Educational Fliers for Best Management Practices in Residential Areas

South Fork Kent Creek Watershed

Rockford, Winnebago County

Olson Ecological Solutions, LLC

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South Fork Kent Creek Watershed
Residential Best Management Practices:

Vegetated Filter Strips

Filter strips are vegetated sections of land located between impervious surfaces or agricultural fields and the waters to which they drain. When installed next to impervious surfaces, vegetated filter strips slow runoff, enable stormwater to pass through deep-rooted vegetation, and filter out pollutants before emptying into swales or other bodies of water. Filter strips may provide some reduction in stormwater runoff volume, but their primary function is to filter out contaminants in stormwater runoff.

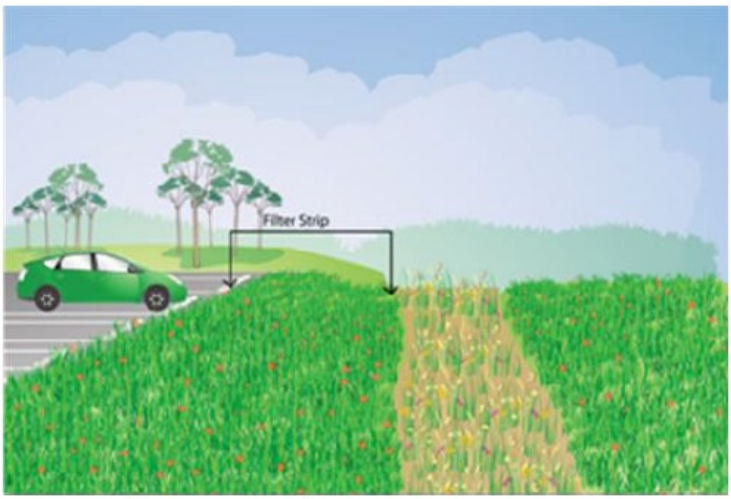

Figure 5.19. Illustration of a Filter Strip (MWRD, 2015)

The EPA has estimated the following load reductions in nitrogen (N), phosphorous (P), biochemical oxygen demand (BOD), and sediment in water sources when vegetated filter strips are in use.

BMP & Efficiency	N	P	BOD	Sediment
Vegetated Filter Strips	**40%**	**45%**	**51%**	**73%**

(EPA Region 5 Model for Estimating Load Reductions, 2018)

Nitrogen and phosphorous naturally occur as nutrients in aquatic systems; however, human activities have greatly increased the amounts that occur. Too much of these nutrients cause significant jumps in algae growth, which negatively impacts water quality, reduces or eliminates oxygen within the water, harms food resources, degrades aquatic habitats, and can eventually cause algal blooms. Some algal blooms produce toxins and promote bacteria growth, which can harm humans who come in contact with the water (EPA, “Nutrient Pollution: The Problem”).

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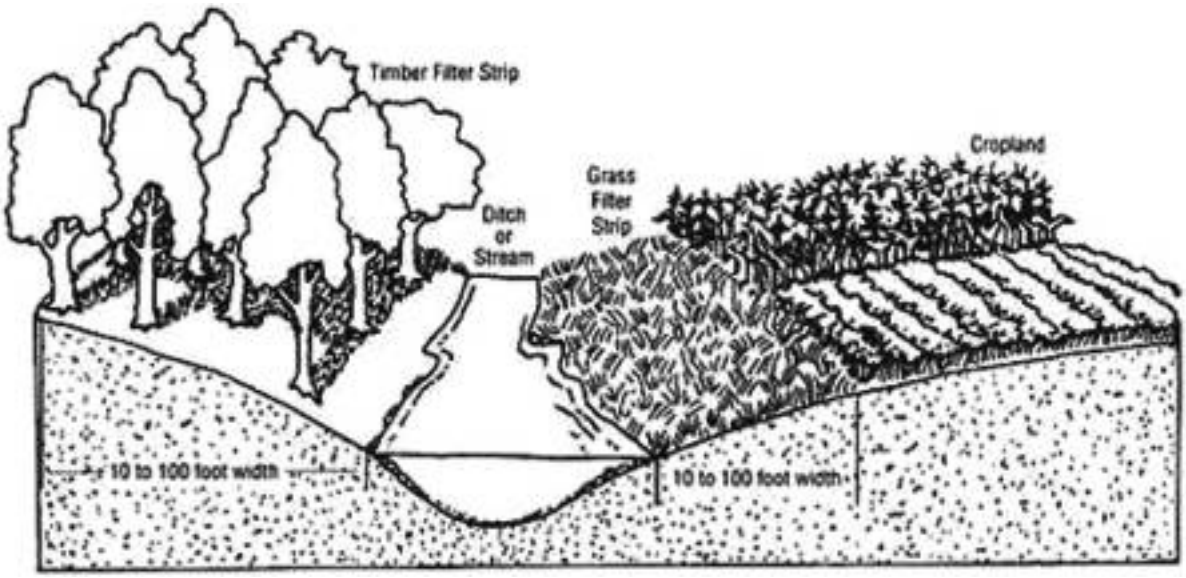
South Fork Kent Creek Watershed
Residential Best Management Practices:

Vegetated Filter Strips

Vegetated filter strips include various types of vegetation, including timber filter strips, grassway filter strips, or native plant filter strips.



(NRCS USDA)

It is suggested to plant native vegetation around waterbody shorelines and streambanks of South Fork Kent Creek and its tributaries in order to filter incoming pollutants. The more land near water that is covered with native plant vegetation, the more likely it is for pollutants (i.e. organic matter, sediments, heavy metals, bacteria, garbage, gasoline, chemicals, etc.) to be filtered out of water runoff before it hits fresh surface water. It is recommended for each strip of native vegetation to be as wide as the space will allow, with a 15-foot minimum (OES, 2014).

Applicable Locations: downslope of any area that produces large amounts of stormwater runoff

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South Fork Kent Creek Watershed
Residential Best Management Practices:

Vegetated Swales

Vegetated swales are shallow channels or swales vegetated with deep rooted plants, which filter out pollutants and slow stormwater. Similar to filter strips, vegetated swales intercept stormwater runoff from nearby impervious areas. Their primary function is to filter pollutants and sediment from stormwater runoff.

Benefits:

- ✓ Collect stormwater sediment
- ✓ Filter pollutants
- ✓ Slow stormwater runoff

Permeable paving drains into a vegetated swale at Elmhurst College *(*Jaffe, M., et al 2010)

Agrecol Native Nursery Swale Mix

Vegetated swales can be applied in most development situations with few restrictions. They are well-suited to treat highway or residential road stormwater runoff due to their linear nature.

Applicable locations: at the end of drains or buildings, adjacent to impervious surfaces such as parking lots and roads

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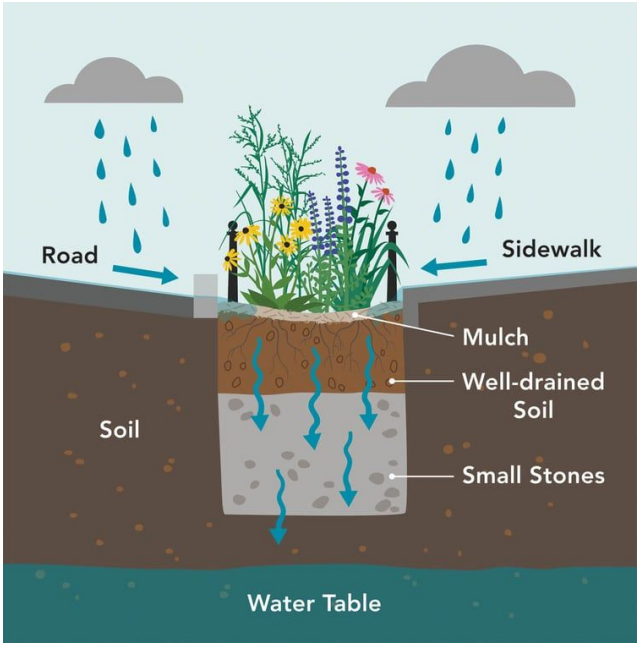
Residential Best Management Practices:

Vegetated Swales

Vegetated swales must be sized to allow sufficient contact time with the swales, such as shallow water depths and low velocities, in order for adequate pollutant removal to occur. In designing these swales, they also must consider drainage area, soils, and the volume control storage. Swales utilize drainage pipes, well-drained soils, and gravel underneath vegetation to aid in water infiltration.



Connecticut Fund for the Environment

City of Columbus, columbus.gov

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South Fork Kent Creek Watershed
Residential Best Management Practices:

Riparian Buffer Restoration

Riparian buffer restoration is the process of creating a small plant habitat situated above the banks of lakes, streams, or ponds by installing hydrophilic plants, which grow in or near water and can tolerate various levels of saturation.

