STORMWATER BEST MANAGEMENT PRACTICES

Guidance Manual for use in Multi-Unit Residential Areas

EASTERN CONNECTICUT CONSERVATION DISTRICT

2024

Photo Credit: Heather Palardy 2022
Quanaduck Cove Condos, Stonington, CT

Stormwater Best Management Practices Guidance Manual for use in Multi-Unit Residential Areas

August 2024

Prepared By:
Eastern CT Conservation District, Inc. (ECCD)

Funded by:
This project has been funded wholly or in part by the United States Environmental Protection Agency under assistance agreement LI-00A01075 to National Fish and Wildlife Foundation

Project Location:
Quanaduck Cove Condo Association, Stonington CT

Project Title/Description:
This manual was developed for the project *Improving Water Quality through Green Infrastructure in Quanaduck Cove and Long Island Sound (CT)*. It is aimed at implementing Stormwater Management Green Infrastructure Best Management Practices. The goal of the project is to mitigate the impact of stormwater runoff on water quality and the environment within Stonington Harbor and Long Island Sound from the Condo Complex. This guidance manual is intended for use by community associations within the Long Island Sound watershed.

Acknowledgments:
Eastern CT Conservation District extends gratitude to EPA, National Fish and Wildlife Foundation - Long Island Sound Futures Fund for funding this project, and to the Quanaduck Cove Condo Association for its collaboration on sustainable stormwater management practices. Special thanks to Judith Rondeau, a former Eastern CT Conservation District employee, for her vision and dedication to Long Island Sound preservation, which inspired this project. Thanks also to the students at Grasso Tech HS in Groton CT, and their Instructors Jimmy Moran and Thuan Huynh, for their contribution to designing the innovative downspout planters. Gratitude is also owed to ECCD staff: Heather Palardy for writing and designing this manual; Dan Mullins, Jean Pillo, Paul Burgess, Lindsay Beutler, and Maura Robie for their support and involvement.

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Introduction

This manual was created with the primary purpose of showing how stormwater management practices can be incorporated into the landscape to reduce the impact of dense residential development on water quality and the environment. This manual is for residents and associations and serves as an informational and educational resource to manage stormwater from impervious areas. Stormwater Best Management Practices (BMPs) with Low Impact Development (LID) systems utilize practices that create or mimic the natural processes that result in infiltration, evapotranspiration, or use of stormwater water in order to protect water quality and associated watersheds.

LID systems are alternative site design strategies using natural and engineered infiltration and storage techniques to control stormwater water where it is generated. LID combines conservation practices with distributed stormwater water source controls and pollution prevention.

Stormwater runoff, when not properly controlled and treated, carries pollutants from land surfaces and roadways into water bodies, such as Long Island Sound, rivers, streams, ponds, and drinking water aquifers. This stormwater threatens the public health, aquatic ecosystems, as well as recreational and aesthetic resources.

Proper stormwater management, including the use of LID techniques, is needed in order to protect these critical resource areas.

As we continue to develop our land and increase the amount of paved surfaces and buildings, known as impervious surface cover, the water cycle is changed.

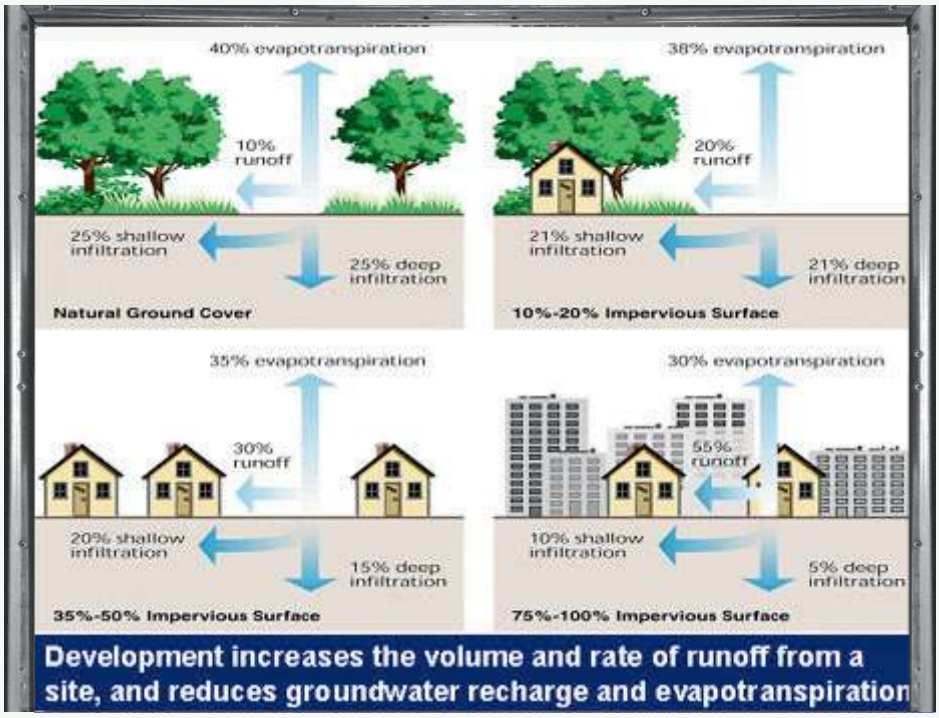


Illustration Credit: EPA Watershed Academy Web 2023

Less rainfall and snowmelt will sink into the ground and more water flows rapidly over the land into the surrounding estuaries, lakes, and rivers. Stormwater runoff can lead to increased flooding, erosion, pollution, and decreased groundwater recharge during dry periods. Stormwater is recognized nationally as the leading cause of water pollution today. With this manual you can take the steps to help manage stormwater runoff.

Definitions

Stormwater Management Terms & Definitions

Best Management Practices (BMPs): Activities or structural improvements that help reduce the quantity and improve the quality of stormwater runoff. BMPs include treatment requirements, operating procedures, and practices to control site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

Clean Water Act: Legislation that provides statutory authority establishes the structure for regulating discharges of pollutants into waters of the United States, which is Public law 92-500; 33U.S.C. 1251 et seq. Also known as the Federal Water Pollution Control Act.

Drinking Water: Water treated or untreated, which is intended for human use and consumption and considered to be free of harmful chemicals and disease-causing bacteria, cysts, viruses, or other microorganisms.

Environmental Protection Agency (EPA): The mission of the Environmental Protection Agency is to protect human health and the environment. Since 1970, EPA has been working for a cleaner, healthier environment for the American people. http://www.epa.gov/epahome/aboutepa.htm

Erosion: Transport of soil particles by wind and water. Often the eroded debris (silt or sediment) becomes a pollutant via stormwater runoff. Erosion occurs naturally but can be intensified by human activities such as farming, development, road-building, and timber harvesting.

