



NYC
Environmental
Protection



RAIN GARDEN
STEWARDSHIP PROGRAM

MAINTENANCE MANUAL

MARCH 2019



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Welcome!

The Rain Garden Stewardship Program is a volunteer program run by the New York City Department of Environmental Protection (DEP). The program provides opportunities for community members to help DEP manage stormwater in a more sustainable and meaningful way, which is important for keeping New York City's waterways clean. Becoming a rain garden steward is a rewarding way to care for your community and protect New York City's rivers and streams. This manual is your guide to rain gardens — what they are, how they work, and what simple activities you can do safely to help keep them beautiful and effective.

The Rain Garden Stewardship Program

New rain garden stewards join the program at a level, or tier, that matches their experience, interests, and availability.

- TIER 1 volunteers support the program by performing simple maintenance tasks a few times a month.
- TIER 2 volunteers have gardening experience and are looking for more involvement in the rain garden program.
- TIER 3 volunteers participate through environmental organizations that partner with DEP's Rain Garden Stewardship Program. These organizations have training and volunteer mechanisms in place to perform more complex maintenance and ensure all tasks are completed as required by DEP.



DEP's rain gardens provide social, aesthetic, and ecological benefits, such as habitat for butterflies and other pollinators.

The table below summarizes the different tasks for each stewardship tier, along with DEP's maintenance expectations and training requirements.

STEWARDSHIP TIER	APPROVED MAINTENANCE TASK	MAINTENANCE EXPECTATIONS	MAINTENANCE TRAINING REQUIREMENTS	REPORTING REQUIREMENTS
Tier 1	<ul style="list-style-type: none"> • Trash, debris, and leaf removal 	Tend to selected rain garden(s) at least three times per month	<ul style="list-style-type: none"> • Mandatory attendance at basic maintenance training • DEP will provide maintenance guidebook 	Recommended monthly reporting of site conditions
Tier 2	<ul style="list-style-type: none"> • All Tier 1 tasks • Sediment cleaning at curb cuts • Snow removal • Weeding • Watering 	Tend to selected rain garden(s) at least three times per month	<ul style="list-style-type: none"> • Mandatory attendance at basic maintenance training • DEP will provide maintenance guidebook 	Mandatory monthly tracking and reporting of maintenance activities
Tier 3	<ul style="list-style-type: none"> • All Tier 1 and 2 tasks • Cleaning sediment from gravel strip and planting bed • Raking and grading of soil • Pruning plants (<i>Note: Pruning of herbaceous materials must be done under the oversight of DEP staff and pruning of trees must be done only by DEP staff or certified citizen pruners.</i>) 	Tend to selected rain garden(s) at least four times per month	<ul style="list-style-type: none"> • Mandatory attendance at basic maintenance training • DEP will provide maintenance guidebook 	Mandatory monthly tracking and reporting of maintenance activities

In addition to guidance and training, DEP provides basic equipment and materials appropriate to perform maintenance activities at each tier on an annual basis. In some cases, other equipment approved by DEP may be needed in addition to that provided (for example, DEP does not provide garden hoses for watering). Equipment for maintenance tasks is listed in **Section 4 –Tools and Safety**. Lastly, the maintenance procedures described in **Section 5 – Maintenance Tasks** includes checklists of all the equipment necessary to perform each individual task.

How to Use This Manual

This manual will help you, as a rain garden steward, carry out the tasks necessary to keep the City's rain gardens clean and functioning properly. It describes the tasks you will be working on and explains how they should be done. It includes equipment checklists, photos, diagrams, and step-by-step guidance for carrying out specific tasks, as well as useful information about what to do when issues arise.

Section 1: Introduction

Section 1 explains what rain gardens are, how they work, what they look like, and why the City is investing in them.

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Section 2: Caring for Rain Gardens

Section 2 gives a general overview of rain garden maintenance.

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Section 3: Volunteering in the Public Space

Section 3 explains how to interact with the public as a volunteer in DEP's Rain Garden Stewardship Program. This section covers our most frequently asked questions and how to respond to them, as well as ways to educate other people about the program.

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Section 4: Tools and Safety

Section 4 describes the tools and materials needed for maintenance tasks and how to work safely in the Right-of-Way.

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Section 5: Maintenance Tasks

Section 5 presents an in-depth look at maintenance tasks and teaches you how to take care of a rain garden throughout the year.

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Appendix: Weed Identification and Management

The **Appendix** provides helpful information for identifying and managing weeds.

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Glossary & Green Infrastructure Terms

The **Glossary & Green Infrastructure Terms** will help you better understand words and concepts used in this guide.

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SECTION 1

INTRODUCTION

Green Infrastructure in New York City

When it rains, stormwater runs off roofs, streets, sidewalks, parking lots, and other hardscapes into the City's sewers. Along the way, this runoff picks up pollutants like oil and pet waste. Because the sewers can overflow into waterways, this can lead to poor water quality in nearby rivers and other water bodies. To help solve this issue, DEP has launched an innovative program for capturing and filtering dirty stormwater runoff using natural systems known as green infrastructure. Rain gardens are one type of green infrastructure that is used in public streets in New York City.

Green infrastructure can reduce pollution in streams and rivers and can also help trap air pollutants, reduce energy use, and cool cities in the hottest months. When designed with attractive landscape plants, green infrastructure can also improve the appearance of road and sidewalk areas.

What Is a Rain Garden?

A rain garden is a landscaped bed or planter that captures stormwater runoff from the street. In New York City, rain gardens do the important work of keeping the City's waters clean by helping to reduce combined sewer system overflows (see **Why Is the City Building Rain Gardens?** below). During a rainstorm each rain garden can collect up to 2,500 gallons of runoff!

For rain gardens to work effectively, these systems need regular maintenance. In many ways rain garden maintenance is like maintenance of any other public landscape. Plants need regular care, and trash and debris must be removed. Unlike traditional landscapes, however, rain gardens have components that are specifically designed to help the whole system function that also require maintenance.

Why Is the City Building Rain Gardens?

In older cities like New York, storm drains collect runoff into a combined sewer system in which both sanitary sewers and storm sewers discharge to the local wastewater resource recovery facility (WRRF). During dry weather, only sewage flows through the pipes. During wet weather, stormwater runoff mixes with wastewater. When the system was built, it was generally able to carry this dirty water without overflows to local waterways. Now, because there is so much more stormwater runoff created by all the pavement and buildings in the city, even smaller storms can cause an overflow. By capturing runoff, rain gardens reduce the amount of water flowing through the sewer system, which helps prevent overflows.



Flowering plants in a rain garden add beauty to streets.

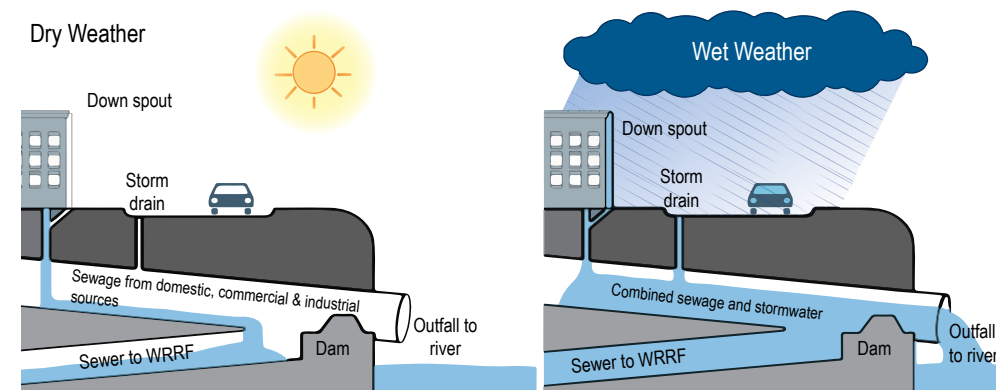


Image Source: US Environmental Protection Agency.

In addition to rain gardens, green infrastructure includes vegetated roofs or "green roofs" on buildings and permeable pavements.

What Is a Catch Basin?

You may not have heard the term "catch basin" before, but you've passed by one almost every time you cross a street in New York City. A catch basin is a type of storm drain located next to the curb that collects rainwater flowing along the gutter. There are more than 144,000 catch basins in the city. Catch basins are designed to direct rainwater that falls on the street and sidewalk into the sewer system.

