Property Owner Guide to Managing Stormwater

What is this guide?

This guide explains how activities on individual properties can impact surrounding water resources and simple steps that can be taken to manage stormwater so as to minimize these off-site impacts.

Who is it for?

This guide is a resource for property owners and managers in New England or any individuals responsible for managing stormwater on larger, developed areas in New England.

Why should you read this?

Readers will learn simple steps to reduce stormwater impacts affecting water quality and flooding. Additionally, your property may have regulatory obligations.

What does it include?

~ Background and education on stormwater, its impacts, and land development's influence on stormwater

~ Approaches to understand how developments impact stormwater

~ Guidance on simple, cost-effective measures that can be taken to address water quality and quantity impacts

Bioretention Basin at Providence College
Image: Rhode Island Stormwater Innovation Center

DEVELOPED BY

VHB and The SNEP Network

TECHNICAL SUPPORT: The University of New Hampshire Stormwater Center, Rhode Island Stormwater Innovation Center, Southeast New England Program (SNEP), Rhode Island Department of Environmental Management, Elizabeth Scott Consulting

FINANCIAL SUPPORT: The SNEP Network

Why what you do on your property matters

The Water Cycle and Important Terms

The water cycle, also known as the hydrologic cycle, is the process in which water circulates through the Earth's environment. Key processes within the water cycle that are important to understand for stormwater management include:

~ **Precipitation** is water that falls from the atmosphere onto Earth's surface

~ **Runoff** is the movement of water across Earth's surface to a collection system or waterbody

~ **Evaporation** is the movement of water from Earth's surface into the atmosphere

~ **Infiltration** is the movement of water from Earth' surface into the ground

How does your site impact the environment?

Land development is often accompanied by an increase in **impervious cover**, or surfaces that do not allow water to infiltrate into the soil such as pavement and rooftops. An increase in impervious cover decreases both infiltration and evaporation while simultaneously increasing both pollutants and the quantity and rate of runoff. The incremental changes to the water cycle brought on by each property that converts fields and forests to impervious surfaces contribute to deteriorated water quality and flooding.

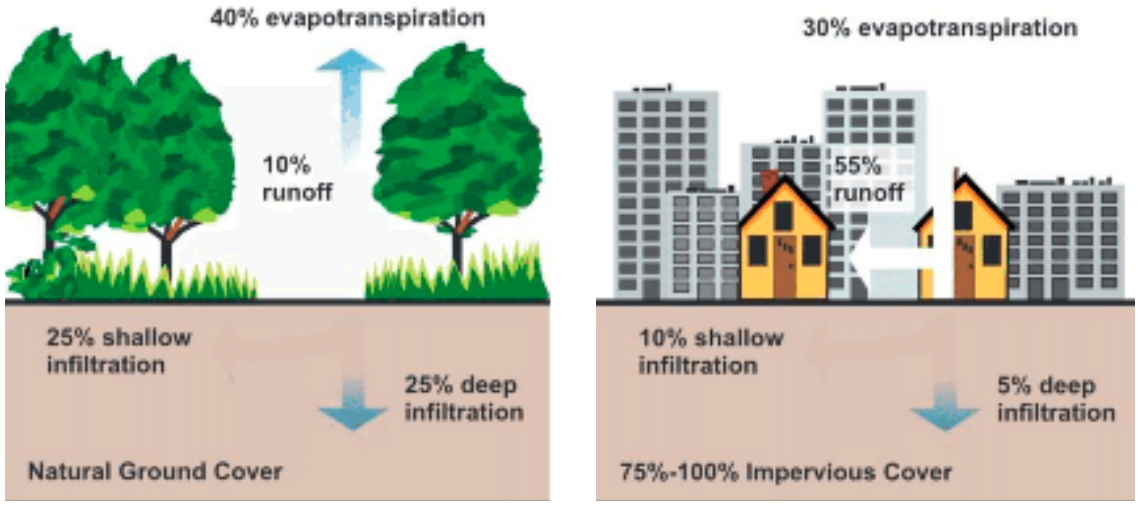
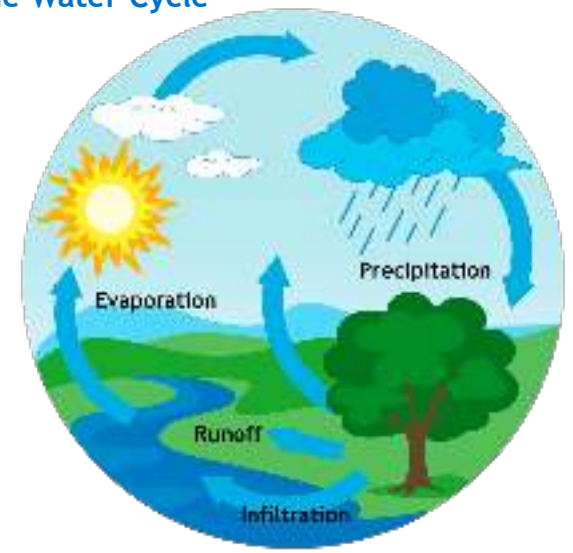