Green Infrastructure: Uses existing natural areas (and engineered solutions that mimic natural processes) to minimize runoff, erosion, and flooding. Other benefits include the increased recreational opportunities and wildlife habitat, as well as cleaner water.

Ground Water: Water that flows below the ground surface through saturated soil, glacial deposits, or rock.

Household Hazardous Materials: Common everyday products that people use in and around their homes including paint, paint thinner, herbicides, and pesticides-that, due to their chemical nature, can be hazardous if not properly disposed.

Impervious Surface or Cover: The characteristic of a material which prevents the infiltration or passage of liquid through it. This may apply to roads, streets, parking lots, rooftops, and sidewalks.

Low Impact Development: (LID) refers to systems and practices that use or mimic natural processes that result in the infiltration, evapotranspiration, or use of stormwater in order to protect water quality and associated aquatic habitat.

Definitions

National Pollutant Discharge Elimination System (NPDES): Established by Section 402 of the Clean Water Act, this federally mandated system is used for regulating point source and stormwater discharges.

Natural Filter: A grassed, wooded, or vegetative strip that acts as a filter for the runoff before the water enters a stream.

Non-Point Source Pollution: Pollutants from many different sources. Nonpoint-source pollution is caused by rainfall or snowmelt moving over and through the ground. As the runoff moves, it picks up and carries away natural and human-made pollutants, finally depositing them into lakes, rivers, wetlands, coastal waters, and even underground sources of drinking water.

Nutrients: A substance that provides food or nourishment, such as usable proteins, vitamins, minerals, or carbohydrates. Fertilizers, particularly phosphorus and nitrogen, are the most common nutrients that contribute to eutrophication.

Pathogens: Microorganisms that can cause disease in other organisms or in humans, animals, and plants. They may be bacteria, viruses, or parasites and are found in sewage, in runoff from animal farms or rural areas populated with domestic and/or wild animals, and in water used for swimming. Fish and shellfish contaminated by pathogens, or the contaminated water itself, can cause serious illnesses.

Point Source Pollution: Pollutants from a single, identifiable source such as a factory or refinery, or a failed septic system with surface outbreak; also called single-point-source pollution. Most of this pollution is highly regulated at the state and local levels.

Pollutants: A contaminant existing at a concentration high enough to endanger the environment or public health or to be otherwise objectionable.

Stormwater Pollution: Water from rain, irrigation, garden hoses or other activities that picks up pollutants (cigarette butts, trash, automotive fluids, used oil, paint, fertilizers and pesticides, lawn and garden clippings and pet waste) from streets, parking lots, driveways and yards and carries them through the stormwater drain system and straight to the ocean. Also included are oils, grease, and metals.

Runoff: Refers to the portion of precipitation within a drainage area that flows out through stream channels. It encompasses various types such as surface runoff, groundwater runoff, or seepage. It represents drainage or flood discharge exiting an area either as surface flow or through pipelines.

Definitions

Sanitary Sewer (Different from the Stormwater Sewer System): A system of underground pipes that carries sanitary waste or process wastewater to a treatment plant.

Stormwater Drain System: Extensive underground conduits for flood control, diverting water to any water body, including infiltration into the ground, ultimately reaching a water body.

Sediment: Solid material, both mineral and organic, that is being transported or has been moved from its site of origin by air, water, gravity, or ice and has come to rest on the earth's surface either above or below sea level. Soil, sand, and minerals washed from land into water, usually after rain. Sediment can destroy fish-nesting areas, adversely impact animal habitats, and cloud waters so that sunlight does not reach aquatic plants.

Stormwater Drain: An opening leading to an underground pipe or open ditch for carrying surface runoff, separate from the sanitary sewer or wastewater system.

Stormwater: Precipitation that accumulates in natural and/or constructed storage and Stormwater systems during and immediately following a stormwater event.

Stream: A body of water, confined within a bed and banks and having a detectable current. Stream is the umbrella term used in the scientific community for all flowing natural waters. In a river or stream, the water is influenced by gravity and flows downhill to reduce its potential energy. The movement of water in a stream is called the current and varies from place to place and time to time dependent upon the volume of water, the slope, and shape and other characteristics of the bed. Additionally, there are intermittent streams that flow only after rainfall or during seasonal high groundwater levels.

Water (Hydrologic) Cycle: The flow and distribution of water from the sky, to the Earth's surface, through various routes on or in the Earth, and back to the atmosphere. The main components are precipitation, infiltration, evapotranspiration, surface runoff, channel and depression storage, and groundwater.

Definitions

Water Quality: Water is essential to human life and to the health of the environment. As a valuable natural resource, it comprises marine, estuarine, freshwater (river and lakes) and groundwater environments, across coastal and inland areas. Water has two dimensions that are closely linked - quantity and quality. Water quality is commonly defined by its physical, chemical, biological, and aesthetic (appearance and smell) characteristics. A healthy environment is one in which the water quality supports a rich and varied community of organisms and protects public health. Water quality in a body of water influences the way in which communities use the water for activities such as drinking, swimming or commercial purposes. More specifically, the water may be used by the community for:

1. Supplying Drinking Water
2. Recreation (swimming, boating)
3. Irrigating Crops and Watering Stock
4. Industrial Processes
5. Navigation and Shipping
6. Production of Edible Fish, Shellfish, and Crustaceans
7. Protection of Aquatic Ecosystems
8. Wildlife Habitats
9. Scientific Study and Education

Watershed: Geographical area that drains to a specified point on a water course, usually a confluence of streams or rivers, can also be known as drainage area, catchments, or a river basin.

Wetland: An area that is inundated or saturated by surface water or groundwater at a frequency, duration, and depth sufficient to support a predominance of emergent plant species adapted to growth in saturated soil conditions.