Figure 6.13. Examples of Riparian and Non-riparian Environments

Benefits:

- ✓ Reduces flood flow rates, velocities, and volumes
- ✓ Minimizes erosion and promotes bank stability of streams, lakes, ponds, or wetland shorelines
- ✓ Helps to control sediment from upland areas by filtering and assimilating nutrients discharged from surrounding uplands
- ✓ Enhances wildlife habitat
- ✓ Overhanging vegetation within buffer helps to cool stream flow
- ✓ Provides nutrient uptake that may reduce algal blooms and subsequent depressed levels of dissolved oxygen in-stream.
- ✓ Enhances natural aesthetics of water bodies

(MWRD, 2015)

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South Fork Kent Creek Watershed
Residential Best Management Practices:

Riparian Buffer Restoration

Native plant buffers (riparian buffers) should be at least 10 feet of dense native plants grown along the water's edge to allow pollutants to filter out and the banks to stabilize (Lake County Stormwater Management Commission, 2018).

Riparian buffer restoration above rip rap shoreline protection would detract geese and filter pollutants from stormwater running from lawns, parking lots, and other land uses next to the shoreline. Steep terrain leading to waterbodies and streams heightens the need for riparian buffers because these buffers help to stabilize the land just next to the surface water and provide erosion control.

Applicable locations: There are opportunities to install riparian buffers enveloping waterbody shorelines and streambanks throughout the watershed.

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South Fork Kent Creek Watershed
Residential Best Management Practices:

Native Plantings

Plants native to the region provide benefits to water quality, streambank stabilization, erosion control, animal and insect habitat, and aesthetic appeal. Many native plants have much deeper roots than cultivated or invasive plants.

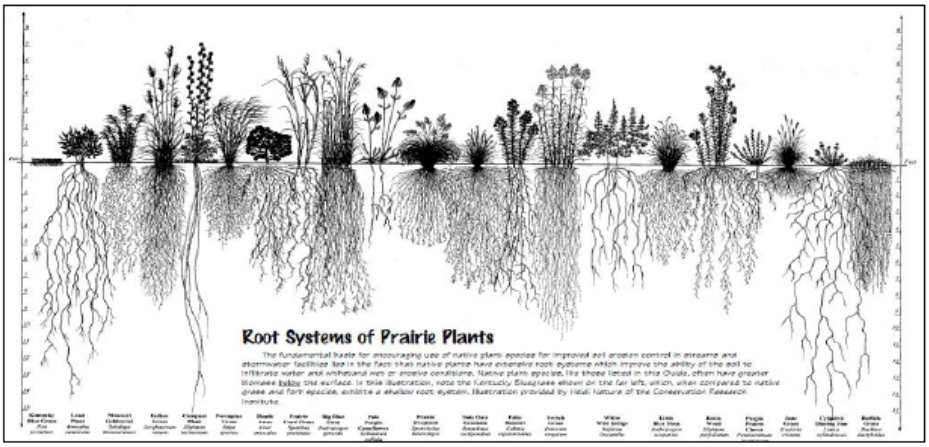

Figure 5.16. Root Systems of Grass and Prairie Plants (Source: Heidi Natura, CRI, 1995). (MWRD, 2015)

Deep-rooted plants can trap suspended sediment and incorporate excessive nutrients into their biomass as polluted water flows through the vegetation. Deep roots also stabilize water shorelines, decrease erosion, and prevent sediment from entering water bodies. Sediment is considered a pollutant to water quality because it alters the volume capacity that a lake or steam can hold, thus eliminating potential habitat, and fluctuates water temperatures, which negatively impacts aquatic life and water quality. Planting natural areas with native plants also increases habitat for birds, mammals, butterflies, and amphibians.