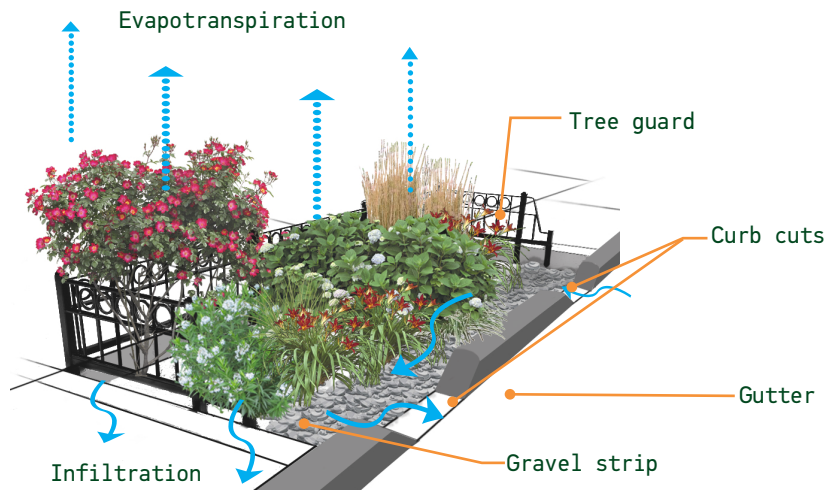


Stormwater flowing into a catch basin.

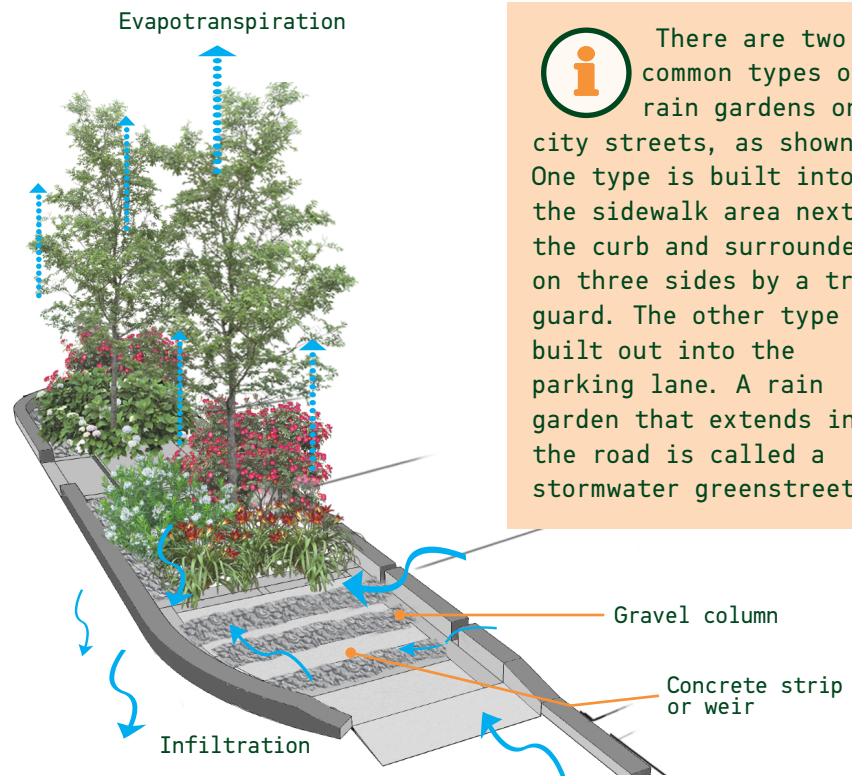
How Do Rain Gardens Function?

Rain gardens collect runoff from paved areas and roofs and allow it to seep into the ground or return to the air through evaporation directly from the soil and plant surfaces. Plant roots also take in water from the soil. Some of this water is released from leaves and stems through a process called "evapotranspiration."

Rain gardens are designed with openings in the curb called "curb cuts" to allow water to flow into the system. When there is more stormwater than the rain garden can infiltrate, the excess amount flows back out to the gutter through the curb cuts. From there it follows its usual path into a catch basin (See sidebar "What Is a Catch Basin?")



MOVEMENT OF WATER THROUGH A RAIN GARDEN IN THE SIDEWALK

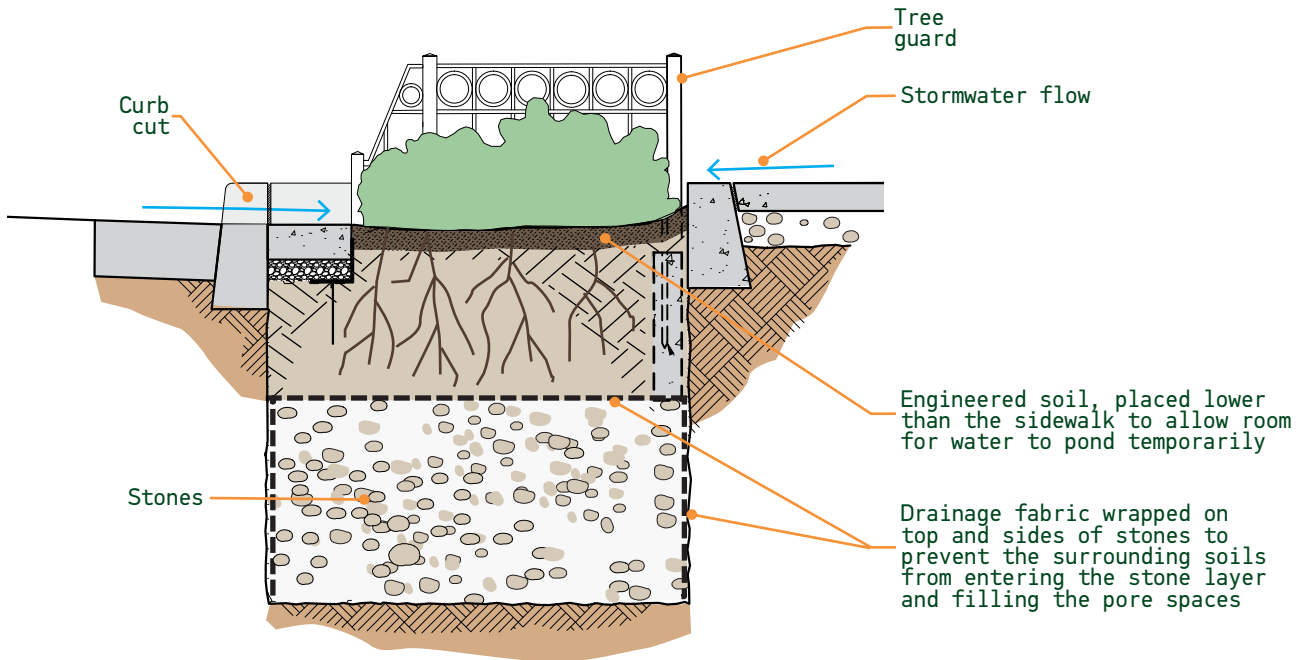


There are two common types of rain gardens on city streets, as shown. One type is built into the sidewalk area next to the curb and surrounded on three sides by a tree guard. The other type is built out into the parking lane. A rain garden that extends into the road is called a stormwater greenstreet.

MOVEMENT OF WATER THROUGH A RAIN GARDEN IN A PARKING LANE

What Is Happening Underground?

Each rain garden is almost five feet deep. The upper layer – usually between two and three feet deep – is a sandy, specially made engineered soil. The main functions of this soil are to support plant growth and filter stormwater. This layer also stores some water and allows it to seep (or "infiltrate") into the next layer, which is made of crushed stone. Pore spaces between the stones provide more storage space for runoff while it slowly infiltrates into underlying soils.



Who Is Responsible for Taking Care of Rain Gardens?

DEP is primarily responsible for maintaining rain gardens citywide. Field crews work in each rain garden once or twice a week to remove trash. During each visit the crew may also pull weeds, remove sediment, water plants and take note of any damage done to the rain gardens. During these visits crews also check the rain garden to determine the need for larger repairs.

Other City government agencies such as the Department of Parks and Recreation, Department of Sanitation, and the Department of Transportation may work together to ensure effective management of stormwater.

As a volunteer, you will provide extra help to keep the rain gardens looking good and functioning well between visits from City staff.



DEP green infrastructure maintenance staff.



SECTION **2**
CARING FOR
RAIN GARDENS

Overview of Rain Garden Maintenance

Rain gardens work best when they are well maintained. In New York City, rain gardens can become filled with litter and may be damaged by vehicles. The City is a stressful environment for plants, and rain garden plants need a lot of care to stay healthy. To keep rain gardens functioning properly, maintenance crews carry out several maintenance tasks on a weekly or twice-weekly basis (for example, trash removal). Other tasks are carried out only during certain seasons (like weeding and watering during the growing season, or snow removal as needed during the winter). During every site visit, crews check for accumulated sediment, dead plants, broken structures, vandalism, or anything else that could affect the functions or appearance of the rain garden.

Some issues cannot be resolved during a routine maintenance visit. These might include repairing concrete curbs and tree guards, solving poor soil drainage, repairing sinkholes, cutting down or replacing large trees, digging up and replacing underground parts like pipes — or anything else that requires special equipment, materials, or testing. If you observe these issues, please contact DEP via raingardens@dep.nyc.gov so that we can address them.

