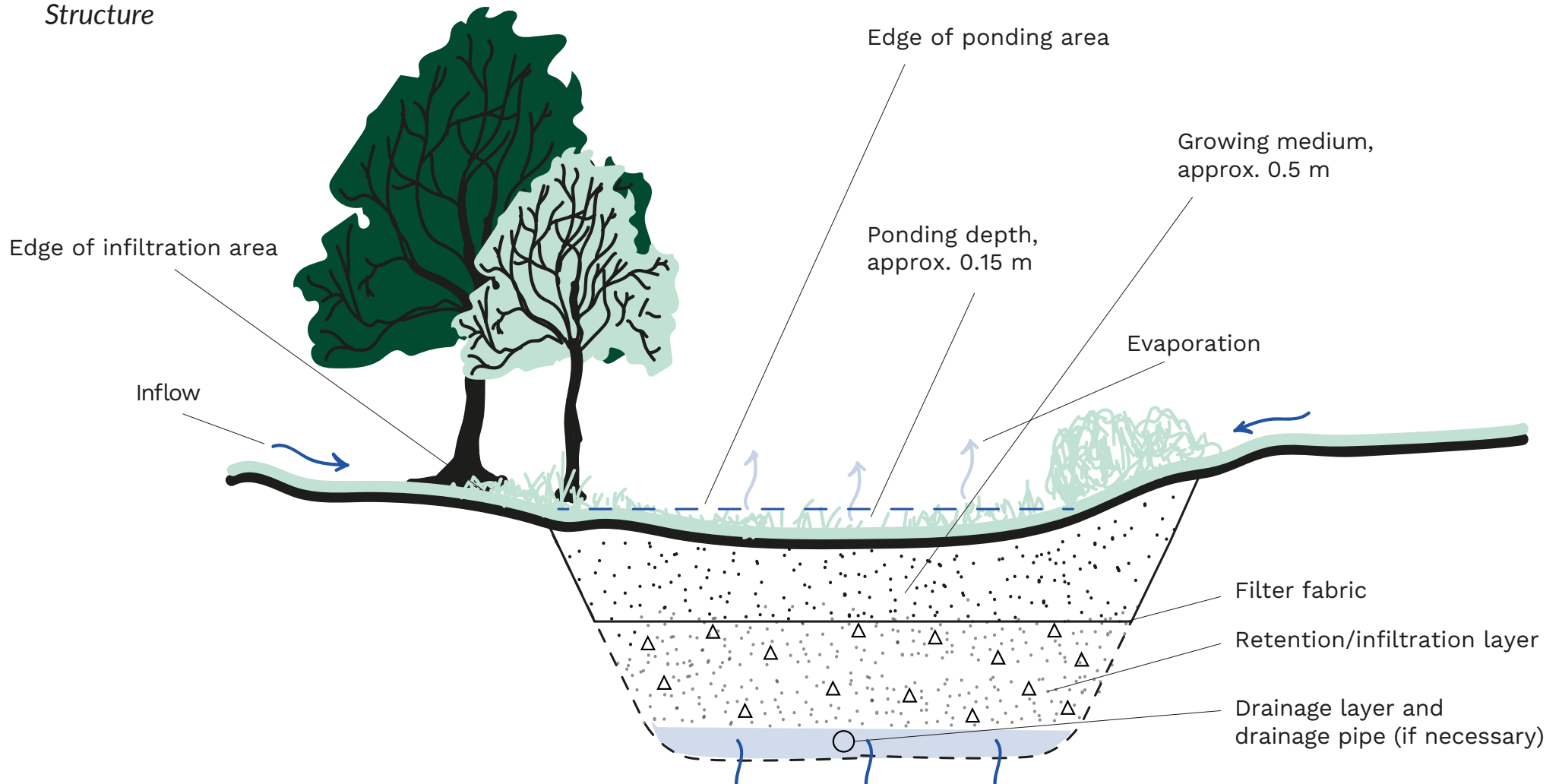
Stormwater can be collected or detained in yard basins.



Vegetated depression designed for the detention and treatment of rainwater.

Biofiltration, rain garden

Structure



Structure of a rain garden. A rain garden must have an overflow leading into a ditch or stormwater sewer. Illustration: Katariina Peltola.

Infiltration requires suitable soil

Stormwater running off impervious surfaces can also be infiltrated into the soil through an infiltration depression or well. Stormwater is purified as it seeps through the soil layers.

Effective infiltration requires that the soil is at least moderately permeable. The suitability of the soil for infiltration must be assessed before designing stormwater infiltration structures. The groundwater level must also be determined in advance. The distance between the base of the infiltration structures and the groundwater must be sufficient to allow for proper filtration of the water. The infiltration structure must extend to a frost-free depth to ensure it functions properly even during winter.

Infiltration methods can also be used in less permeable soil by equipping the system with a drainage or overflow solution, which makes it a partially infiltrating system.

Underground solutions

There are underground solutions and structures available in the market for the detention and treatment of stormwater, such as stormwater cassettes. These are suitable for properties where natural stormwater treatment is not possible. You can also install features such as sand and oil separators or sediment-collecting filters in the stormwater drains to promote stormwater treatment.

Stormwater conveyance and discharge

When planning the stormwater treatment system, you must pay attention to discharge and overflow routes to prevent water from discharging into unwanted areas, for example



during heavy rainfall. This prevents moisture-related issues on your property and your neighbouring properties.

Open ditches in residential areas are an essential part of the stormwater and surface water conveyance network and flood pathways. An open ditch is a more natural way to convey stormwater and has many positive qualities compared to a stormwater sewer network. Open ditches detain and regulate water flows. In addition, open ditches are not as flood sensitive as stormwater sewers. The vegetation in a ditch purifies water through biological activity.

It is advisable to detain stormwater on the property before conveying it into an open ditch to reduce erosion.

Each property owner/holder has an obligation to keep the ditches bordering their property open to facilitate the flow of water and reduce flood damage.

Sources and further information:

Report on stormwater quality (in Finnish):

www.kuntaliitto.fi/julkaisut/2023/2220-selvitys-hulevesien-laadusta

Climate-Proof City – The Planner’s Workbook:

<https://www.ilmastotyokalut.fi/en/index.htm>



Scan the QR code to watch informative videos on stormwater and different stormwater structures (in Finnish).

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