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Residential Best Management Practices:

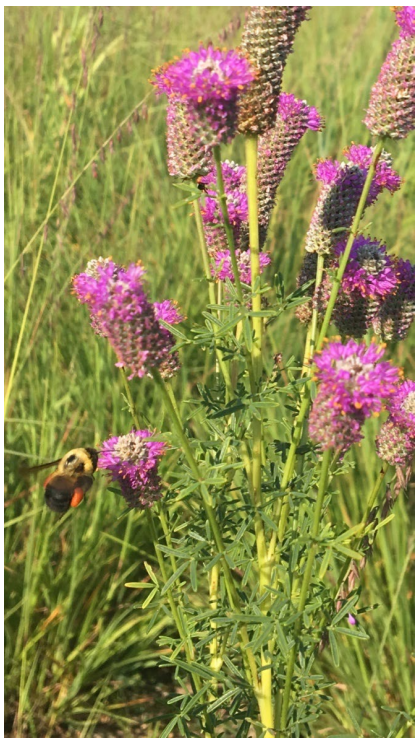
Native Plantings

In 2015 the Metropolitan Water Reclamation District compared the runoff coefficient between impervious surfaces (ie. asphalt parking lots, concrete sidewalks, etc.) to other permeable surfaces like native plantings and porous pavement. The runoff coefficient (C) relates the amount of runoff to the amount of precipitation. A larger value in C means lower infiltration rates and higher runoff. They found that while impervious surfaces have a runoff coefficient of .90, areas planted with native plants has a much lower C of .15.

Table 5-2. Runoff Coefficients (C Values) for the Rational Method

Surface Type	Runoff Coefficient, C
Impervious area (Roads, roofs, sidewalks, etc.)	0.90
Pervious Area	0.45
Gravel (loose, unbound)	0.75
Water Surface (open water)	1.00
Native Plantings	0.15
Wetlands	0.79
Synthetic Turf Fields	0.75
Green Infrastructure:	
Pervious Surfaces (Porous Asphalt, Pervious Concrete, Permeable Pavers)	0.75
Bioswale	0.10
Rain Garden	0.10
Green Roof	(Refer to Table 5-9)

(MWRD, 2015)



Native plants can be utilized in many of the best management practices recommended in this plan, including vegetated swales, vegetated filter strips, riparian buffer restoration, and floating islands. Native plantings help the South Fork Kent Creek watershed plan goals no matter where they are planted, but they are most beneficial when planted within the path of stormwater.

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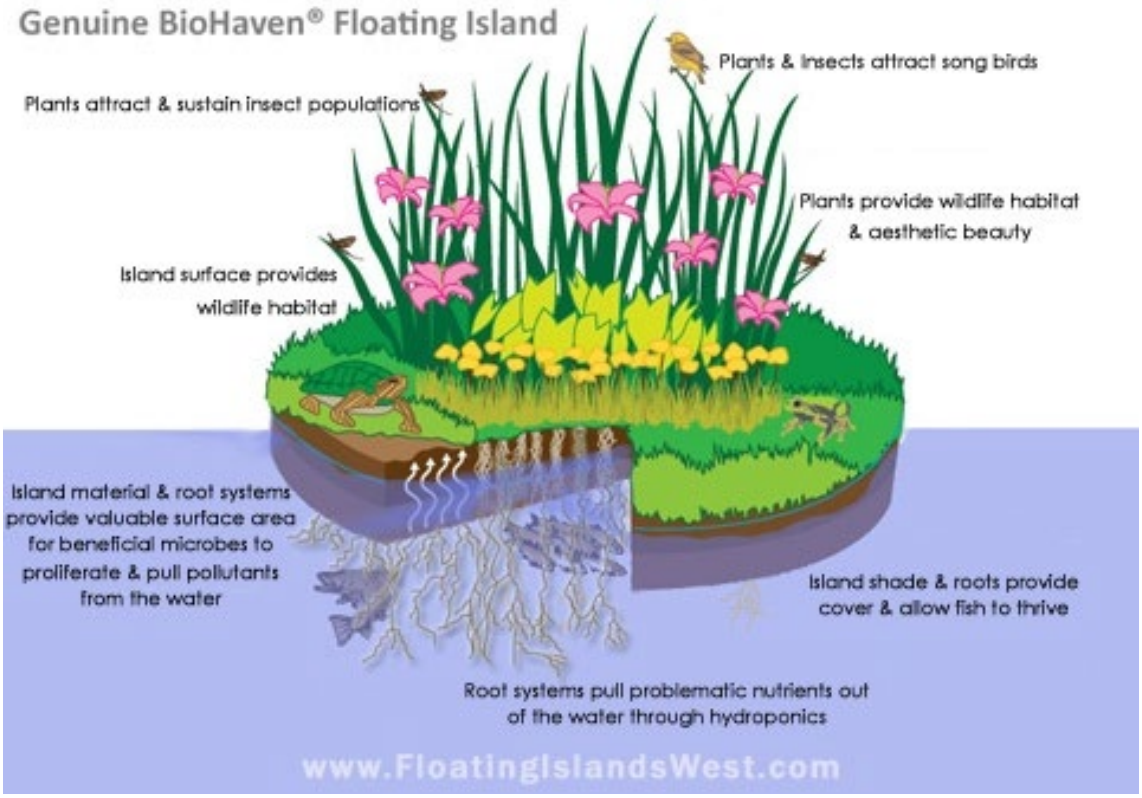
South Fork Kent Creek Watershed
Residential Best Management Practices:

Floating Islands

Many best management practices for water quality focus on preventing pollutants from entering local fresh water sources, i.e. preventative measures. There is a best management practice that focuses on filtering out pollutants that still entered the targeted bodies of water. Floating wetlands, or islands, can further reduce pollutants in the lake as a long-term solution: 82% reduction in total phosphorous, 70% reduction in total nitrogen, and 45% reduction in BOD (biological oxygen demand).



Floating Treatment wetlands are manmade floating wetlands that when installed mimic naturally occurring wetlands in a concentrated capacity. 250 square feet of island translates to the equivalent filtering capacity of 1 acre of wetland. Natural wetlands are nature's water filters. Wetlands remove nitrates, filter excessive nutrients and sediment, recharge groundwater, and aid in erosion and flood control (Floating Islands West).

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South Fork Kent Creek Watershed
Residential Best Management Practices:

Floating Islands

Floating islands have seen successful implementation in various waterways with a diverse wealth of benefits: habitat enhancement, wetland and lake restoration, water quality improvement, stormwater treatment, and recreational use. BioHaven floating islands use marine-grade, non-toxic materials. These islands have also been shown to remove heavy metals, nutrients and other pollutants at removal rates of 63%-98%.

Floating islands in Levings Lake, Rockford, IL

Floating islands are already in place at Levings Lake, along with other best management practices like constructed wetlands and native plantings. These best management practices at Levings Lake have demonstrated effectiveness in reducing excess nutrients and sediment. Floating islands allow filtering plants and good bacteria to float on the water in a constructed island, introducing a filtration capability where there wasn't an opportunity before. Floating islands are recommended in addition to preventative measures in areas where pollutant reduction goals cannot be met using preventative measures alone, or where other benefits such as fish habitat are desired.

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South Fork Kent Creek Watershed
Residential Best Management Practices:

Permeable Pavement Parking Lot

Permeable pavement is pavement designs with various percolating layers that filter stormwater. They are especially important in filtering out the first flush pollutants, like car oil, gasoline, heavy metals, litter, suspended solids, and road salt, at the beginning of a storm event.

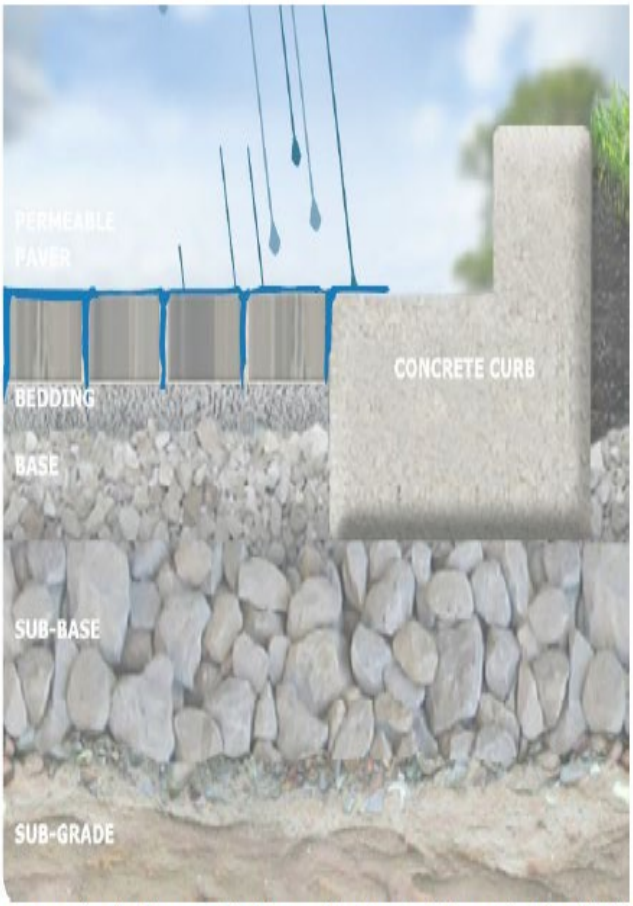

Figure 5.13. Example of a Permeable Paver Parking Lot Cross-Section (APT, 2011)
(MWRD, 2015)

Benefits:

- ✓ decreased surface runoff
- ✓ reduced runoff velocity
- ✓ improved water quality
- ✓ groundwater recharge through more direct infiltration

Applicable locations for implementation: The installation of permeable pavement is recommended for parking lots, driveways, access roads, sidewalks, and other low traffic impervious surfaces.