Image retrieved from "Stream Corridor Restoration: Principles, Processes, and Practices," pp. 3-23, October 1998, courtesy of the Federal Interagency Stream Restoration Working Group

The Water Cycle



What Happens Downstream of my Property?

Runoff from impervious cover drains to storm drains and pipes, and then directly to a wetland or other receiving water without any treatment or infiltration to replenish groundwater. Pollutants are carried directly to waterways and runoff is increased. This degrades water quality and increases erosion and flooding.

Image: Rhode Island Stormwater Innovation Center

Stormwater Impacts

Water Quality—Common Pollutants and Sources

Stormwater runoff gathers pollutants as it flows across developed surfaces. Different land uses introduce various pollutants to the runoff.

NUTRIENTS

Excessive nutrients contribute to aquatic weed growth, algal and cyanobacteria blooms—impacting recreation and human and animal health. Sources include:

- Fertilizers
- Animal waste/organic matter
- Detergents

BACTERIA

Disease causing bacteria can limit recreational uses and lead to shellfish harvesting closures. Sources include:

- Animal waste
- Human waste
- Organic matter

METALS

Metals can impact the health of fish and humans. Sources include:

- Industrial activities
- Rooftops
- Vehicles
- Paints
- Pesticides

SEDIMENT

Sediment can impact aquatic organisms and clog infrastructure. Sources include:

- Construction activities
- Erosion
- Urban runoff

OIL AND GREASE

Oil and grease are toxic to aquatic organisms. Sources include:

- Vehicle fueling
- Parking lots
- Vehicles and heavy equipment
- Material storage

CHLORIDES

Chlorides can impact aquatic organisms. Sources include:

- Salt and deicing activities
- Water softeners

Illicit discharges are non-stormwater discharges to the drainage system or waterbodies that contribute to pollution. These can include sanitary sewer or floor drain connections. These can also include dumping into storm drains or cleaning activities that runoff to drains.

Regulatory Programs Both state and federal programs exist that dictate the need to manage stormwater discharges from both public and private entities. These programs exist to mitigate impacts of stormwater runoff described to left. Read more from the US EPA.

Water Quantity and Climate Change

Impervious surfaces prevent rainfall from infiltrating into the ground and replenishing groundwater. In turn, waterbodies do not receive groundwater inflow critical for plants and animals during extended dry periods. Additionally, increased periods of drought reduce soil ability to absorb and capture rainfall. This combined with larger and more frequent storms results in localized flooding.

\+ Larger Storms
\+ Impervious Cover
= **Localized Flooding**

\+ Periods of Drought
\+ Impervious Surfaces
= **Extreme Low Stream Flow and Water Levels**

Knowing Your Site

Understanding how site features and activities interact with precipitation and generate runoff and pollutants will help you understand how your site impacts the natural systems around it. Note pollutants generated at each area and think about what else may be a source of pollution on your site. Knowing your site is the first step in effectively managing the stormwater it produces.

1 | Material Stockpiles Portions of stored material and packaging can be sources of pollution when exposed to rainfall

2 | Dumpsters and Waste Storage Pollutants come from general facility waste which can be carried by stormwater that runs across improperly managed containers and dumpster leaks

3 | Loading Docks Pollutant sources include metals, sediment, oils/gas, and organic matter brought by vehicles, trash, and debris from shipping and receiving processes

4 | Rooftop Pollutant sources include particulate nutrients and metals from the atmosphere or rooftop vents and bacteria from bird waste

5 | Other Impervious Surfaces Walkways, storage areas, and other impervious surfaces can produce fertilizers and/or other pollutants from adjacent lawns in addition to trash, chlorides from winter deicing, and sediments