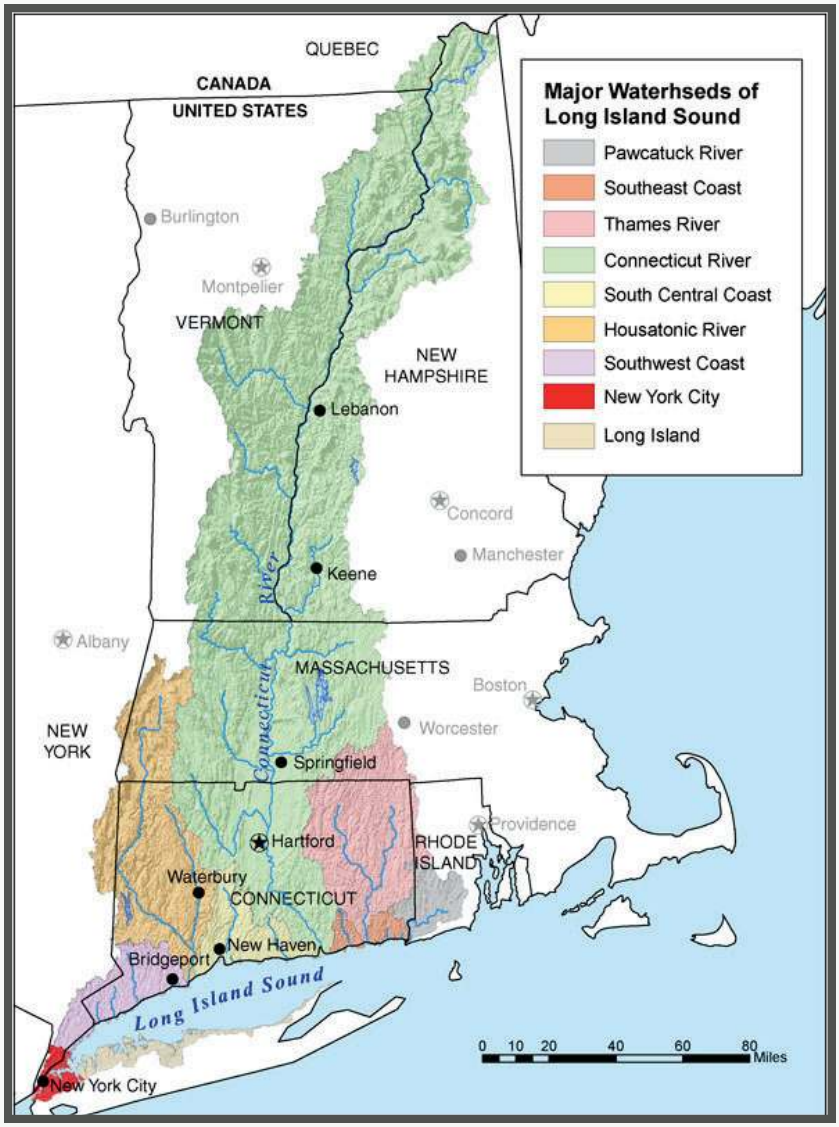


Illustration Credit: AmericanRivers.org

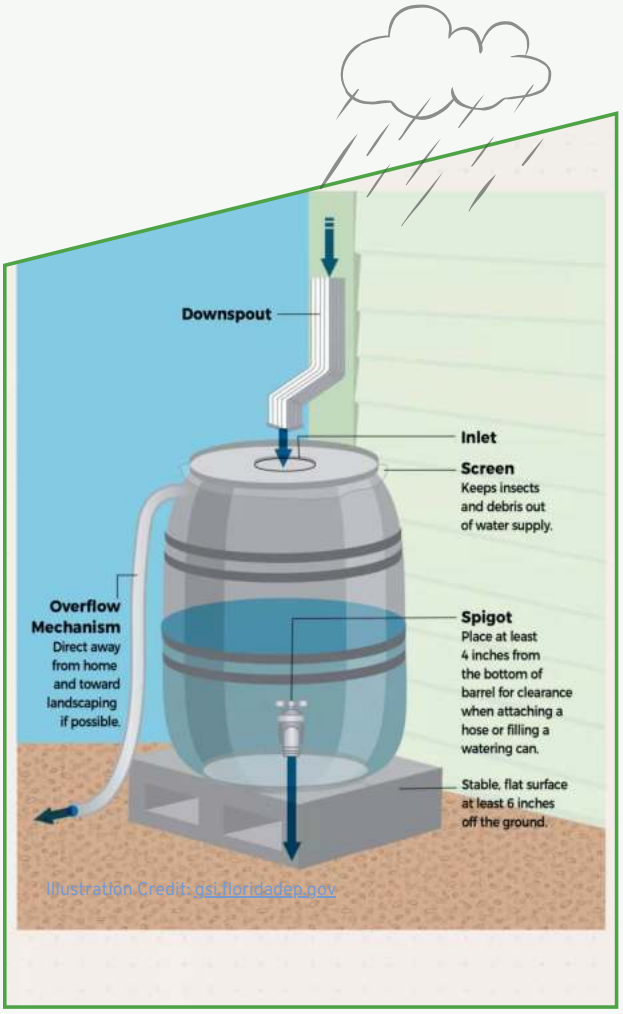
The Watershed of Long Island Sound

Rain Barrels

Rain barrels are specially designed containers that hold an average of 50 gallons of water. They are a low-cost stormwater water collection device that can easily connect to your roof downspout and store the water for later use. Using the rainwater for watering plants or washing your car can lower your water bill and decrease demand during times of drought.

Diverting stormwater water from your roof into a rain barrel reduces the amount of pollutants being discharged into stormwater sewers that empty into nearby streams, rivers, and lakes. This collection helps control local flooding, protects rivers and streams from erosion, recharges local groundwater resources, keeps pollutants from paved areas that would otherwise enter waterways, and helps reduce the need for sewer upgrades in combined sewer overflow communities.

Under parking lot cisterns are like huge rain barrels to store stormwater. They are commonly used in tight spaces under parking lots (Ferguson Waterworks).



Some things to consider:

- rain barrels should be placed on raised level surface,
- kept clean/free from mosquitos by covering with a screen or lid,
- outflow should rather be directed away from the foundation,
- disconnect and empty barrel during winter,
- store barrel upside down,
- paint your barrel to personalize and match the surrounding landscape,
- do not use the water for drinking, bathing, for yourself or pets,
- do not use on vegetables or other edible plantings.

Installing a rain barrel is a simple and easy way to save money and conserve water, with the added benefits of reducing stormwater runoff and improving water quality for all.

Downspout Planters

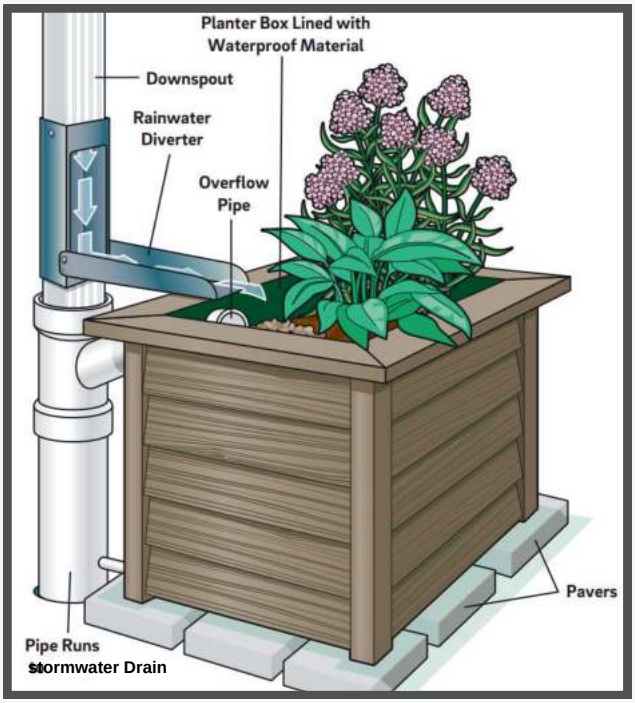


Illustration Credit: Philadelphia Water Department

A downspout planter works similarly to the way that rain barrels work. Connected to the roof gutter system, downspout planters allow stormwater from the downspout to flow through and be absorbed by vegetation storing the runoff and filtering the sediment and pollutants. They can be different types of structures or materials, with open bottoms; all planters will contain a layer of gravel, soil, filter fabric, non-permeable liner and vegetation with enough space for a bit of ponding at the top.