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South Fork Kent Creek Watershed
Residential Best Management Practices

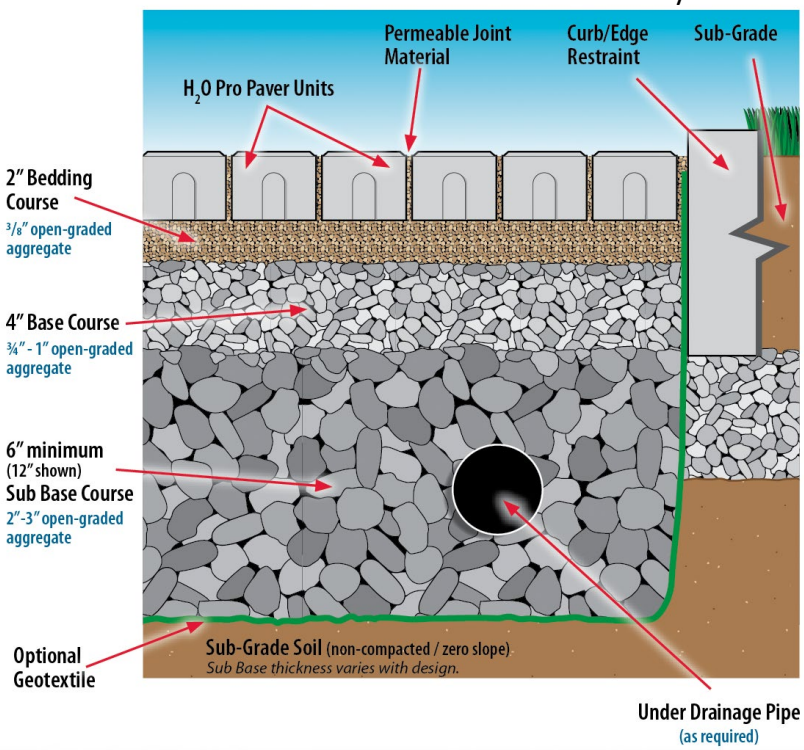
Permeable Pavement Parking Lot

Morton Arboretum, Lisle. Permeable pavers

A recent National Water Quality Inventory reported that runoff from urban areas is the primary source of water quality impairments to tested estuaries and the third-largest source of impairments to surveyed lakes (EPA, *Protecting Water Quality from Urban Runoff*).

Permeable pavements infiltrate, filter, and/or store precipit ation where it falls. These pavements are usually installed using permeable interlocking pavers. This best management practice could be cost effective where property values are high and flooding or icing is an issue (EPA, What is Green Infrastructure?).

County Materials



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South Fork Creek Kent Watershed
Residential Best Management Practices:

Infiltration Trench

In urban areas, rain fall flows over impervious surfaces such as asphalt, collecting pollutants as it makes it way downhill. Storm water typically flows into drains leading to a sewage system and ultimately into Earth's water system. In developed areas, overflow of sewers is a common occurrence during a heavy rainfall, contributing organic pollutants to the fresh storm water. Flooding and faulty septic systems threaten local watersheds with increased exposure to contaminants.

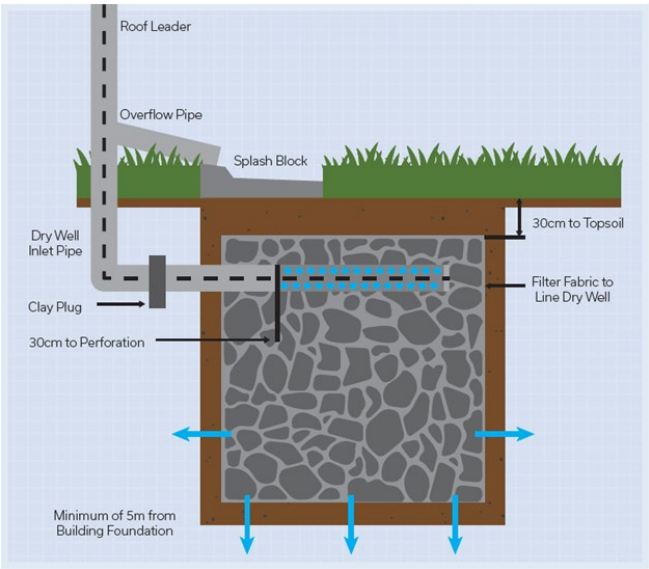

Diagram of an infiltration trench (Source: Windsor City Hall)