6 | Natural Buffers Naturally vegetated land adjacent to wetlands and waterbodies provides a buffer, protecting these resources from pollutant-generating areas

7 | Fleet Storage and Maintenance Areas Pollutant sources include soaps, oils, greases, and metals from car debris, tire ware, and fleet storage, washing, and maintenance

8 | Roadways, Driveways and Parking Areas Pollutant sources include metals, sediment, oils/gas, and organic matter brought by cars and equipment, sediment and chlorides deposited by winter maintenance, trash, and general litter

9 | Landscaped Areas Pollutant sources include fertilizers, organics/nutrients from soil/ vegetation, and trash

Know Where Water Goes and What You Can Do About It

Ask yourself the following questions to determine where stormwater flows on your site and what you can do to mitigate stormwater impacts. Additional ideas and measures can be found in the tables on page 19 at the end of the guidance.

Are parking areas sloped to storm drains? Utilize unused parking for a small treatment basin.

After entering inlets water is conveyed through pipes and eventually to waterbodies.

Look for opportunities to direct runoff to treatment areas. The example below shows parking lot low flows redirected to a small basin created from an unused parking area. Larger flows can still drain quickly through the drainage system.

Do you have existing treatment on-site?

Existing treatment measures may need to be cleaned or could be enhanced in some way to make them more effective in capturing and treating runoff

Maintain and upgrade existing treatment measures

Where does water go after it leaves your site?

Walk your property during a rain event to determine drainage patterns. Note if you have an underground system that may go directly to receiving water or to a municipal system.

Vegetate unused pavement

Are there areas where pavement can be removed?

This parking lot is oversized and underutilized. Areas toward the rear of the lot are great candidates for parking space reduction and introduction of green space.

Know Where Water Goes and What You Can Do About It

Ask yourself the following questions to determine where stormwater flows on your site and what you can do to mitigate stormwater impacts. Additional ideas and measures can be found in the tables on page 19 at the end of the guidance.

Street sweeping can be implemented across paved areas to minimize pollutants generated on parking lots and roadways.

Subsurface leaching basin

Does your roof have gutters and downspouts?

Do they discharge to the surface or go underground to pipes?

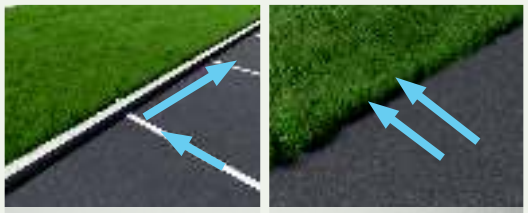
The subsurface leaching basin collects and infiltrates runoff from the roof leader.

Is runoff controlled by curbing? Or does runoff flow over vegetated areas?

Maintain vegetated areas that receive runoff from impervious areas.

Existing impervious disconnection

Look for more areas to encourage this simple treatment practice by removing curbing and directing roof drains to vegetated areas.



Impervious disconnection through curb removal

Do you have areas of flooding?

Treatment measures can be combined with solutions to correct drainage issues.

Consider modifying existing islands to incorporate stormwater treatment measures which can work in linear or wider areas allowing for flexibility to fit existing layouts on your property.

Use and expand parking island for stormwater management

What Can You Do as Property Owner/Manager?

Stormwater management and treatment concepts have been developed and refined for decades and can be simple and complimentary to the site.

These strategies can be broken into three categories of control measures:

~ **Site Operations/Good Housekeeping**—Site management techniques that reduce pollutant sources and exposure to precipitation/runoff

~ **Site Layout/Disconnection**—Encouraging runoff from impervious surfaces to flow over pervious surfaces for infiltration and treatment, reducing overall impervious cover, or maintaining existing pervious areas and buffers

~ **Structural Treatment**—Constructed treatment measures that achieve pollutant removal through hydrologic, physical, biological, or chemical processes

Control Measure: activity or structure that reduces stormwater pollutants and manages runoff

Often stormwater control measures have many co-benefits including aesthetics, safety, traffic calming, temperature regulation, greenhouse gas reduction, among many others.

Steps to Managing Stormwater on Your Property

1 Know Your Site
Understand sources of pollution and flow patterns throughout your site. *See pages 4-5*.

2 Evaluate Considerations and Constraints
Understand stormwater management goals, site constraints, and site uses that may either be constraints or opportunities. *See page 19* *and the New England Retrofit Manual*.