Maintaining a rain garden week after week and watching the plants grow can be very satisfying. This section of the manual outlines the activities that the rain garden needs to ensure its successful function and attractive appearance.

Keeping the Rain Garden Functioning

To function properly, rain gardens need healthy plants and soil. They also need to stay free of trash and anything else that could obstruct the flow of water or clog up the system.

Keeping Plants Healthy. Healthy plants soak up water and keep the rain garden looking nice. If the plants are sparse or dead, they cannot do their job and will not look like much of a garden. Regular weeding, watering, trimming, and sometimes replanting are important to keep the rain garden functioning and looking its best.



(Left) A healthy clump of irises in a rain garden. (Right) Discolored leaves showing signs of disease.



All of the plants, with the exception of weeds, have been specifically chosen to survive life on a busy NYC street. Do not add flowers, shrubs, vegetables or any other kinds of plants to the rain garden without explicit permission from DEP. Call 311 or email DEP at raingardens@dep.nyc.gov if you see a dead plant that needs to be removed or replaced.

Removing Obstructions. To keep the rain garden functioning properly, water needs to be able to get in and out. In most cases, water enters and exits the rain garden through curb cuts like the ones shown below. If these curb openings – or the landscaped bed – get filled with trash or sediment, water may not be able to get in, or it may pool in the bed for too long because it cannot infiltrate. Removing trash, sand, and other debris from these areas on a weekly basis (or more if possible) helps keep flow paths clear.

LOOKING AHEAD:

- Use **Section 5 – Maintenance Tasks** to perform specific tasks correctly, such as removing and disposing of sediment.



(Left) A clean curb opening for stormwater entering a rain garden. (Right) This curb cut is partially blocked with sediment and debris.

Caring for the Soil. If water is to seep into the ground properly, soil cannot be hard-packed or clogged with fine particles. Regularly removing grit, sand, and debris from the surface of the soil can help to keep the system healthy and allow water to infiltrate.



(Left) A loose, well-aerated soil surface. (Right) Compacted soil at base of a shrub.

i Do not add mulch, wood chips, or tree branches to the rain garden.

Keeping the Rain Garden Looking Good

Rain gardens look best when they are clean and litter-free, with lush but orderly plantings. The following are top priorities for maintenance to keep the rain garden looking its best.

Weeding. Weeding the curbside rain gardens is important for keeping plants healthy. Weeds are not only unsightly, they crowd out the other plants, making it hard for them to absorb water and receive the right levels of sunlight necessary for growth. Newly planted rain gardens may have sparse plantings, allowing weeds to grow. Weedy plants that are left can spread seeds to parks, or private property.



Weeding should be done at least twice per month during the growing season from May 15 to October 31 to keep the rain garden looking and working its best. However, never use weed whackers or herbicides like RoundUp in the rain gardens.



(Left) Well-established plant community. (Right) Desirable plants overtaken by weeds.

Pruning and Trimming. Rain garden plants must not be allowed to grow so large that they crowd sidewalks or make it hard to see around intersections. Shrubs and small plants should be trimmed regularly to prevent them from growing higher than four feet. Low tree branches will be pruned by a professional and are not your responsibility.



(Left) Shrubs and trees that have been trimmed stay within the rain garden. (Right) Overgrown plants can cause a tripping hazard.



Do not prune trees or other large plants in the rain gardens unless you have received written permission from DEP maintenance staff or are a certified Citizen Pruner.

Cleaning Up Litter. One of the biggest challenges of maintaining rain gardens is keeping up with the litter that washes in with stormwater, is dropped by pedestrians, or is blown in by the wind. Litter may be worse after large gatherings, weekends and holidays, or in busy areas.



Be careful! Do not use your hands to pick up trash, especially if it is partially hidden in plants or leaves. There may be sharp or otherwise dangerous objects in the rain garden.



(Left) A cleaned curbline and well-tended plant bed. (Right) Trash, sediment, displaced stones, and weeds create an unsightly appearance.

Inspecting the Soil and Plants. Without healthy plants and soil in place, the rain garden will not function properly. Heavy rains can cause the soil to wash away, exposing the roots of the plants. Inspect the rain garden after any big storm. If you see plants with exposed roots or if they appear generally unhealthy contact DEP at raingardens@dep.nyc.gov.

LOOKING AHEAD

- Use **Section 5 – Maintenance Tasks** to perform specific tasks correctly, such as watering.



A rain garden steward watering plants within the rain garden.

Watering when it Is Hot and Dry.

Even though the rain garden is designed to collect rainwater, it may need additional water during hot and dry periods. Watering is necessary for plants, especially young plants, to grow. If one week goes by with little to no rain and very high temperatures, if plants are drooping, or if the soil looks dry and dusty, then you should water the rain garden thoroughly. If you do not have access to watering equipment but you know that the rain garden is in need of water, contact DEP at raingardens@dep.nyc.gov and we will address the issue.

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SECTION

VOLUNTEERING IN
THE PUBLIC SPACE

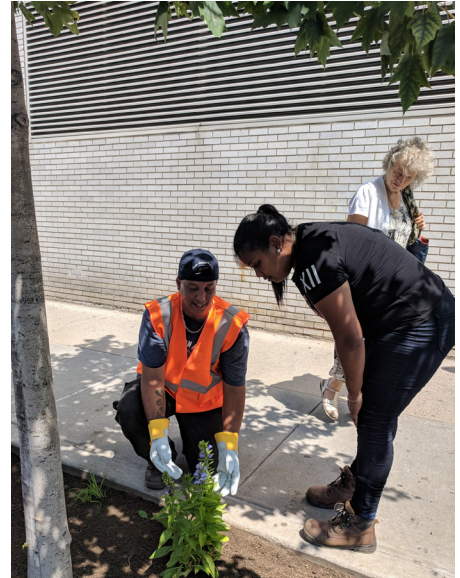
Volunteering in the Public Space

Volunteering in the public space means you are likely to be approached by fellow community members who are curious about what you are doing, or who may have an opinion they want to share. This is a great opportunity to tell them all about the many ways that rain gardens help keep New York City clean, green, and beautiful.

Rain Garden Talking Points

When talking to fellow community members about green infrastructure, keep your explanations brief and simple. Below are some key points that can help you explain what rain gardens are and what they do.

- Introduce yourself and explain what you are doing. Explain that you are a rain garden steward and are volunteering as part of the DEP Rain Garden Stewardship Program.
- Explain that rain gardens are planted areas designed to collect and infiltrate stormwater that runs off the streets and sidewalks when it rains.
- Point out that DEP is building rain gardens and other types of green infrastructure to manage stormwater and improve water quality in local waterways.
- Emphasize that green infrastructure is a cost-effective way to help create a sustainable New York City. It can help to:
 - improve street drainage
 - reduce puddles and ponds
 - reduce pollution
 - reduce air temperature during hot weather
 - create green space
 - beautify neighborhoods
- Add that the City is responsible for rain garden maintenance. Maintenance crews will remove litter, sediment, and weeds from each installation on a regular basis. As a steward of a rain garden, your maintenance activities will help DEP's maintenance staff.



A volunteer explaining why specific plant species are chosen for rain gardens.



DEP staff teaching school children about how rain gardens work on Earth Day.



DEP staff are always happy to answer community questions about the rain gardens. Just ask us!

Frequently Asked Questions and Contacting DEP

Will the rain garden attract mosquitoes?

Mosquito larvae require at least 72 hours of standing water to develop. Rain gardens are designed to drain in 48 hours or less. If the rain garden does not appear to be draining properly, please call 311 or email us at raingardens@dep.nyc.gov.

Will tree roots crack the sidewalk or interfere with utility lines?

During design and construction, DEP and utility companies work together to ensure rain gardens will not directly interfere with existing underground and aboveground utility service lines. Older tree roots can break sidewalks if the tree pit is not large enough, but the City's standard rain gardens are at least 10 feet long, which gives tree roots space to grow.

Contractors have been working on rain gardens in my neighborhood and there are tree guards but no plants. Why are these sites still unfinished?

Construction on rain gardens may begin at different times throughout the year. However, planting of the rain gardens must occur during the spring or fall when weather conditions are better for planting. Construction on these rain gardens may have begun earlier in order to be ready for the next appropriate planting season.

Can I exchange plants that were planted in a rain garden with plants that I've selected?

Rain garden plants are selected because they are able to grow well in the tough conditions found in these systems, including alternating wet and dry periods. Please do not replace them – other plants may not function as well in a rain garden setting.

How can I contact DEP staff if there is a problem with a rain garden near my home or business?

You may see something wrong with a rain garden before a DEP gardener. Let us know!