Photo Credit: Laura Hopkins Quanaduck Cove Condos, Stonington 2024

Find planter box designs here:
https://www.pwdraincheck.org/en/contractor-documents

Common places for the planters are urban areas adjacent to buildings. They are aesthetically pleasing and generally take up a small footprint with a simple design. The pollutants it specifically targets are nutrients, metals, bacteria, sediment, debris, oil, and grease. For this reason, it is important to not use edible plants in the planter boxes.

Pollutant Removal Efficiencies:

- 30-50 % Total Nitrogen Reduction
- 30-90 % Total Phosphorous Reduction
- 40-90 % Metals Reduction

megamanual.geosyntec.com

Some maintenance is required such as removal of weeds, checking drainage after rainfall, assuring all openings(entry and exits) are free of debris, removal of dead vegetation in fall. For information on how to design and construct your own downspout planter box visit pwdraincheck.org/en/contractor-documents and click on downspout planter fabrication.

Photo Credit: Philadelphia Water Department

Rain Gardens

Rain gardens, also referred to as bio-filters or bio-retention areas, are bowl-shaped garden beds featuring native perennials and shrubs known for their water and drought tolerance.

They effectively gather runoff from impermeable surfaces like driveways or rooftops, allowing it to infiltrate into the soil. These gardens treat the initial runoff, which is often the most contaminated, while any excess water drains out. By design, rain gardens capture the first inch to inch and a half of water during a stormwater and gradually release it into the ground, bypassing the stormwater system.

These rain gardens do a great job of picking up contaminants that are left by our everyday activities like lawn fertilizers and pesticides; oil, gas and heavy metals from our vehicles; viruses and bacteria in animal droppings, as well as sediment.

Without intervention, these contaminants eventually find their way into nearby ponds and streams, where they can harm wildlife and make the water unsafe for drinking and swimming. Rain gardens also attract pollinators like birds, butterflies, and bees.

Photo Credit: Heather Palardy, Groton Public Library 2024

Photo Credit: Heather Palardy, Groton Public Library 2022

Some things to consider:

- The water that collects in the rain garden should infiltrate within 36 hours after a stormwater.
- An average residential rain garden costs between 3-5 dollars per square foot.
- A rain garden requires no more effort to maintain than a regular garden bed.

Photo Credit: Heather Palardy, Groton CT 2024

Rain Gardens

In Eastern Connecticut, there are several native plants that can support pollinators in a rain garden. Here are some examples:

Eastern Purple Coneflower (Echinacea purpurea): Perennial flower attracts various pollinators, including bees and butterflies.

Black-eyed Susan (Rudbeckia hirta): Bright yellow petals and a dark center, it provides nectar for bees and butterflies.

New England Aster (Symphyotrichum novae-angliae): Purple flower blooms in late summer and attracts lots of pollinators.

Swamp Milkweed (Asclepias incarnata): As a host plant for monarch butterflies, this perennial flower is essential for their life cycle.

Virginia Sweetspire (Itea virginica): With fragrant white flowers, it attracts bees, butterflies, and other insects. It also provides some fall color with its leaves.

Blue Wild Indigo (Baptisia australis): This native perennial features spiky blue flowers that attract bumblebees and other pollinators.

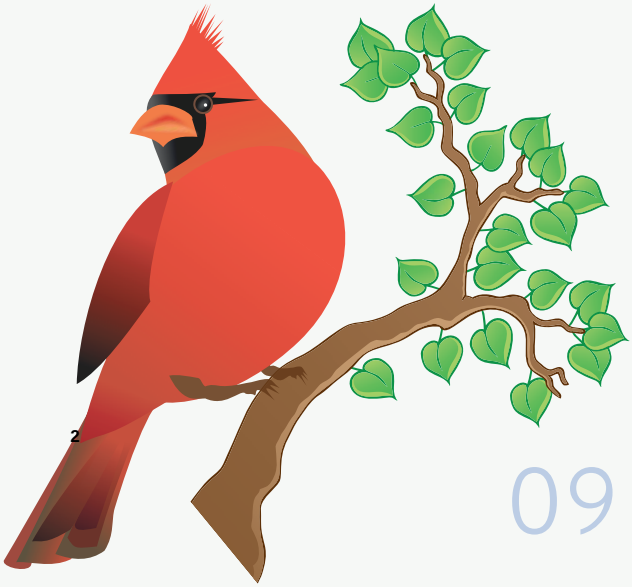
Joe-Pye Weed (Eutrochium purpureum): This tall, pinkish-purple flower provides nectar for butterflies, bees, and other beneficial insects.

Swamp Rose Mallow (Hibiscus moscheutos): This showy, large flower attracts hummingbirds, bees, and butterflies, and thrives in wet areas.

Photo Credit: Heather Palardy Groton Public Library, CT 2022

Choose plants suitable for your rain garden's conditions, considering soil type, sun exposure, and moisture levels. Incorporate a variety of bloom times and heights for sustained nectar and pollen sources.

Maintenance for the first two years involves clearing debris and weeds to allow native plants to establish. Afterwards, maintain by pruning and replenishing mulch as needed.



Rain Gardens

Steps for a rain garden

1. Must be 10' from foundation and 50' from septic system.

2. Dig a hole 6-12 inches deep and fill it with water. If water remains after 24 hours, the site is not suitable for a rain garden.

3. It should be able to retain and infiltrate the first 1.3" of runoff from the area that drains to it. Calculate the area to be collected from (roof or driveway), multiply by 1.3 and then divide by 6 for a rain garden that will be 6 inches deep.

4. Use the toll-free CT Call Before You Dig service (1-800-922-4455).

5. Dig about 8 inches deep, create a flat area in the center of your bowl shape to have an area for the water to collect then tapering up and out.

6. Dig holes for plants twice as wide as their root structure, deep enough for the soil in the pot to align with the garden's surface. Amend soil and loosen root-bound plants before planting, mulch with 2-3 inches, avoiding proximity to plant bases. Water immediately after planting and weekly until established, aiming for one inch per week unless it rains (CT SW Manual, EPA).