3 Evaluate Control Measures
Review existing control measures in all categories. Evaluate the effectiveness of these practices and identify potential modifications to improve them.

4 Prioritize, Identify and Implement Control Measures

1 | Start with simple operation and good housekeeping measures and optimization of existing site practices
2 | Identify site layout and simple ways to disconnect flow from impervious areas to pervious areas
3 | Consider adding structural treatment practices, many of which can be small and simple yet still provide valuable benefits

See pages 13 through 18 for specific types of control measures in all categories.

5 Continue to Evaluate
Continuously evaluate your site to ensure control measures are successful and identify opportunities for more. This is especially important when other maintenance and site upgrade work is happening.

Implementation—How Can You Get Something Done?

Keep it Simple

A lot of these measures are easily implementable within your current operations or site layout. Key examples include the following *(see pages 13 through 18 for a full list of control measures)*:

~ Disconnecting rooftops by redirecting roof leaders

~ Ensuring proper trash and dumpster management

~ Reducing excess/unused pavement

Taking Advantage of Existing Work

~ Use needed maintenance and upgrade work on your site as an opportunity to incorporate control measures cost effectively

Leveraging Partnerships

~ More complex measures may be implemented through partnerships or grants

Partnerships

Partnerships between private property owners and other organizations with similar goals such as municipalities, regional planning agencies, and watershed groups can be a cost saving strategy that supports water quality goals.

Public and nonprofit entities often have access to funding through grant or loan programs unavailable to private properties. Consider how partnerships could help manage stormwater both on and off your site in a mutually beneficial manner.

See examples of how this can be done on the following pages




Questions to ask

What upcoming projects do I have?

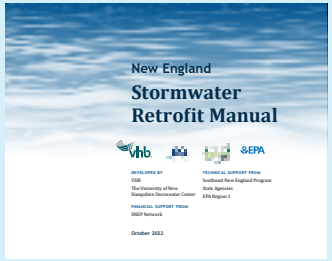
» Do my planned property improvements or redevelopment plans optimize opportunities to reduce runoff volume and pollutants?

» What existing operations can be adjusted?

» Can I modify my existing site layout?

» What entities have a shared interest?

» Do I have flooding on my site that can or needs to be addressed?



The New England Stormwater Retrofit Manual was developed for the purpose of supporting the implementation of stormwater controls on existing developed sites. Use it to learn more and support your stormwater improvement journey.
Learn More

EXAMPLE OF HOW THIS CAN BE DONE

San Souci and Citizens Bank

Providence, RI

The Woonasquatucket River Watershed Council coordinated a public private partnership between the Rhode Island Department of Transportation and Citizens Bank to provide funding to create stormwater retention areas and reduce impervious area in the bank parking lot and landscaped areas. This site reconfiguration removed 6,000 square feet of impervious area and implemented a bioretention basin to manage stormwater. Through efficient site reconfiguration this retrofit maintained the same number of parking spaces while reducing impervious area and adding in water quality treatment. Learn more here.

Image: Rhode Island Stormwater Innovation Center

Before, Google 2018

After, Google Earth 2023

EXAMPLE OF HOW THIS CAN BE DONE

Farm Fresh Rhode Island

Providence, RI

The Farm Fresh Rhode Island development installed several bioretention areas along with filtration chambers below its parking lot that collect runoff from the entire site. Farm Fresh Rhode Island partnered with the Woonasquatucket River Watershed Council (WRWC) to implement this project and secured funding from several federal resources. While this project was a large redevelopment project, they were implemented in a strategic and cost-effective way. Learn more here.

Image: WRWC

Image: WRWC

Before, Google Earth 2013

After, Google Earth 2023

EXAMPLE OF HOW THIS CAN BE DONE

Berry Brook Watershed

Dover, NH

In Dover, NH two bioretention treatment units and one tree filter were installed at an elementary school in town. Both bioretention basins treat runoff from the school's roof, treating a combined total of 0.14 acres, 0.07 acres each, of impervious surface. One bioretention basin on the southside of the building was specifically designed to prevent roof run off backsplash, which prior to this measure would carry sediment and mulch around the school area to the stormwater system. The tree filter treats runoff from 0.33 acres of impervious area from the school parking lot. Learn more from the UNH Stormwater Center.