Call 311 anytime to alert us to problems: a broken tree guard, cracked concrete, a dead tree, standing water after 48 hours, missing or dead plants, dangerous or dumped materials. When you call 311, make sure you tell the dispatcher which borough you are in and where on the street the rain garden is located. Use terms like "rain garden" or "green infrastructure" so that the dispatcher can send your request to the right people.

You can also call DEP directly at 718-595-7599, or email us at raingardens@dep.nyc.gov. Be sure to include photographs documenting the problem.

DEP's website also has additional information on the Rain Gardens program: nyc.gov/raingardens.



NYC 311 is a citywide reporting hotline that routes complaints to the responsible City organization.

NYC
311

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4

SECTION
TOOLS AND
SAFETY

WORKING IN THE RIGHT-OF-WAY

The public nature of the Right-of-Way (the city's roads and sidewalk areas) can present a unique set of opportunities and challenges for rain garden stewards that volunteer there. For example, this work presents an excellent opportunity to educate the public about the rain garden program. But there are also some specific safety concerns, particularly related to working alongside moving vehicles, and coming into contact with unknown and potentially hazardous materials. Understanding safety methods for working in the Right-of-Way and avoiding hazards can help ensure that your work is safe and productive.

Working Safely in the Right-of-Way

Working in the Right-of-Way on foot requires you to be careful and to pay attention to traffic. Most of the maintenance of rain gardens can be done from the sidewalk, but occasionally you may also be working alongside parked or parking vehicles in order to clean out curb opening areas, sweep the gutter, weed, or water plants. Below are a few best practices that can help you protect yourself and fellow volunteers:

- **Avoid distractions** by limiting the use of phones, tablets, music, or headphones while working in the Right-of-Way.
- **Wear a high-visibility protective vest** at all times to make you more visible. Often the spaces next to rain gardens are used as parking lanes, and drivers may back in quickly without being aware of your presence.
- **Place traffic cones** in the gutter at either end of your work zone to alert drivers if the task requires working from the road, such as watering.
- **Keep equipment on the same side of the street** as your work site wherever possible. If you are working with a team that is cleaning a nearby rain garden, try to limit crossing the road by carrying the tools you need in a container.
- **Use the sidewalk** wherever possible. Avoid walking in the road.
- When working in the gutter, **work alongside another crew member** and take turns watching the street for traffic. When feasible, care for rain gardens and gutter areas from the sidewalk side rather than the street side.



When removing trash from curb cuts, gravel strips, and planting beds, work from the sidewalk. Avoid working in the street unless absolutely necessary.



Hypodermic needles or other sharp objects mixed in with common trash pose a significant health hazard.

If you find needles, knives, or other sharp, dangerous materials in the rain gardens, contact 311 or DEP immediately and trained field supervisors will dispose of these materials using the proper equipment. Never dispose of dangerous materials by hand.

Tools to Keep You Safe

When working in the Right-of-Way it is important to acknowledge that hazards exist and to understand ways to protect yourself and fellow volunteers. Brightly colored clothing and safety gear should be worn at all times and a common sense approach to safety should be followed.

All rain garden volunteers must wear high-visibility safety vests, heavy-duty work gloves, as well as boots or shoes with ankle support.

Additional safety equipment such as the following may be needed for certain tasks. The items below are recommended but not provided by DEP.

- **Eye protection** – used for working with dusty material, such as leaves or sediment
- **Ear protection** – used for operating loud machinery, such as leaf blowers (leaf blowers are only to be used by volunteers with explicit permission from DEP staff)
- **First aid kit** – used to treat minor cuts, scrapes, and burns
- **Long sleeves/pants** – used for protection against scrapes, sun, and stinging or biting insects
- **Sunscreen (SPF 35+)** – used to protect exposed skin from sun damage. Also, consider wearing long sleeves/pants and a wide brim hat for additional protection from the sun

Avoiding Hazardous Materials and Sharp Objects

It is possible you may encounter hazardous materials while working in the Right-of-Way. Hazardous materials may be dumped or spilled in the rain gardens or may wash in from the street during rain. Hazardous materials such as needles or chemicals may be mixed in with leaves, sediment, and trash and may be difficult to see. Disease-causing microbes and potentially toxic chemicals and materials may be present in gravel strips and soils.

When handling leaves, soil, or any potentially hazardous materials, use heavy duty gloves, trash grabbers, and shovels to avoid direct contact. Never reach in to pick up items that cannot be seen. Report any hazardous materials to the 311 hotline and/or email DEP at raingardens@dep.nyc.gov.

If you or a fellow volunteer is injured, call 911.





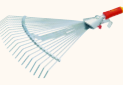


Tools and Materials for Rain Garden Maintenance

It is important to always have the right tools to ensure that all tasks are completed properly and safely. Not all stewardship tiers will be performing the same rain garden maintenance tasks. Table 1 below outlines the approved task(s) for each tier and the necessary tools to perform the task. In addition, Table 2 summarizes the list of tools and materials provided by DEP, and Table 3 lists the tools and materials approved, but not provided by DEP at each tier.

TABLE 1 – SUMMARY OF APPROVED MAINTENANCE TASKS AND TOOLS

TIER 1	
Approved Task	Tools ^{1,2}
Trash, Debris, and Leaf Removal	Trash grabber, trash bags, shrub rake
TIER 2	
Approved Tasks	Tools ^{1,2}
Trash, Debris, and Leaf Removal	Trash grabber, trash bags, shrub rake
Sediment Cleaning at Curb Cuts	Cultivator, broom, dustpan, scoop shovel, shrub rake
Weeding	Work gloves (most weeding should be done by hand after sufficient identification), hand trowel, soil knife
Snow Removal	Snow shovel, flat shovel
Watering	Garden hose, watering can, watering wand
TIER 3	
Approved Tasks	Tools ^{1,2}
Trash, Debris, and Leaf Removal	Trash grabber, trash bags, shrub rake
Sediment Cleaning at Curb Cuts	Cultivator, broom, dustpan, scoop shovel, shrub rake, flat shovel
Cleaning Sediment from Gravel Strip and Planting Bed	
Weeding	Work gloves (most weeding should be done by hand after identification), hand trowel, soil knife
Snow Removal	Snow shovel, flat shovel
Watering	Garden hose, watering can, watering wand
Pruning Plants	Hand pruners and loppers <i>Note: pruning of herbaceous perennials and shrubs should done only by DEP staff or by volunteers given explicit permission and under the supervision of DEP staff. Pruning of trees may only be done by DEP staff or by certified citizen pruners.</i>
¹ See Table 2 for tools, materials and material quantities provided by DEP for volunteers at each tier.	
² See Table 3 for additional tools and materials <u>approved</u> for volunteers at each tier but not provided by DEP.	

TABLE 2 – TOOLS AND MATERIALS PROVIDED BY DEP AT EACH TIER

Tools and Materials	Applicable Maintenance Task	Quantities	Tier 1	Tier 2	Tier 3
Work gloves 	All Tasks	1 pair (per person)	✓	✓	✓
Safety vest 	All Tasks	1 (per person)	✓	✓	✓
Trash bags 	All Tasks	10 (per group)	✓	✓	✓
Trash grabber 	Trash, Debris, and Leaf Removal	1 (per person)	✓	✓	✓
Shrub rake 	Trash, Debris, and Leaf Removal	1 (per group)	✓	✓	✓
	Sediment at Curb Cuts		✗	✓	✓
	Cleaning Sediment from the Gravel Strip and Planting Bed		✗	✗	✓
Broom* 	Trash, Debris, and Leaf Removal	1 (per group)	✗	✓	✓
	Sediment Curb Cuts		✗	✓	✓
	Cleaning Sediment from the Gravel Strip and Planting Bed		✗	✗	✓
Hand pruners 	Pruning Plants	1 (per group)	✗	✗	✓

✓ = Provided by DEP

✗ = Not provided by DEP

* DEP allows a broom to be used for all Tier 1 tasks, although it is not provided at Tier 1.

TABLE 3—TOOLS AND MATERIALS APPROVED BUT NOT PROVIDED BY DEP AT EACH TIER

Tools and Materials		Applicable Maintenance Tasks	Tier 1	Tier 2	Tier 3
Dustpan		Trash, Debris, and Leaf Removal	✓	✓	✓
		Sediment Cleaning at Curb Cuts	✗	✓	✓
		Cleaning Sediment from the Gravel Strip and Planting Bed	✗	✗	✓
Scoop shovel		Sediment Cleaning at Curb Cuts	✗	✓	✓
		Cleaning Sediment from the Gravel Strip and Planting Bed	✗	✗	✓
Cultivator		Sediment Cleaning at Curb Cuts	✗	✓	✓
		Cleaning Sediment from the Gravel Strip and Planting Bed	✗	✗	✓
Snow shovel		Snow Removal	✗	✓	✓
Garden hose		Watering	✗	✓	✓
Watering can		Watering	✗	✓	✓
Watering wand		Watering	✗	✓	✓
Hand trowel		Weeding	✗	✓	✓
Soil knife		Weeding	✗	✓	✓
Loppers		Pruning Plants	✗	✗	✓
Leaf blower		Trash, Debris, and Leaf Removal	Only to be used by trained volunteers with special permission from DEP.		