A built structure called an infiltration trench is designed to collect fresh storm water. The trenches are excavated near infrastructure where running water could be captured, like the end of a sloped driveway, and temporarily held beneath ground. They are lined with a geotextile material and then filled with granular stone. This facilitates the infiltration of water into the ground to recharge the water table with uncontaminated water.

Benefits:

- ✓ Reduces fresh water in sewer system
- ✓ Reduces risk of flooding
- ✓ Recharges the water table
- ✓ Reduces peak flows in sewer
- ✓ Improves water quality
- ✓ Reduces channel erosion

Applicable locations for implementation:

- Rooftops
- Driveways
- Parking lots
- Roadsides

Infiltration trenches should not be used near farms or industrial complexes to ensure that pollutants in these areas do not leach into the ground water.

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Residential Best Management Practices:

Infiltration Trench

Low impact developments such as these mimic natural processes that result in the infiltration, evapotranspiration, and use of storm water to protect water quality, and maintain a watershed's hydrological function (USEPA,2018).

Infiltration trench next to grassed strip
(Source: Nebraska Stormwater Cooperative, 2017)

When used correctly, green infrastructure has the capability of restoring damaged Earth systems. One potential downfall of an infiltration trench is that it ineffectively captures sediments which can clog the system (SUNY College). Paired with vegetative filter strips or another natural buffer can increase the overall effectiveness of storm water management.

Infiltration Strip intermixed with other BMPs (Source: Wikipedia, 2018)

- USEPA. (2018, August 6). Urban Runoff: Low Impact Development. Retrieved from https://www.epa.gov/nps/urban-runoff-low-impact-development.
- SUNY College, E. S. F. D. (n.d.). Stormwater Management: Infiltration Trenches. Retrieved October 30, 2019, from https://www.esf.edu/ere/endreny/GICalculator/InfiltrationIntro.html.

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South Fork Creek Kent Watershed
Residential Best Management Practices:

Level Spreader

A level spreader is an erosion control device used to dilute concentrated runoff by uniformly spreading water over an area. Acting as a buffer, it slows the movement of incoming overland water.

Benefits:

- ✓ Slows flow of run off
- ✓ Reduces particulate pollutants
- ✓ Reduces erosion

Level Spreader redistributing concentrated runoff from culvert.
(Source: North Carolina Cooperative Extension)

Applicable locations for implementation:

- Parking lots
- Roadways
- Near other impervious surfaces

Level spreaders are best followed by a vegetative strip.

Level Spreader from urban parking lot leading runoff into vegetated buffer strip.
(Source: Sustainable Technologies, 2018)

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Residential Best Management Practices:

Level Spreader

A level spreader acts only as a buffer to pollutants and not a stand-alone solution. Other developments such as riparian buffers, vegetative strips, infiltration trenches, or blind swales could all be implemented in the design of a storm water treatment chain.

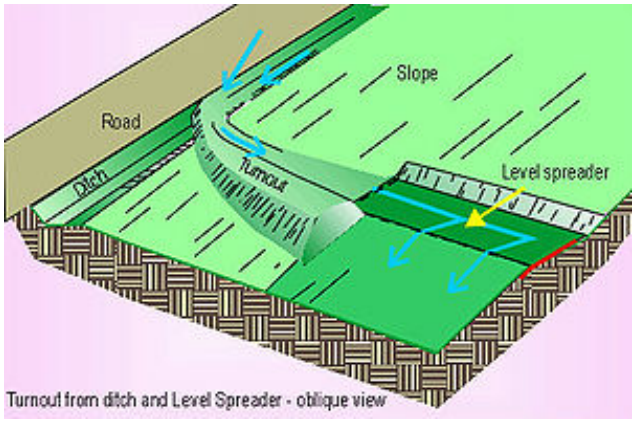

Diagram of a Level Spreader
(Source: Sustainable Technologies, 2018)

Requirements:
Must be made of poured concrete or other durable material with a lip at least 3 inches above ground.
Proper maintenance ensures debris, upland erosion, or overgrown vegetation does not collect and clog the spreader.