BioRetention, Image: University of New Hampshire Stormwater Center

BioRetention, Image: University of New Hampshire Stormwater Center

Tree Filter, Image: University of New Hampshire Stormwater Center

EXAMPLE OF HOW THIS CAN BE DONE

Horgan Skating Rink

Auburn, MA

The Horgan Skating Rink in Auburn, MA is owned by the Department of Conservation and Recreation (DCR) who installed stormwater retrofits on this site. Retrofits included a vegetated infiltration basin to treat runoff from the rooftop along with two leaching basins to treat on-site runoff from the parking lot. These retrofits also prevent flooding of adjacent municipal sports fields. These basins treat 71,800 square feet of impervious area and remove 1.7 lbs of phosphorous per year, helping DCR meet their watershed goals.

Infiltration basin

Leaching basin down grade of parking lot catchbasins

Infiltration basin

Control Measure Descriptions and Resource—Site Operations*

Proper Materials Storage

Materials such as salts, sands, sediments, and other materials related to site activities should be stored inside whenever possible. Storage locations should be inspected to ensure leaks are not present.

Resource 1 | Resource 2 | Resource 3

Fertilizer/Nutrient Management

Adjusting fertilizer type, composition, and application practices to apply only the amount the plants need. Storing fertilizer and other materials to prevent exposure to precipitation.

Resource 1 | Resource 2 | Resource 3 | Resource 4

Structural Treatment Measure Maintenance

Performing routine and non-routine maintenance on structures on a set schedule or after intense storm events. State regulations may dictate maintenance schedules.

Resource 1 | Resource 2 | Resource 3

Organic Waste Management

Collecting and properly disposing of leaf litter and other organic debris from landscaping activities.

Resource 1 | Resource 2

*full web addresses of resources linked below can be found on pages 20 through 23

Control Measure Descriptions and Resource—Site Operations*

Vehicle Wash/Maintenance Containment

Employing best practices such as conducting activities in impervious contained areas and ensuring runoff does not run into waterbodies via closed drainage or other means without treatment. Refraining from washing under carriages engine compartments. Ensuring spill prevention and control measures are in place in maintenance.

Resource 1 | Resource 2 | Resource 3

Trash and Dumpster Management

Maintaining waste areas properly, keeping dumpster lids closed, and performing routine inspection of waste containers for leaks. Ensuring dumpster locations are away from drainage infrastructure and waterways. Using dry methods for any clean-up needed.

Resource 1 | Resource 2

Sweeping

Sweeping parking areas and roadways with mechanical or vacuum sweeper to remove sediment and debris, and therefore pollutants.

Resource 1 | Resource 2

Storm Drain Cleaning

Clearing debris and sediment build up within catch basin sumps and ensuring grates/covers are clear of debris. Best practices are to keep catch basin sumps free of sediment and debris.

Resource 1 | Resource 2

*full web addresses of resources linked below can be found on pages 20 through 23

Control Measure Descriptions and Resources—Site Layout/Disconnection*

Impervious Cover Disconnection

Altering flow patterns so that runoff that normally would flow directly to a receiving water or into a drainage system flows over vegetated surfaces to achieve treatment.

Resource 1

Pavement Removal

Limiting pavement from new designs as well as replacing pavement at existing sites with grass or vegetation.

Resource 1

Vegetation and Buffer Area Management and Enhancement

Maintaining existing vegetation, soil health, and resource buffer areas or improving by introducing new vegetation, improving soil quality, or restoring buffer areas adjacent to waterways.

Resource 1 | Resource 2 | Resource 3

*full web addresses of resources linked below can be found on pages 20 through 23

Control Measure Descriptions and Resources—Structural Treatment[1*]

Surface Ponds

Surface Infiltration[2]

Area that allows runoff to infiltrate and filter through native soils to achieve treatment. The performance of these measures is largely influenced by the soil type.

Resource 1

Rain Garden/Bioretention/Bio Filtration/ Surface Sand Filter

Filtering measures using soil, plants, or sand to hold and treat stormwater before it is discharged. Bioretention and filtration measures rely on soil and vegetation while sand filters utilize sand media.

Resource 1 | Resource 2 | Resource 3 | Resource 4

Gravel Wetland

Wetland cells containing gravel media with soils and planted with wetland vegetation that act as media filters to promote biological processes.