✓ = Approved
✗ = Not approved



SECTION **5**
MAINTENANCE
TASKS

Tiers 1, 2, & 3

Trash, Debris, and Leaf Removal



INSTRUCTIONS

- Observe the site to make sure that there are no hazardous materials or conditions (such as oil, sharp glass, or needles).
- Collect and remove trash, debris and leaves from all areas of the rain garden, the gutter, 2–3 feet of sidewalk behind the tree guard, and on 4–5 feet on either side of each curb opening using the trash grabber, broom, shovel, and/or dustpan. Do not stand on the engineered soil inside the rain garden.
- Ordinary trash may be bagged and disposed with regular household trash.
- Report graffiti to 311 (Mayoral Task Force will remove it as necessary).

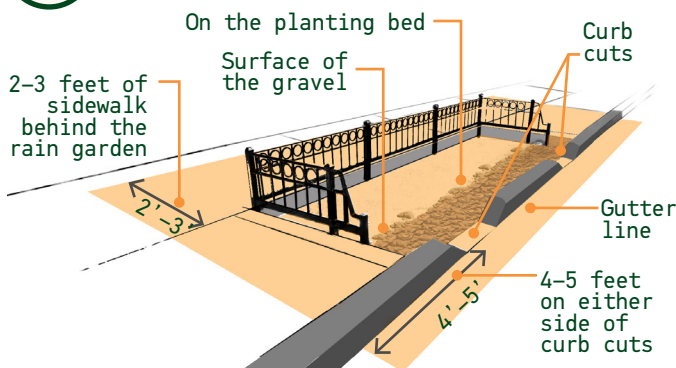
NOTE: If it appears that hazardous materials may be mixed in with trash, stop work immediately. See “Avoiding Hazardous Materials and Sharp Objects” in **Section 4 – Tools and Safety**.



Trash grabbers and buckets can be used to remove trash.



WHERE TO REMOVE TRASH



KEY INFORMATION

- When cleaning up trash, wear gloves and use a grabber rather than your hands.
- Report any toxic spills and health hazards (such as hypodermic needles or chemicals) and illegal dumping activity to 311 and DEP at raingardens@dep.nyc.gov. Examples of illegally dumped materials include fluorescent light bulbs, mattresses or other heavy items that cannot be hauled off. A DEP field supervisor can help determine the best course of action that is consistent with DEP health and safety protocols.
- Refer to **Section 4 – Tools and Safety** for further safety guidance.



IMPORTANCE OF TRASH REMOVAL

- Trash detracts from the appearance of the neighborhood.
- Trash can promote further littering and dumping.
- Trash can also damage plants or block the flow of water.



SEASONAL APPLICABILITY

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
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NOTE: Trash should be removed year-round wherever it is present.



EQUIPMENT & MATERIALS

- | | |
|--|--|
| <input type="checkbox"/> Work gloves | <input type="checkbox"/> Trash grabber |
| <input type="checkbox"/> High-visibility safety vest | <input type="checkbox"/> Trash bags |
| <input type="checkbox"/> Safety glasses | <input type="checkbox"/> Shrub rake |
| | <input type="checkbox"/> Broom |
| | <input type="checkbox"/> Dustpan |

Tiers 2 & 3

Sediment Cleaning at Curb Cuts



INSTRUCTIONS

- Observe the site to make sure that there are no hazardous materials or conditions (such as oil, sharp glass, or needles).
- Sweep sediment 4–5 feet from either side of curb openings, the gutter line next to the rain garden, and 2–3 feet around the sidewalk side(s) of the rain garden.
- Collect and remove sediment using shovels and trash bags.
- Dispose of bagged sediment with ordinary trash.

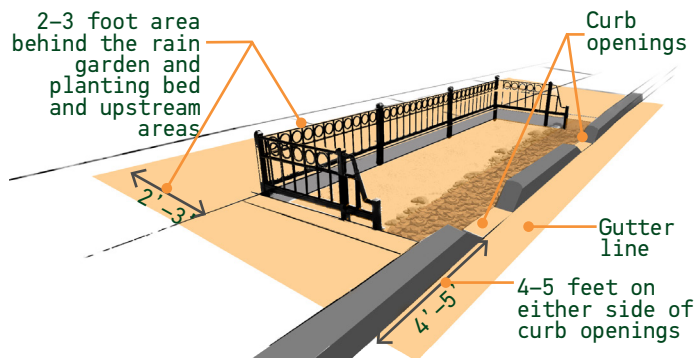
NOTE: If it appears that hazardous materials may be mixed in with the sediment, stop work immediately. See “Avoiding Hazardous Materials and Sharp Objects” in Section 4 – Tools and Safety.



Remove sediment from curb cuts.



WHERE TO REMOVE SEDIMENT



KEY INFORMATION

- It can be difficult to distinguish between engineered soil and sediment that washes in off the street. Sediment is composed of finer material than engineered soil and is usually found in small mounds at curb cuts and where water pools in the rain garden. Refer to the information in "**Stormwater Soil or Sediment**" on page 34 to help identify sediment.
- Sediment is often mixed in with trash, leaves, and other debris. In many cases it may be easier to remove large pieces of trash before attempting to remove sediment from the rain garden. See "**Trash, Debris, and Leaf Removal.**"
- In early spring it is important to remove deicing salts that may have collected over the winter.
- Alert the field supervisor to any potentially hazardous materials (sharp objects, chemicals, petroleum residue) mixed with debris.
- Refer to **Section 4 – Tools and Safety** for further safety guidance.



IMPORTANCE OF SEDIMENT REMOVAL

- Sediment can damage plants by burying the stems and coating the leaves. It can also clog the gravel strip and soil bed, leading to less infiltration of stormwater.



SEASONAL APPLICABILITY

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
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NOTE: Sediment should be removed year-round wherever it is present.



EQUIPMENT & MATERIALS

- | | |
|--|---|
| <input type="checkbox"/> High-visibility safety vest | <input type="checkbox"/> Cultivator |
| <input type="checkbox"/> Work gloves | <input type="checkbox"/> Broom |
| <input type="checkbox"/> Safety glasses | <input type="checkbox"/> Dustpan |
| | <input type="checkbox"/> Shrub rake |
| | <input type="checkbox"/> Flat or scoop shovel |

Tiers 2 & 3

Snow Removal



INSTRUCTIONS

- Observe the site to make sure that there are no hazardous materials or conditions.
- Leave snow that has fallen into the rain garden in place. There is no need to remove snow from the planting bed.
- Clean next to sidewalk areas. Shovel a 3 foot perimeter around the tree guard and other areas as directed by the field supervisor. Do not shovel snow into the rain garden; snow may contain deicing salt from pavements.

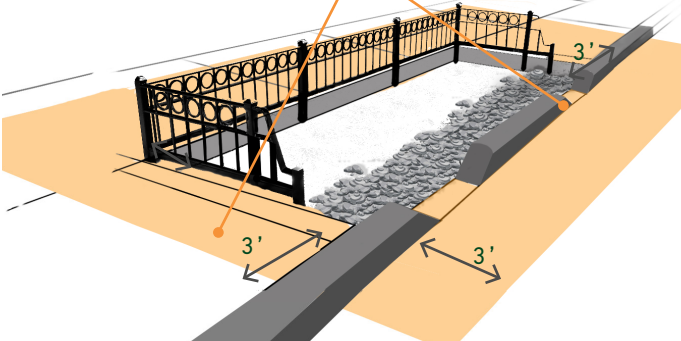


DEP maintenance staff removing snow from curb cuts and area surrounding a rain garden.



WHERE TO REMOVE SNOW

Remove snow and ice within 3 foot of the tree guard line, curb cuts and curbs.



KEY INFORMATION

- When shoveling snow, bend at your knees rather than your back to minimize the risk of back injuries.
- Alert the field supervisor to any potentially hazardous materials (sharp objects, chemicals, oil) mixed in with snow.
- Refer to **Section 4 – Tools and Safety** for further safety guidance.



IMPORTANCE OF SNOW REMOVAL

- During freezing conditions, there is usually no stormwater to be managed. Frozen ground infiltrates less water.
- As the ground thaws it becomes more important to ensure that water can enter and exit the rain garden.



SEASONAL APPLICABILITY

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
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NOTE: Snow may need to be removed in winter, early spring, or fall.