Photo Credit: Heather Palardy
Butterfly Weed, Asclepias tuberosa

Vegetative Buffers

Vegetive buffers are strips of vegetation such as trees, shrubs, or grasses planted next to waterbodies like streams, ponds, lakes, and rivers. The vegetation adjacent to streams creates space between the water and upland land development and uses. The total width of a completely functional buffer will range between 35 and 150 feet (CT Conservation District).

Photo Credit: Heather Palardy Quanaduck Cove Condos, Stonington, CT 2023

Benefits of Buffers

Buffer zones create a space where rainwater can seep into the ground, replenishing the groundwater. They reduce the speed of stormwater, aiding in the filtration of sediment, reducing soil erosion, and preventing streambank collapse (EPA). Additional benefits include the filtration of nutrients and pollutants, erosion and sediment control, streambank stabilization and shade for streams, reduced impact from floods, and providing habitat and food for wildlife and pollinators.

Other factors to consider:

Preserve existing vegetation, especially on steep slopes, and maintain shallow slopes for optimal plant growth. Avoid compacted soil and use a variety of native plants like grass, shrubs, and trees. Regular maintenance, including weed and pest control, mowing, fertilizing, and pruning, is essential to keep the plants healthy. Inspections should be done after heavy rainfall and at least once a year to check for encroachment, erosion, plant density, and damage.

The effectiveness of vegetation buffers depends on factors like buffer width, slope, plant types, soil condition, and location. Establishing a vegetated buffer can be affordable if there is enough space to preserve existing vegetation. Costs include clearing the area, acquiring plants or seeds, and ongoing maintenance.

Planning and Design

1. **Assess the Site**: considering soil types, topography, existing vegetation, and potential pollutant sources. Develop a buffer zone plan, including dimensions, plant species, and design elements. Consider existing natural areas and plan for future ones on a site map. Contact your local inland and wetland agency to obtain the necessary permits.
2. **Site Preparation:**

Clear unwanted vegetation and debris. Prepare the soil by removing weeds and loosening it for optimal root growth. Mark the boundaries to avoid damaging important vegetation areas.

Vegetative Buffers

Planning and Design Continued

3. Plant Selection:

Choose native plant species suitable for the specific soil and hydrological conditions. Consider the desired functions of the buffer, such as filtration, erosion control, and habitat creation.

4. Planting:

Follow planting guidelines for each species, including proper spacing and depth. Water the plants adequately after planting to promote establishment. Use sediment traps or check dams to control water flow and level spreaders to distribute water evenly, avoiding strong, concentrated flows.

Photo Credit: Heather Palardy Quanaduck Cove Condos, Stonington, CT 2023

5. Maintenance:

Regularly monitor the buffer zone for maintenance needs, including watering during dry periods, controlling weeds, and pruning or replacing plants as necessary. Ongoing maintenance is crucial to ensure the buffer's effectiveness and longevity.

Native Shrubs and Bushes ideal for Buffers in Eastern Connecticut :

Blueberries (Vaccinium spp.): Attracts pollinators such as bees and butterflies with beautiful fall foliage.

Inkberry (Ilex glabra): Evergreen produces small, black berries that attract birds and provides food and shelter for wildlife.

Red Chokeberry (Aronia arbutifolia): Produces clusters of white flowers in spring, followed by bright red berries in late summer, attracting birds and butterflies.

Black Chokeberry (Aronia melanocarpa): Like red chokeberry, white flowers, and dark purple berries.

Serviceberry (Amelanchier spp.): White flowers in spring, followed by edible berries attracting birds and providing nesting sites.

Elderberry (Sambucus spp.): Clusters of white flowers in spring, followed by dark purple berries. Attracts birds and butterflies and are a valuable food source.

Viburnums (Viburnum spp.): Produce attractive flowers and fruits that attract birds, butterflies, and other pollinators.

For more information on:

- Native plantings visit-https://nenativeplants.psla.uconn.edu/native-plants/
- Installation visit- https://seagrant.uconn.edu/wp-content/uploads/sites/1985/2022/01/RiparianBufferBooklet.pdf

Bioretention Basins and Tree Filters

Bioretention practices and tree filters are nature-inspired solutions for cleaning up urban water. These systems function like giant sponges, absorbing rainwater and removing pollutants from surfaces like roads and rooftops before they reach larger stormwater sewer systems (EPA).

Design considerations for these systems encompass factors such as drainage area size, slope, soil quality, and groundwater levels. Engineers tailor designs to either facilitate water infiltration into the ground and/or focus on purification.

Find Tree Filter Boxes here:
https://www.terrehill.com/stormwater/terre-tree-filter

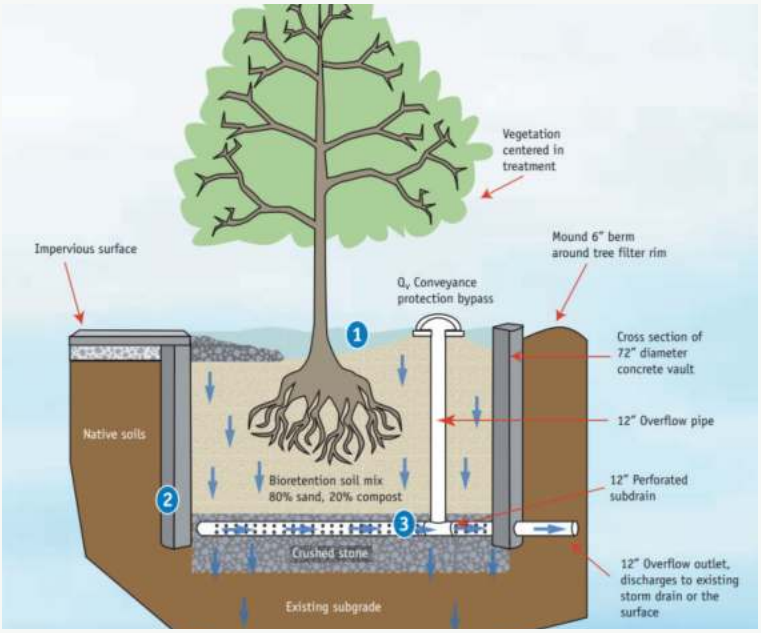


Image Credit: University of New Hampshire, stormwater Center 2009 Biannual Report. p.22

Routine maintenance involves trimming vegetation and grass, checking for clogs, and inspecting water outlets. Key issues to address include sediment clogging inlets and debris accumulation on the tree filter surface. Despite their initial cost, bioretention practices and tree filters effectively slow water flow and reduce contaminants during smaller storms, aiding in flood reduction and long-term cost savings by curbing pollution and minimizing flooding risks.