Resource 1 | Resource 2

1 Existing measures pre-existing on-site can be retrofitted to provide additional treatment processes.

2 Infiltration measures may not be readily suitable at sites with soil or groundwater contamination. It is possible that these measures can be applied with proper lining, but further evaluation is necessary.

*full web addresses of resources linked below can be found on pages 20 through 23

Control Measure Descriptions and Resources—Structural Treatment[1*]

Subsurface Structures

Subsurface Sand Filter

Filters that remove sediments and pollutants as water passes through a settling chamber and filter bed.

Resource 1 | Resource 2

Subsurface Infiltration

Subsurface structure allowing runoff to infiltrate into and filter through native soils. These areas are often sited under parking lots.

Resource 1

Leaching Basin/Infiltration Trench

Subsurface perforated structures surrounded by crushed stone or undergound trenches of crushed stone that store runoff and slowly infiltrate it to surrounding soils.

Resource 1 | Resource 2

1 Existing measures pre-existing on-site can be retrofitted to provide additional treatment processes.

*full web addresses of resources linked below can be found on pages 20 through 23

Control Measure Descriptions and Resource*

Other

Permeable Pavement

Porous surface that captures drainage in voids where it is temporarily stored. Runoff captured either ultimately infiltrates into the underlying and soils or can be routed through an underdrain.

Resource 1 | Resource 2

Tree Filters

Areas with planted trees that filter captured runoff.

Resource 1 | Resource 2

Cisterns/Rain Barrels

Containers that collect rooftop runoff for non-potable reuse or slower release. They can be connected directly to downspouts.

Resource 1 | Resource 2

Proprietary Structures

Structures often manufactured by a private company that are designed to settle and separate trash, sediment, and/or oil from runoff as it flows through the device.

Resource 1 | Resource 2

*full web addresses of resources linked below can be found on pages 20 through 23

Control Measure Considerations Matrix

Control Measure	Applicability to Site Areas: Roadways, Driveways and Parking Areas	Rooftop	Loading and Storage Areas[1]	Other Impervious Cover[2]	Landscaping / Vegetated Areas	Costs	Addresses Pollutants	Reduces Localized Flooding?	Co-benefits
Site Operations / Good Housekeeping									
Sweeping	■		■	■		$$	●		
Storm drain cleaning	■		■	■		$$	●	▬	
Leaf litter management	■			■	■	$	●		
Fertilizer/nutrient management					■	$	●		
Vehicle wash/maintenance containment	■		■	■		$	●		
Trash and dumpster management	■		■	■		$	●		
Material storage management	■		■	■	□	$	●		
Existing structural treatment measure maintenance	■	■		■	■	$$	❍	▬	
Site Layout / Disconnection									
Impervious cover disconnection	■	■		■		$	●	▬	
Pavement removal	■		□	■		$	●	▬	
Vegetation and buffer area management and enhancement	■			■	■	$	❍	▬▬	
Structural Treatment [3]									
Surface Ponds and Basins									
Surface infiltration	□	■	□	□	■	$$	●	▬▬	
Rain Garden / Bioretention / Bio Filtration / Sand filter	□	■	□	□	■	$$	●	▬	
Gravel wetland	□	■	□	□	■	$$$	●	▬▬	
Subsurface Structures									
Leaching basin / Infiltration trenches	■	■		■	■	$	●	▬	
Subsurface infiltration chambers	■	■	□	■	■	$$$	●	▬▬	
Subsurface sand filter	■	■	■	■	■	$$$	●	▬	
Other									
Permeable Pavement / Porous gutters	■			■		$$	●	▬	
Tree Filters	■	□		■	■	$	❍	▬	
Cisterns / Rain barrels		■				$$	❍	▬	
Proprietary structures	■	■	■	■	■	$$	●		

[1] Can include loading docks, material storage, fleet storage, and washing / maintenance areas.

[2] Can include walkways, patios and other miscellaneous impervious areas.

[3] In addition to new control measues, existing measures on-site can be retrofitted to provide additional treatment processes.

[4] Modifications could include adding additional infrastructure to route flow to a treatment structure, such as adding curb cuts to allow a parking lot to drain to a basin.