EQUIPMENT & MATERIALS

- High-visibility safety vest
- Snow shovel
- Work gloves
- Flat shovel
- Safety glasses

Tiers 2 & 3

Watering



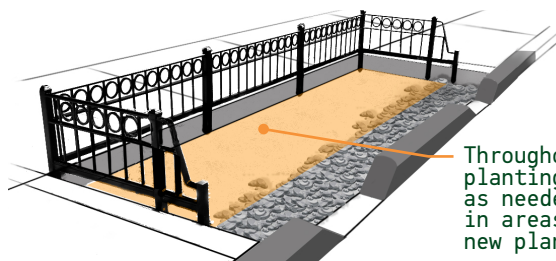
INSTRUCTIONS

DEP maintenance staff water thousands of rain gardens across Brooklyn, Queens, and the Bronx during the summer months, using hydrants and City trucks equipped with water tanks. As a volunteer, however, we expect you to water the rain gardens only if you have easy access to the right equipment and a water source. We suggest using a garden hose that can attach to a watering wand or a watering can.

- Observe the site to make sure that there are no hazardous materials or conditions (such as oil, sharp glass, or needles). Place traffic cones in the roadway to alert drivers and pedestrians that maintenance work is being performed.
- Clear gutter of debris in front of the rain garden.
- Keep your watering materials out of pedestrian pathways so those walking by are not at risk of tripping over a hose or watering can.
- Water the soil. Keep leaf wetting to a minimum to prevent diseases.
- Soak the top 6–8 inches of soil evenly by constantly moving the watering wand across the surface rather than concentrating the spray in one place.
- If you use a hose without a wand attachment, rest it on the gravel strip pointing it into the rain garden and let the water gradually infiltrate into the soil.



WHERE TO WATER



Throughout the planting bed as needed, or in areas with new plantings.



KEY INFORMATION

- During establishment (the first 1–3 years), the roots of plants are not fully developed and cannot get water from deep in the soil. Frequent watering is needed to keep the top layer of soil moist.
- Refer to **Section 4 – Tools and Safety** for further safety guidance.



IMPORTANCE OF WATERING

- Sufficient soil moisture is necessary for plant growth. Watering prevents wilting and browning.
- Watering helps newly installed plants get established and maintains established plants during drought.
- If plants die due to drought, there is less shade for the remaining plants and the soil dries out more quickly.



A DEP staff member waters plants with a watering wand attached to a hose.



SEASONAL APPLICABILITY

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
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NOTE: Water plants semi-weekly during hot, dry weather during the first 1–3 years of establishment. Avoid watering in direct sunlight during the hottest parts of the day.



EQUIPMENT & MATERIALS

- | | |
|--|--|
| <input type="checkbox"/> High-visibility safety vest | <input type="checkbox"/> Garden hose |
| <input type="checkbox"/> Work gloves | <input type="checkbox"/> Watering can |
| <input type="checkbox"/> Traffic cones | <input type="checkbox"/> Watering wand |

Tiers 2 & 3

Weeding



INSTRUCTIONS

- Observe the site to make sure that there are no hazardous materials or conditions (such as oil, sharp glass, or needles).
- Identify weeds to be removed. If you are unable to identify a weed with the help of the weed guide, send a picture to DEP at raingardens@dep.nyc.gov and we will confirm if it is a weed.
- Remove the entire weed by gripping and pulling directly upward, ensuring that the root has also been dislodged if weeding by hand. Hand pulling is more successful with younger plants and/or when the soil is moist.
- Use a digging tool (soil knife, hand trowel) to remove plants that are more firmly rooted in the soil.
- Shake off any loose soil from the roots.
- Fill and smooth any holes left in the planting bed after weeding.

NOTE: Weeding directly by hand pulling or using manual weeding tools is best done when the soil is moist but not soaked.

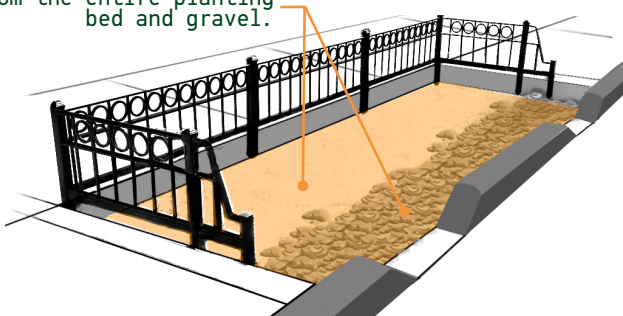


(Left) An oscillating hoe is effective for removing seedlings masses. (Right) A soil knife is used to dig up or loosen deep rooted weeds.



WHERE TO WEED

Weeds should be removed from the entire planting bed and gravel.



KEY INFORMATION

- Invasive weeds are defined by the State of New York as species that could be potentially harmful if allowed to escape into a natural, non-urban environment. These types of plants should be removed from the rain gardens (refer to **Appendix – Weed Identification and Management** for an illustrated guide).
- Weeds can also be more broadly defined as any unwanted plants based on appearance.
- Refer to **Section 4 – Tools and Safety** for further safety guidance.



IMPORTANCE OF WEEDING

- Weeds look messy and may be considered a nuisance.
- Weeds compete with desired plants for sunlight, water and nutrients.
- Weeds may harbor pests and diseases that can be harmful to desirable plants.
- Weeds allowed to grow in rain gardens may produce seeds that could spread to parks and private properties.



SEASONAL APPLICABILITY

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
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NOTE: Weeding should be performed throughout the growing season, generally from April to October. Weeding is most effective when plants are big enough to grasp firmly but small enough that they are not established.



EQUIPMENT & MATERIALS

- | | |
|--|--------------------------------------|
| <input type="checkbox"/> High-visibility safety vest | <input type="checkbox"/> Soil knife |
| <input type="checkbox"/> Work gloves | <input type="checkbox"/> Hand trowel |

Tier 3

Cleaning Sediment from the Gravel Strip and Planting Bed



INSTRUCTIONS

- Observe the site to make sure that there are no hazardous materials or conditions (such as oil, sharp glass, or needles). Place traffic cones in the roadway to alert drivers and pedestrians that maintenance work is being performed.
- Remove any loose debris or sediment from the surface of the gravel and the planting bed (see **"Trash, Debris, and Leaf Removal"** and **"Sediment Cleaning at Curb Cuts"** task sheets).

CLEANING THE GRAVEL STRIP

- Dig gently to avoid damaging the edging strip that separates gravel from soil. Use a cultivator to loosen sediment. If you see any damage to the edging strip, report it to the field supervisor.
- Use a broom to sweep up all loose sediment, being mindful of approaching pedestrians. Any loose sediment that is not properly discarded will find its way back into the rain garden.
- Rake away any sediment that may have been blown on the rain garden.

CLEANING SEDIMENT FROM THE PLANTING BED

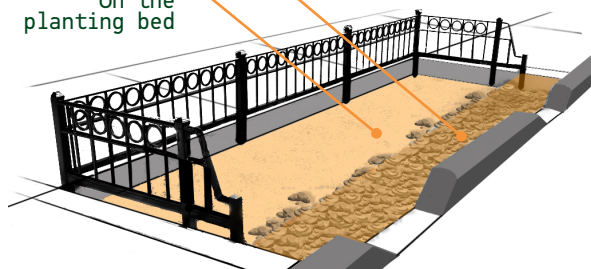
- Gently scrape the top surface (1–3 inches) of the rain garden with a small rake, shovel, and/or trowel, taking care not to damage plants or remove the planting bed soil.
- Collect and remove sediment from the gutter (see **"Sediment Cleaning at Curb Cuts"** task sheet).
- Dispose of sediment with the trash.



WHERE TO CLEAN SEDIMENT FROM THE GRAVEL STRIP AND PLANTING BED

On the gravel or concrete strip

On the planting bed



KEY INFORMATION

- The gravel strip may need frequent cleaning. Refer to the **"Rain Garden Cross Section"** on the following page to see how it works.
- Cleaning the planting bed may be more critical in late winter or early spring to remove de-icing salts.
- Alert the field supervisor of any potentially hazardous materials (sharp objects, chemicals, petroleum residue) mixed in with debris.
- Refer to **Section 4 – Tools and Safety** for further safety guidance.



IMPORTANCE OF SEDIMENT CLEANING ON THE GRAVEL STRIP AND PLANTING BED

- The gravel strip can become clogged with sediment over time and lose its ability to filter stormwater.
- Sediment in the gravel strip makes it easier for weeds to grow.
- The gravel strip may also become mucky and slippery, making it unsafe for pedestrians getting in and out of cars.
- Sediment can damage plants by burying the stems and coating the leaves.



SEASONAL APPLICABILITY

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
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NOTE: Gravel strip cleaning should be performed year-round as feasible during periods of dry weather (surface of gravel must be dry, typically 2+ days after rain).