Multi-residential properties often choose tree box filters for their compact design and effective stormwater management in limited spaces. These filters fit seamlessly into urban environments, offering high water quality treatment while integrating well with existing landscaping (UNHSC).

Photo Credit: Heather Palardy

Bioretention Basin Chase Bank Groton, CT 2023

Installing tree box filters requires obtaining the necessary permits from local regulatory agencies and enlisting a construction team to ensure proper setup.

Their ability to handle runoff efficiently and blend with urban aesthetics makes them a practical choice for managing stormwater in dense residential areas.

Bioretention Basins

How to Create a Bioretention Basin

Creating a bioretention basin involves several steps to manage stormwater runoff effectively. Here's a simplified guide based on Hydrology Studio's recommendations.

1. Site Assessment and Planning:
Choose a location where runoff is common, like near parking lots or roads. Test the soil to ensure it absorbs water well, like with a rain garden.

2. Design:
Define the basin's shape and size, using contours or trapezoids. Select plants that can thrive in both wet and dry conditions. Add drainage features like perforated pipes and overflow weirs to manage excess water.

3. Permitting:
Contact local planning and environmental agencies to get the necessary permits and submit your design plans.

4. Construction:
Excavate the area and prepare the soil by adding gravel, sand, and a special soil mix. Plant the selected vegetation and apply mulch to keep moisture in and prevent erosion.

5. Maintenance:
Regularly inspect the basin for erosion, sediment buildup, and plant health. Manage vegetation by trimming and removing invasive species. Clear sediment and debris from inlets and the basin surface.

6. Forebay Use:
Consider adding a forebay to capture the initial runoff before it enters the main basin. This can be a separate small pond or part of the main design.

By following these steps, you can effectively design and implement a bioretention basin that helps manage stormwater, improve water quality, and enhance urban green spaces.

Photo Credit: Heather Palardy

Bioretention Basin North Stonington, CT 2024

Green Roofs

Green roofs are an effective LID technique designed to manage stormwater runoff by mimicking natural water processes. They consist of layers of vegetation and soil that absorb rainwater, which is then returned to the atmosphere through evaporation and transpiration. This system helps to mitigate water pollution by filtering out harmful metals and sediments, improves water quality, and reduces the impact of stormwater runoff on local rivers and streams.

In addition to water management, green roofs offer several benefits:

- Reduced Flooding: By capturing and slowing down stormwater, green roofs help to minimize local flooding.
- Lower Sewer Costs: They reduce the volume of stormwater entering sewer systems, potentially decreasing the need for expensive sewer upgrades.
- Energy Efficiency: Green roofs provide natural insulation, which lowers heating and cooling costs, and helps to mitigate the urban heat island effect.
- Environmental Impact: They improve air quality, provide habitat for wildlife, and enhance public spaces.

Green roofs come in two main types:

- Extensive Green Roofs: These have shallower soil and are lighter, making them suitable for retrofit projects and sloped roofs. They typically support low-growing plants such as sedums and grasses.
- Intensive Green Roofs: These have deeper soil layers, allowing for a wider range of plant species, including shrubs and small trees. They are often used on flat roofs and may include public-access areas.

While the initial cost of installing a green roof can be higher than traditional roofing, the long-term savings from reduced energy use and stormwater management can offset these costs. Maintenance involves regular inspections and minor upkeep, such as weeding and watering, but green roofs are generally low-maintenance due to their hardy plant selections.

For more detailed guidance, consult the "Rainfall as a Resource: A Resident's Guide to Green Roofs in Connecticut" by the CT DEEP.

Permeable Pavers

Permeable pavers, like pervious concrete and pervious asphalt, are designed to allow water to infiltrate through the surface and into the ground. These pavers have compositions similar to traditional pavement but with gaps or voids that enable water drainage. They are commonly used in various residential and commercial applications, including driveways, walkways, patios, sidewalks, pool areas, and parking lots.

Permeable pavers offer several benefits. They aid in stormwater management by reducing runoff. Additionally, they filter some pollutants especially from vehicles like oil and brake dust, improving water quality. Moreover, they contribute to groundwater recharge by facilitating water infiltration, supporting sustainable water supply. Permeable pavers can help mitigate erosion and protect water bodies from damage. While they may slightly reduce the strain on sanitary sewer systems, especially during lighter rainfall, they are not effective for high-intensity rainfalls as they primarily manage initial runoff rather than infiltrate significant amounts of water.

Professional installation is recommended for permeable pavers to ensure proper functioning. Regular maintenance, such as vacuuming to remove debris and sediments from the gaps, is essential to maximize their water quality benefits.

While the initial costs of installing permeable pavers may be higher than traditional pavements, they offer long-term savings by reducing the need for additional stormwater management infrastructure (CT DEEP).

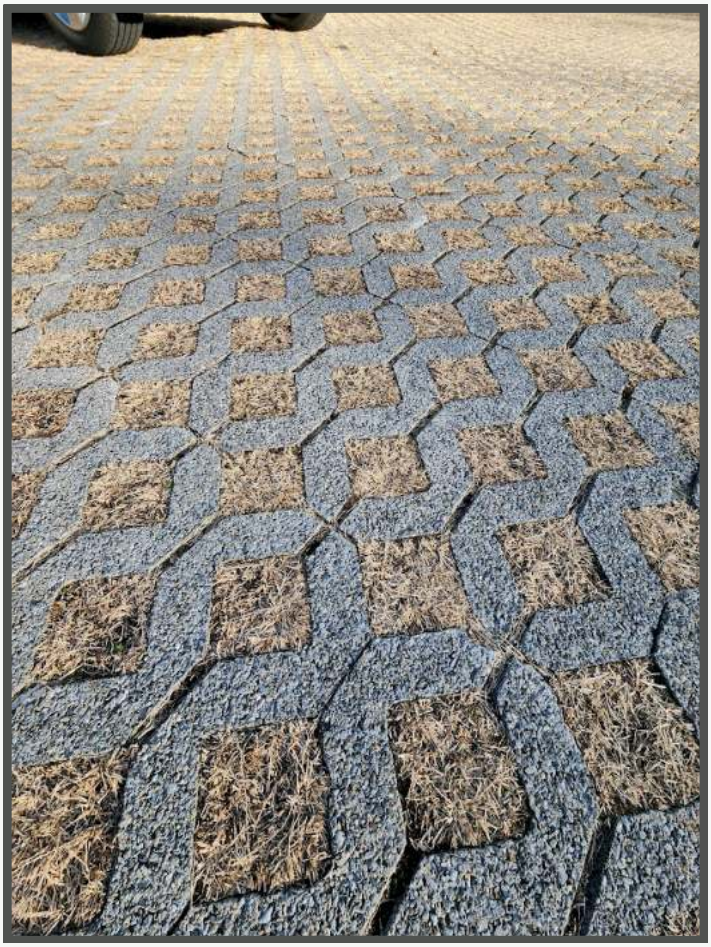


Photo Credit: Heather Palardy Great Neck School Waterford, CT

Find the same type of pavers above here:
https://paveroutlet.com/belgard-turfstone-permeable-pavers