KEY	
■	Readily can provides treatment of area
□	Provides treatment of area with modifications[4]
●	Provides high treatment
❍	Provides moderate treatment
$/$$/$$	Low / Medium / High cost
▬ ▬ ▬	Low / Medium / High impact on flooding
	Temperature regulation
	Aesthetic
	Habitat

Control Measure Resources

Material Storage

Resource 1
https://www.epa.gov/sites/default/files/2021-03/documents/swppp_guide_industrial_2021_030121.pdf

Resource 2
https://www.epa.gov/system/files/documents/2021-11/bmp-deicing-material-application-and-storage.pdf

Resource 3
https://dep.wv.gov/WWE/Programs/stormwater/MS4/guidance/Documents/Manual%208%20Pollution%20Source%20Control%20Practices%202005.pdf#page=139

Fertilizer/Nutrient Management

Resource 1
https://dep.wv.gov/WWE/Programs/stormwater/MS4/guidance/Documents/Manual%208%20Pollution%20Source%20Control%20Practices%202005.pdf#page=159

Resource 2
https://dep.wv.gov/WWE/Programs/stormwater/MS4/guidance/Documents/Manual%208%20Pollution%20Source%20Control%20Practices%202005.pdf#page=163

Resource 3
https://yourcleanwater.org/fertilizer-calculator/

Structural Treatment

Resource 1
https://www.mass.gov/doc/massachusetts-stormwater-handbook-vol-2-ch-2-stormwater-best-management-practices/download

Resource 2
https://www.bwsc.org/sites/default/files/2024-05/Green Infrastructure Maintenance Handbook.pdf

Resource 3
https://storymaps.arcgis.com/stories/049e56ace70b410fae3f29cbb799846d

Organic Waste Management

Resource 1
https://www.usgs.gov/centers/upper-midwest-water-science-center/science/using-leaf-collection-and-street-cleaning-reduce

Resource 2
https://pollutionprevention.virginia.edu/assets/docs/SOP/SOP_DisposalLandscapeOrganicWaste.pdf

Vehicle Wash/Maintenance

Resource 1
https://www.epa.gov/system/files/documents/2021-11/bmp-municipal-vehicle-and-equipment-maintenance.pdf

Resource 1
https://dep.wv.gov/WWE/Programs/stormwater/MS4/guidance/Documents/Manual%208%20Pollution%20Source%20Control%20Practices%202005.pdf#page=125

Resource 1
https://dep.wv.gov/WWE/Programs/stormwater/MS4/guidance/Documents/Manual%208%20Pollution%20Source%20Control%20Practices%202005.pdf#page=131

Trash Management

Resource 1
https://dep.wv.gov/WWE/Programs/stormwater/MS4/guidance/Documents/Manual%208%20Pollution%20Source%20Control%20Practices%202005.pdf#page=147

https://thinkblueconnecticutriver.org/wp-content/uploads/2021/02/Dumpster-for-BoH-One-Pager.pdf

Sweeping

Resource 1
https://www.des.nh.gov/sites/g/files/ehbemt341/files/documents/2020-01/vol2-ch4-sct2.pdf#page=2, https://www.epa.gov/system/files/documents/2021-11/bmp-parking-lot-and-street-sweeping.pdf

Storm Drain Cleaning

Resource 1
https://nepis.epa.gov/Exe/ZyNET.exe/200044BA.TXT?ZyActionD=ZyDocument&Client=EPA&Index=1995+Thru+1999&Docs=&Query=&Time=&EndTime=&SearchMethod=1&TocRestrict=n&Toc=&TocEntry=&QField=&QFieldYear=&QFieldMonth=&QFieldDay=&IntQFieldOp=0&ExtQFieldOp=0&XmlQuery=&File=D%3A%5Czyfiles%5CIndex%20Data%5C95thru99%5CTxt%5C00000015%5C200044BA.txt&User=ANONYMOUS&Password=anonymous&SortMethod=h%7C-&MaximumDocuments=1&FuzzyDegree=0&ImageQuality=r75g8/r75g8/x150y150g16/i425&Display=hpfr&DefSeekPage=x&SearchBack=ZyActionL&Back=ZyActionS&BackDesc=Results%20page&MaximumPages=1&ZyEntry=1&SeekPage=x&ZyPURL

Resource 2
https://megamanual.geosyntec.com/npsmanual/catchbasinmaintenance.aspx

Impervious Cover Disconnection

Resource 1
https://snepnetwork.org/wp-content/uploads/2022/10/SNEP_Stormwater-Retrofit-Manual_Oct-2022-508c.pdf#page=52