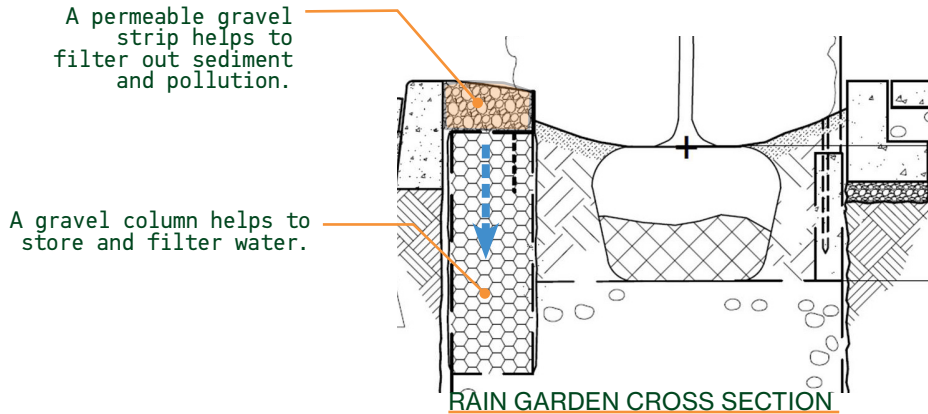
EQUIPMENT & MATERIALS

- | | |
|--|---|
| <input type="checkbox"/> Work gloves | <input type="checkbox"/> Cultivator |
| <input type="checkbox"/> High-visibility safety vest | <input type="checkbox"/> Broom |
| <input type="checkbox"/> Safety glasses | <input type="checkbox"/> Flat or scoop shovel |
| | <input type="checkbox"/> Shrub rake |
| | <input type="checkbox"/> Dustpan |

Tier 3

Cleaning Sediment from the Gravel Strip and Planting Bed

How the Filter Strip Functions



Stormwater Soil or Sediment?

Sediment can vary in appearance depending on nearby site conditions.



Sediment collected on the surface of the soil

Clean, stormwater soil below the surface

(Left) Stormwater soil will appear darker brown and can be squeezed to form a lightly packed ball. (Right) Sediment has been removed from the top surface of the planting bed, revealing darker soil below.



(A) Sediment may be light or dark gray, or may appear sandy. It is mostly made of very fine material. (B) Sediment may look blackish if it has been contaminated by fuel or oil. (C) Concrete dust from nearby construction can wash into rain gardens, often creating a hard, crusty layer. (D) The largest deposits of sediment are usually found at curb opening areas and at the bottom of the rain garden.

Tier 3

Pruning Plants



INSTRUCTIONS

Perennial plants, which come back every year, need to be trimmed and cut back periodically to stay healthy. This task requires special training and should not be done except as specifically requested by DEP. Some methods and reasons for pruning plants as explained below.

DEAD-HEADING

- Cut back dead flowers and seed heads to promote new flowering stalks during the growing season.

DEAD-LEAFING

- Cut back dead, damaged or diseased leaves to keep the plant healthy during the growing season.

PINCHING BACK

- Cut back a portion of the plant 2/3–3/4 of its full height to maintain its shape.
- Make cuts above a branching point.
- In the fall, cut dead plant stems back to remove the majority of leaf-bearing stems.

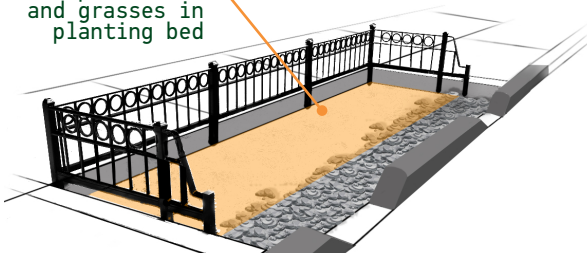
REJUVENATION

- Cut weak stems to the ground to promote healthy growth on remaining stems during the growing season.
- Cut stalks with dead flowers to promote new blossoms.
- If warm season grasses need to be cut back (for example, switchgrass), cut seed heads back to the base and cut leaves to the base only as necessary. Cut no more than 1/3–1/4 of the total plant.



WHERE TO TRIM AND PRUNE DEAD PLANTS

Cut back perennials and grasses in planting bed



KEY INFORMATION

- Not every perennial responds well to trimming, so if in doubt remove only dead plant parts.
- Dispose of plant cutting with the trash.
- Clean tools regularly to avoid spreading diseases.
- Alert DEP staff or the field supervisor to any potentially hazardous materials (sharp objects, chemicals, petroleum residue) found in the planting bed.
- Refer to **Section 4 – Tools and Safety** for further safety guidance.



IMPORTANCE OF TRIMMING AND PRUNING PLANTS

- Overcrowded plants are more likely to develop diseases.
- Dead leaves and stems, if left in place, can prevent new plants from coming up in the spring.
- Small plants that are shaded out by larger plants will grow poorly.
- Overgrown plants look messy.



SEASONAL APPLICABILITY

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
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NOTE: Pruning should occur during the following times:

Herbaceous perennials: March 1 to May 31 and September 1 to October 1

Warm season grasses: March 1 to May 31

Cool season grasses: Anytime beside summer



EQUIPMENT & MATERIALS

- High-visibility safety vest
- Hand pruners
- Work gloves
- Loppers
- Safety glasses

Must Be Done with DEP Staff

Supplemental Planting



INSTRUCTIONS

A DEP gardener will instruct you when a rain garden needs plants. With DEP help, follow the steps below to install new plants:

- Lay out plant materials as instructed by the field supervisor.
- Dig a hole slightly wider than the planting container, and about as deep.
- Remove leftover root materials or plants that may be in the way of new plantings.
- Gently break up the root ball at the base.
- Install the new plant in the planting hole.
- Replace the soil carefully so that the top of the root ball remains level with the surrounding soil.
- Water the plant thoroughly (see "**Watering**" section).



(Left) Pot-bound roots should be carefully teased apart. (Right) The planting hole should be dug wider than the planting container.



WHERE TO ADD PLANTS

Add new plants to planting bed as necessary



KEY INFORMATION

- New plants require an increased level of care during the first growing season.
- Alert the field supervisor of any potentially hazardous materials (sharp objects, chemicals, petroleum residue) mixed in with debris or soil.
- Refer to **Section 4 – Tools and Safety** for further safety guidance.



IMPORTANCE OF SUPPLEMENTAL PLANTING

- A healthy plant canopy shades plant roots and keeps the underlying soil moist.
- A full cover of desirable plants helps to prevent weed growth.



SEASONAL APPLICABILITY

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
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NOTE: Plants should be installed within the following time frames:

Fall

Evergreen Shrubs: September 1 to October 15

Deciduous Shrubs: October 15 to December 1

Herbaceous Perennials: August 15 to September 15

Spring

Evergreen Shrubs: April 1 to May 15

Deciduous Shrubs: March 1 to May 31

Herbaceous Perennials: March 1 to May 31



EQUIPMENT & MATERIALS


- | | |
|--|--------------------------------------|
| <input type="checkbox"/> High-visibility safety vest | <input type="checkbox"/> Soil knife |
| <input type="checkbox"/> Work gloves | <input type="checkbox"/> Hand trowel |
| <input type="checkbox"/> Safety glasses | <input type="checkbox"/> Garden hose |
| | <input type="checkbox"/> Shrub rake |







APPENDIX
WEED
IDENTIFICATION
AND MANAGEMENT





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The list below identifies some of the most common weeds that grow in rain gardens. Weeds not shown may also appear in rain gardens, so talk to your field supervisor to see if an unfamiliar plant needs to be weeded. Refer to New York State Prohibited and Regulated Invasive Plants (2014) available at https://www.dec.ny.gov/docs/lands_forests_pdf/isprohibitedplants2.pdf for additional information.