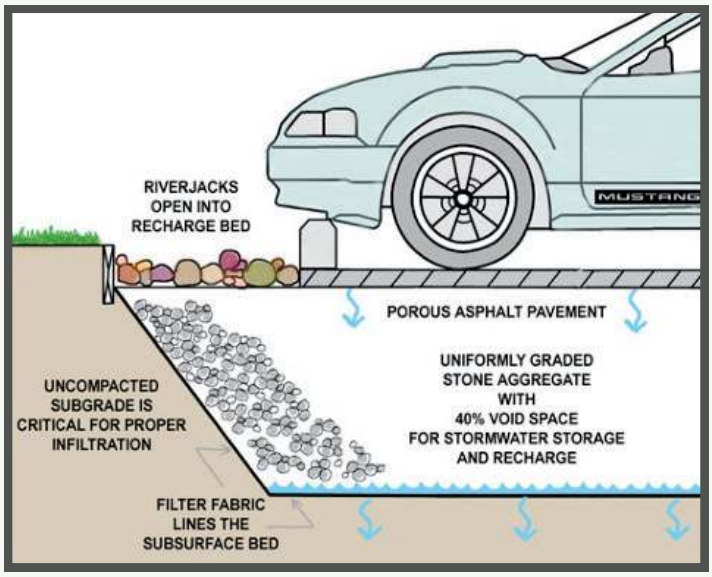
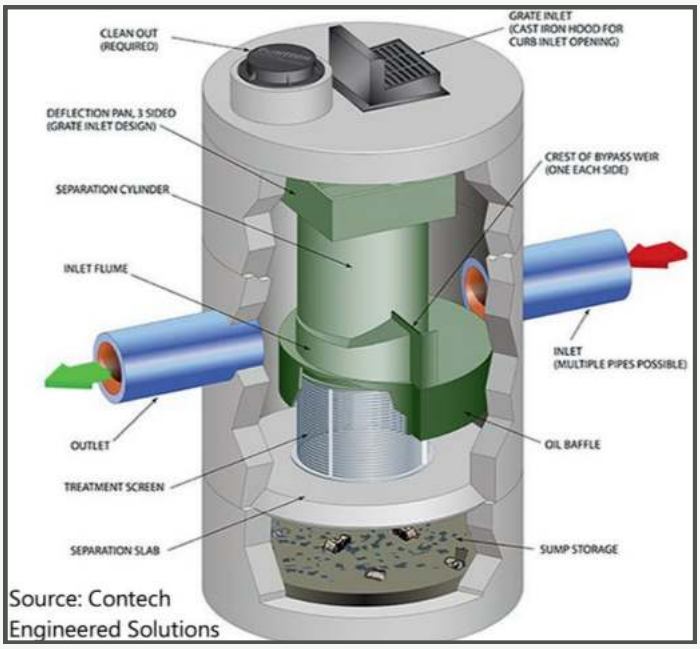


Illustration Credit: Cahill Associates (CT DEEP)

Hydrodynamic Separators

Hydrodynamic separators are a type of proprietary stormwater BMP that effectively removes pollutants from runoff using settling and filtration mechanisms. These systems utilize the principles of fluid dynamics to separate pollutants such as sediment, debris, oil, and grease from stormwater runoff before it enters receiving waters.

Engineers play a critical role in evaluating site conditions, drainage characteristics, and regulatory requirements to determine the suitability of hydrodynamic separators for specific stormwater management needs. They consider factors such as land use requirements, underground features, and the acceptance of runoff from high-pollutant load watersheds when siting these devices. Additionally, engineers assess limitations such as bedrock depth, presence of utilities, and unstable subsurface conditions to ensure proper installation and functionality of hydrodynamic separators.



Hydrodynamic Separator

CT DEEP: Watershed Response Plan Hole in the Wall Beach Niantic, CT

Find Separators here:
https://www.conteches.com/stormwater-management/hydrodynamic-separation/cds/

Design recommendations for hydrodynamic separators emphasize adherence to manufacturer specifications, including appropriate sizing and configuration for effective pollutant removal. Accessibility for maintenance and considerations for vehicular loading and tailwater effects are also essential design considerations.

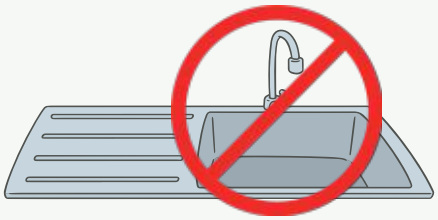
Hydrodynamic separators are typically used for pretreating runoff from small impervious drainage areas, removing a significant portion of Total Suspended Solids (TSS) to qualify for pretreatment applications. Regular maintenance, including periodic inspections, cleaning, and disposal of accumulated pollutants, is crucial to ensure optimal performance and compliance with regulations. Inspection frequencies, cleaning procedures, and disposal methods should be in accordance with manufacturer guidelines and environmental regulations. Proper maintenance practices help prevent system failures and ensure continued pollutant removal efficiency.

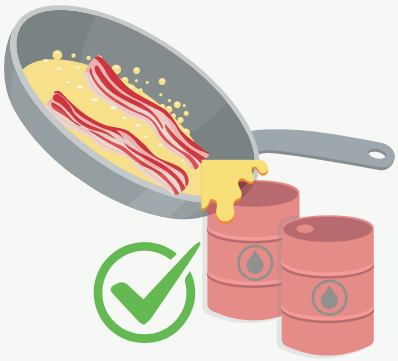
For more information, please visit CT DEEP Connecticut Stormwater Quality Manual.

Pet Waste and FROG

Pet Waste Etiquette:

Proper disposal of pet waste is crucial for maintaining clean and healthy environments. The EPA recommends promptly collecting pet waste and disposing of it in designated bins, particularly in areas such as parks and sidewalks where people and animals frequent. Failure to dispose of pet waste properly can lead to water contamination, posing risks to public health and the environment. By adhering to pet waste etiquette, individuals can contribute to cleaner and safer outdoor spaces for everyone to enjoy.





Parking Lot:

Effective parking lot housekeeping is essential for environmental protection and public safety. Regular sweeping to remove excess sand, salt, and litter prevents debris from entering stormwater drains, which can lead to water pollution. Routine maintenance, including cleaning and inspections, helps manage pollutants like oil stains and trash. Installing **stormwater drain filters** can intercept petrochemical spills before they reach waterways (Water Pollution Solutions).