Level Spreader and Vegetative Strip (Source: Kirk)

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South Fork Creek Kent Watershed
Residential Best Management Practices:

Runoff and Sediment

There are several techniques to divert, diffuse, and contain runoff in the design of storm water treatment plans. Concentrated runoff eventually amounts to soil erosion and downstream sedimentation. Eroded soils and waterways are more exposed to further erosion and contamination. In developed environments, impervious pavements and compacted soils reduce opportunities for water filtration and increase water velocity and flooding. Harmful contaminants from waste such as pathogenic bacteria are encouraged to attach to sediments and thrive on nutrient surpluses. The presence of these pollutants have the capability of contaminating a watershed. A healthy watershed is vital to both human and environmental health. Applying a combination of sediment control practices can keep contaminants out of our watersheds by intervening with runoff.

Rock Check Dams (Source: Hassanli, 2009)

Rock Check Dams

These structures are built across swales or ditches to decrease erosion as well as trap sediments.
They are best used in areas without natural barrier resulting in high velocity storm water flow.

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South Fork Creek Kent Watershed
Residential Best Management Practices:

Runoff and Sediment

Rock Outlet Diversion

These structures are commonly developed in basins at the outlet of conduits, culverts, or channels. Outlet diversions are designed to reduce the energy of high-speed storm water. This technique reduces erosion and levels of sedimentation downstream.

Rock Outlet Diversion (Source: NC.gov)

Stone Lined Channel
(Source:= Hughes, 2017)

Lined Channels

Lined channels divert concentrated runoff from sensitive areas. They can be lined with grass, rocks, concrete, or other materials that combat erosive activity. A lined channel is best used when soils are prone to erosion by storm water, typically in narrow spaces.

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References

Hassanli, A. M., & Beecham, S. (2009). Criteria for optimizing check dam location and maintenance requirements. *Check Dams, Morphological Adjustments*. Retrieved from https://www.researchgate.net/publication/287636490_Criteria_for_optimizing_check_dam_location_and_maintenance_requirements

Hughes, A. (2017). *Stone-lined Channel near Glyncorrwg. Talbot, Britain*. Retrieved from https://www.geograph.org.uk/photo/5414912

Kirk, B. (n.d.). Portland bumpout level spreader weir: GI Forebay/Weir Treatment: Landscape architecture, Ecology, Landscape. Retrieved October 30, 2019, from https://www.pinterest.com/pin/419116309058296582/?nic=1a.

NC.gov. (n.d.). Overview of Sedimentation and Erosion Control Practices. Retrieved October 30, 2019, from https://files.nc.gov/ncdeq/Energy Mineral and Land Resources/Land Resources/Land Quality/Erosion and Sediment Control Planning and Design Manual/Chapter 5/Chapter 5 Part 3.pdf.

Nebraska Stormwater Cooperative. (2017, January 11). infiltration-trench-.original. Retrieved October 30, 2019, from http://www.nebraskah2o.org/infiltration-trench-original/.

North Carolina Cooperative Extension. (n.d.). Urban Waterways: Level Spreader. Retrieved October 30, 2019, from chesapeakestormwater.net.

SUNY College, E. S. F. D. (n.d.). Stormwater Management: Infiltration Trenches. Retrieved October 30, 2019, from https://www.esf.edu/ere/endreny/GICalculator/InfiltrationIntro.html.

Sustainable Technologies. (2018, March 6). Level spreaders. Retrieved October 30, 2019, from https://wiki.sustainabletechnologies.ca/wiki/Level_spreaders.

USEPA. (2018, August 6). Urban Runoff: Low Impact Development. Retrieved from https://www.epa.gov/nps/urban-runoff-low-impact-development.

Wikipedia. (2018, March 23). Percolation trench. Retrieved October 30, 2019, from https://en.wikipedia.org/wiki/Percolation_trench.

Windsor City Hall. (n.d.). Climate Resilient Home: Infiltration Trench. Retrieved October 30, 2019, from https://www.citywindsor.ca/residents/environment/climate-change-adaptation/climate-resilient-home/Pages/Infiltration-Trench.aspx.