Pavement Removal

Resource 1
https://snepnetwork.org/wp-content/uploads/2022/10/SNEP_Stormwater-Retrofit-Manual_Oct-2022-508c.pdf#page=39

Vegetation and Buffer Area Management and Enhancement

Resource 1
https://snepnetwork.org/buffer/

Resource 2
https://greenport.pa.gov/elibrary/GetDocument?docId=7571&DocName=CHAPTER%206.7.1%20BMP%20RIPARIAN%20BUFFER%20RESTORATION.PDF%20%20%3Cspan%20style%3D%22color%3Agreen%3B%22%3E%3C%2Fspan%3E%20%3Cspan%20style%3D%22color%3Ablue%3B%22%3E%3C%2Fspan%3E

Resource 3
https://megamanual.geosyntec.com/npsmanual/soilamendments.aspx

Surface Infiltration

Resource 1
https://snepnetwork.org/wp-content/uploads/2022/10/SNEP_Stormwater-Retrofit-Manual_Oct-2022-508c.pdf

Rain Garden/Bioretention/Bio Filtration/Surface Sand Filter

Resource 1
https://www.mass.gov/doc/massachusetts-stormwater-handbook-vol-2-ch-2-stormwater-best-management-practices/download#page=24

Resource 2
https://snepnetwork.org/wp-content/uploads/2022/10/SNEP_Stormwater-Retrofit-Manual_Oct-2022-508c.pdf#page=75

Resource 3
https://snepnetwork.org/wp-content/uploads/2022/10/SNEP_Stormwater-Retrofit-Manual_Oct-2022-508c.pdf#page=76

Resource 4
https://megamanual.geosyntec.com/npsmanual/bioretentionareasandraingardens.aspx

Gravel Wetland

Resource 1
https://extension.unh.edu/sites/default/files/media/2023-05/nhdot_sgw_02-06-15_final_report.pdf

Resource 2
https://snepnetwork.org/wp-content/uploads/2022/10/SNEP_Stormwater-Retrofit-Manual_Oct-2022-508c.pdf#page=78

Subsurface Sand Filter

Resource 1
https://snepnetwork.org/wp-content/uploads/2022/10/SNEP_Stormwater-Retrofit-Manual_Oct-2022-508c.pdf#page=76

Resource 2
https://www.epa.gov/system/files/documents/2021-11/bmp-sand-and-organic-filters.pdf

Subsurface Infiltration

Resource 1
https://snepnetwork.org/wp-content/uploads/2022/10/SNEP_Stormwater-Retrofit-Manual_Oct-2022-508c.pdf#page=58

Leaching Basin

Resource 1
https://megamanual.geosyntec.com/npsmanual/leachingcatchbasin.aspx

Resource 2
https://snepnetwork.org/wp-content/uploads/2022/10/SNEP_Stormwater-Retrofit-Manual_Oct-2022-508c.pdf#page=66

Permeable Pavement

Resource 1
https://www.epa.gov/soakuptherain/soak-rain-permeable-pavement

Resource 2
https://snepnetwork.org/wp-content/uploads/2022/10/SNEP_Stormwater-Retrofit-Manual_Oct-2022-508c.pdf#page=69

Trees

Resource 1
https://www.epa.gov/sites/default/files/2015-11/documents/stormwater2streettrees.pdf

Resource 2
https://megamanual.geosyntec.com/npsmanual/treeboxfilters.aspx

Cisterns/Rain Barrels

Resource 1
https://snepnetwork.org/wp-content/uploads/2022/10/SNEP_Stormwater-Retrofit-Manual_Oct-2022-508c.pdf#page=57

Resource 2
https://megamanual.geosyntec.com/npsmanual/rainbarrelsandcisterns.aspx

Proprietary Structures

Resource 1
https://www.mass.gov/doc/massachusetts-stormwater-handbook-vol-2-ch-2-stormwater-best-management-practices/download#page=13

Resource 2
https://megamanual.geosyntec.com/npsmanual/proprietaryseparators.aspx

The Southeast New England Program (SNEP) Network brings together local environmental organizations, academic institutions, regional planners, and consultants who collaborate to provide municipalities, tribes and organizations in Rhode Island and Southeast Massachusetts access to free training and technical assistance to advance stormwater management, ecological restoration, and sustainable financing goals across the region. The SNEP Network is administered through EPA's partnership with the New England Environmental Finance Center, a non-profit technical assistance provider for EPA Region 1.

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