By following these housekeeping practices, property managers and owners can ensure proper waste disposal, promptly address spills, and maintain a cleaner environment, better water quality, and a safer parking lot.

FROG (Fats, Rags, Oils, and Grease) Disposal:

The proper disposal of fats, rags, oils, and grease (FROG) is a significant concern for environmental protection. It is essential for protecting the environment and maintaining functional sewer systems. Disposing of FROG by pouring it down sinks or toilets can lead to severe blockages and environmental damage.

Additionally, sanitation wipes (including diaper wipes) and rags should never be flushed or disposed of down drains, as they do not break down and can significantly contribute to clogs. The EPA recommends collecting FROG in sealed containers and either recycling or taking it to designated disposal facilities. By avoiding the disposal of non-flushable items in drains and following proper disposal methods for FROG, individuals can help prevent sewer blockages and protect water quality.

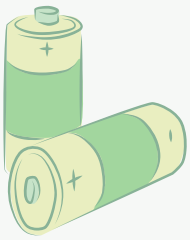
Dumpster Etiquette

Dumpster Etiquette:

Maintaining proper dumpster etiquette is essential for ensuring cleanliness and preventing environmental hazards. Keeping dumpster lids closed is crucial to avoid littering and deter wildlife from accessing the contents.

An overfilled dumpster can lead to spills and contamination, posing risks to public health and the environment. To manage waste effectively, it is important to avoid overloading the dumpster and to properly sort waste.

Installing dumpster pads is a key practice in managing waste. These concrete or solid surface pads provide a stable base for dumpsters and prevent contamination of the surrounding area by containing any leaks or spills. Regular inspection and maintenance of these pads help detect and address leaks, ensuring that pollutants do not affect the environment.



Posting signs to indicate prohibited items, such as chemical liquids and paints, ensures proper waste disposal and further protects the environment. By adhering to these practices, you contribute to a cleaner and safer community.
People can further contribute by ensuring that hazardous materials, such as batteries and chemicals, are not disposed of in dumpsters but are instead taken to appropriate recycling or disposal facilities.

Participating in community clean-up efforts and reporting issues with dumpster management to local authorities can help prevent pollution and improve waste management practices. By following these practices and encouraging others to do the same, individuals play a crucial role in maintaining a cleaner and safer environment.

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Final Thoughts

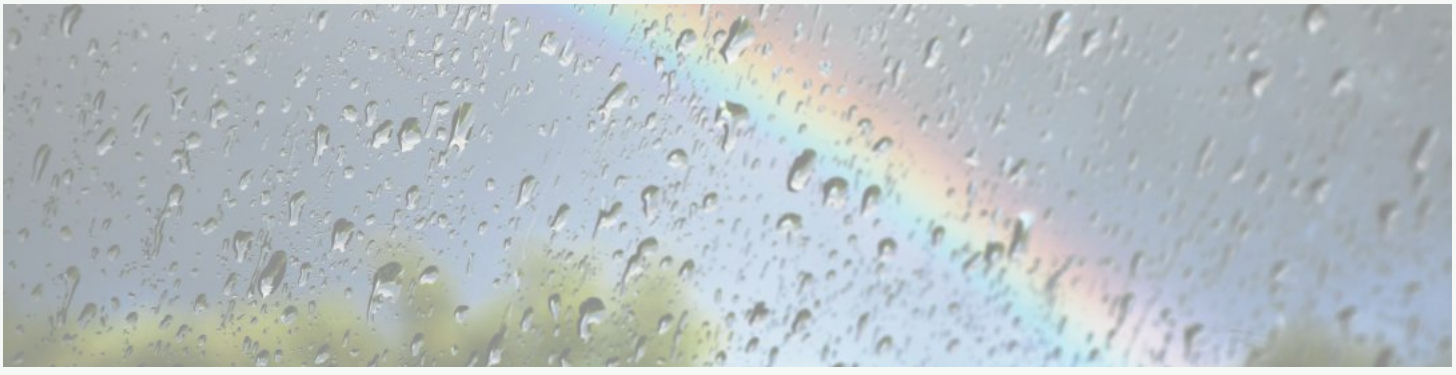
This stormwater Management Guidance Manual, funded in part by The National Fish and Wildlife Foundation – Long Island Sound Futures Fund, serves as a valuable resource for residents and associations looking to incorporate stormwater management practices into multi-unit residential areas. By utilizing Best Management Practices (BMPs) with Low Impact Development (LID) systems, individuals can mitigate the impact of dense residential development on water quality and the environment.

LID systems offer alternative site design strategies that utilize natural and engineered infiltration and storage techniques to control stormwater at its source. As stormwater runoff poses significant threats to public health, aquatic ecosystems, and recreational resources, it's imperative to implement proper stormwater management practices to protect critical resource areas.

As urbanization continues to alter the water cycle by increasing impervious surface cover, the need for effective stormwater management becomes more apparent. By reducing stormwater runoff and promoting infiltration, LID techniques can help mitigate issues such as flooding, erosion, and pollution, thereby safeguarding water resources and associated ecosystems.

This manual outlines various BMPs, including rain gardens, rain barrels, vegetative buffers, downspout planters, bioretention basins, tree filters, permeable pavers, and hydrodynamic separators, each offering unique benefits for managing stormwater runoff. Proper installation and maintenance of these practices are essential to maximizing their effectiveness in protecting water quality and minimizing environmental impact.

By incorporating these stormwater management practices into residential landscapes, individuals can contribute to cleaner waterways, healthier ecosystems, and more sustainable communities. Together, we can work towards preserving the integrity of our natural environment for current and future generations. For more information, please visit Eastern CT Conservation District at https://conservect.org/eastern/about



Special thanks to our dedicated volunteers and board members whose hard work and commitment made our project successful. Your invaluable contributions truly make a difference!

NOTES

The Eastern Connecticut Conservation District (ECCD) is a local not-for-profit, 501(c)(3) organization dedicated to helping the towns and citizens of Eastern Connecticut with their conservation needs. The creation of the ECCD is a result of the reorganization of Connecticut's eight county-based soil and water Conservation Districts into five regional watershed areas: Northwest, Southwest, North Central, Connecticut River Coastal and Eastern.

The service area of the ECCD encompasses thirty-six municipalities covering Windham and New London counties and part of Tolland County. Our service area includes the towns of:

Andover, Ashford, Bozrah, Brooklyn, Canterbury, Chaplin, Columbia, East Lyme, Eastford, Franklin, Griswold, Groton, Hampton, Killingly, Lebanon, Ledyard, Lisbon, Mansfield, Montville, New London, North Stonington, Norwich, Plainfield, Pomfret, Preston, Putnam, Scotland, Sprague, Sterling, Stonington, Thompson, Union, Voluntown, Waterford, Windham and Woodstock.