WEED	CHARACTERISTICS	MANAGEMENT
<p>Common Ragweed (<i>Ambrosia artemisiifolia</i>)</p>  <p><small>Image credit: Umass Extension</small></p>	<ul style="list-style-type: none"> • Annual weed 3' tall • Deeply divided, spear-shaped leaves • 1/8" tall flower spikes start green and turn yellow as seeds ripen • Blooms July–October • Seeds can persist for 5 years 	<ul style="list-style-type: none"> • Remove entire plant by pulling out root before seed set in late summer
<p>Mugwort (<i>Artemisia vulgaris</i>)</p>  <p><small>Image credit: Umass Extension</small></p>	<ul style="list-style-type: none"> • Annual weed 3' tall • Deeply divided leaf and leaflets • Older stems can turn purple 	<ul style="list-style-type: none"> • Remove entire plant by pulling out root before seed set in late summer
<p>Prostrate Spurge (<i>Chamaesyce maculata</i>)</p>  <p><small>Image credit: Umass Extension</small></p>	<ul style="list-style-type: none"> • Annual weed growing less than 12" tall • Highly branched, mat-shaped plant • Small opposite leaves with a reddish blotch at middle of upper surface • Blooms June–October 	<ul style="list-style-type: none"> • Remove entire plant by digging out slender taproot
<p>Lambsquarters (<i>Chenopodium album</i>)</p>  <p><small>Image credit: Umass Extension</small></p>	<ul style="list-style-type: none"> • Annual weed 18" tall • Deeply toothed leaves • Stems have many colors (light blue green to striped with purple and green) • Greenish flowers bloom from June – October 	<ul style="list-style-type: none"> • Remove entire plant by digging out root



WEED	CHARACTERISTICS	MANAGEMENT
<p>Canada Thistle (<i>Cirsium arvense</i>)</p>  <p style="writing-mode: vertical-rl; transform: rotate(180deg); font-size: small;">Image credit: Memorize</p>	<ul style="list-style-type: none"> • Invasive perennial weed 1'–3' tall • Crinkly leaves with numerous pale thorns • Lavender pompom-like flowers bloom from July to September 	<ul style="list-style-type: none"> • Remove entire plant by pulling out underground stem
<p>Horseweed (<i>Erigeron canadensis</i>)</p>  <p style="writing-mode: vertical-rl; transform: rotate(180deg); font-size: small;">Image credit: Umass Extension</p>	<ul style="list-style-type: none"> • Annual weed 7' tall • The plant stalk is tall and has long, pointed leaves all along its length • Small white flowers on highly branched stem flower from July to September 	<ul style="list-style-type: none"> • Remove taproot and secondary fibrous roots before seed set
<p>Hairy Galinsoga (<i>Galinsoga quadriradiata</i>)</p>  <p style="writing-mode: vertical-rl; transform: rotate(180deg); font-size: small;">Image credit: Umass Extension</p>	<ul style="list-style-type: none"> • Annual weed 1' tall with hairy, oppositely arranged, sharply toothed leaves • Small white with 3-toothed petals bloom from June to October 	<ul style="list-style-type: none"> • Remove entire plant by pulling out fibrous roots
<p>Carpetweed (<i>Mollugo verticillata</i>)</p>  <p style="writing-mode: vertical-rl; transform: rotate(180deg); font-size: small;">Image credit: Umass Extension</p>	<ul style="list-style-type: none"> • Annual weed less than 12" tall • Plants grow as a circular mat with wiry stems • The leaves are arranged in a circular pattern at joints on the stems • Small white flowers bloom from May–October 	<ul style="list-style-type: none"> • Remove entire plant by pulling out small, branched taproot

WEED	CHARACTERISTICS	MANAGEMENT
<p>Common Plantain (<i>Plantago major</i>)</p>  <p style="writing-mode: vertical-rl; transform: rotate(180deg); font-size: small;">Image credit: UMass Extension</p>	<ul style="list-style-type: none"> • Perennial weed 6"-10" tall • Oval, ribbed leaves are arranged in a roselike form • Multiple small white flowers bloom from May to October on flower spikes 	<ul style="list-style-type: none"> • Remove entire plant by pulling out fibrous roots.
<p>Japanese Knotweed (<i>Polygonum cuspidatum</i>)</p>  <p style="writing-mode: vertical-rl; transform: rotate(180deg); font-size: small;">Image credit: UMass Extension</p>	<ul style="list-style-type: none"> • Perennial weed up to 10' tall • Hollow stems with large 4"-6" round leaves come to a point at tip • Spikes of white flowers bloom in late summer 	<ul style="list-style-type: none"> • If the plant is small, it can be manually removed by pulling. Larger infestations can only be removed by multiple applications of herbicide.
<p>Bristled Smartweed (<i>Persicaria longisetia</i>)</p>  <p style="writing-mode: vertical-rl; transform: rotate(180deg); font-size: small;">Image credit: Digital Atlas VA</p>	<ul style="list-style-type: none"> • Annual weed up to 2' tall • Stems are sprawling and have numerous long, oval shaped leaves • Small, pink, grapelike cluster of 1" spike flowers bloom from July to September 	<ul style="list-style-type: none"> • Remove entire plant by pulling out shallow branching taproot.
<p>Bitter or Broad-Leaf Dock (<i>Rumex obtusifolius</i>)</p>  <p style="writing-mode: vertical-rl; transform: rotate(180deg); font-size: small;">Image credit: UMass Extension</p>	<ul style="list-style-type: none"> • Perennial weed 1'-3' tall • Leaves with wavy margins grow in a roselike pattern early in the season but bolt (grow upright) later in the season • Flowers in June and October • Produces reddish seeds that can last for 50 years in the soil 	<ul style="list-style-type: none"> • Remove entire plant by digging out taproot.

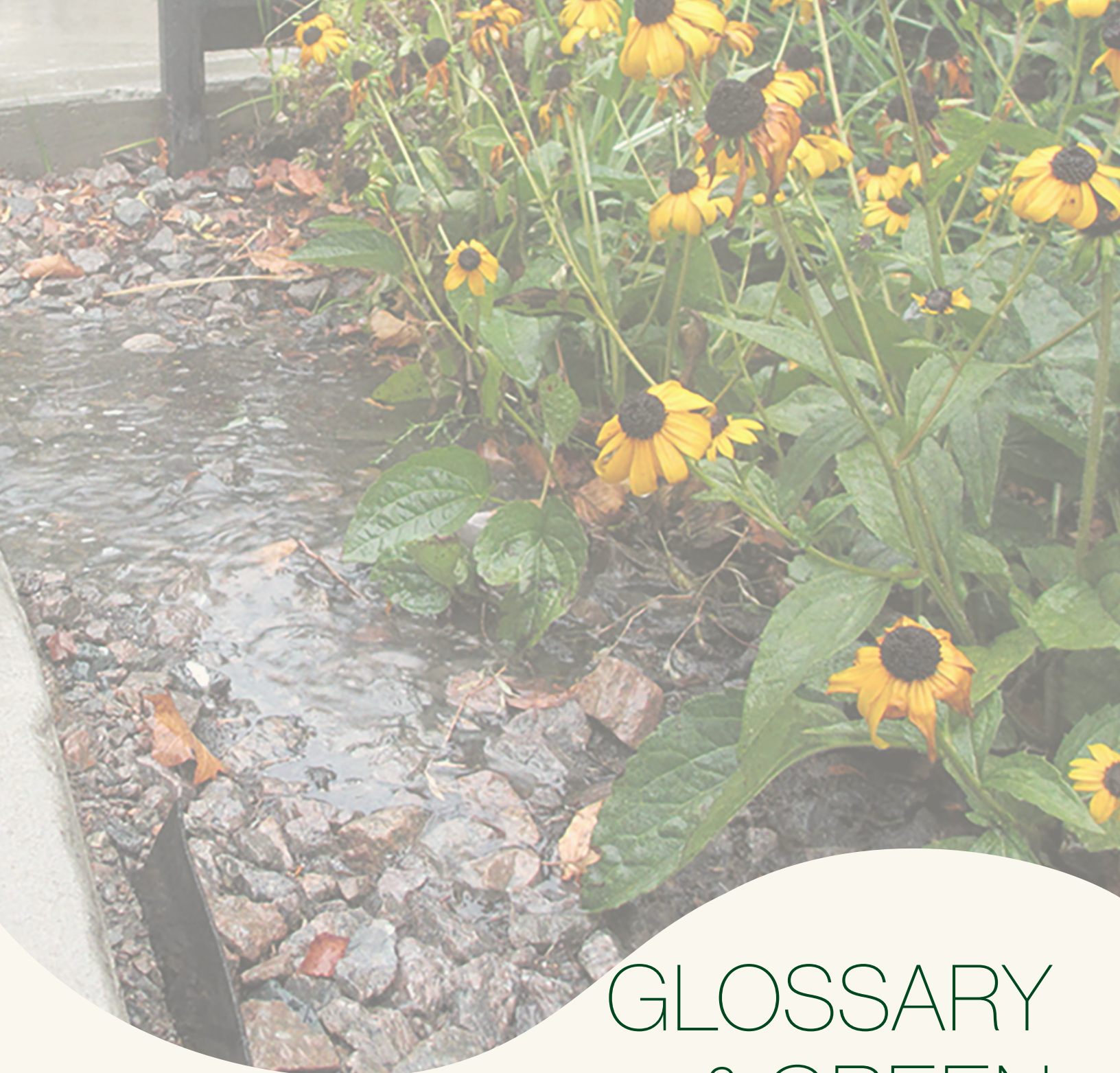
WEED	CHARACTERISTICS	MANAGEMENT
<p>Annual Sowthistle (<i>Sonchus oleraceus</i>)</p>  <p><small>Image credit: Umass Extension</small></p>	<ul style="list-style-type: none"> • Annual weed 1'–1½' tall • Leaves are toothed and are arranged around the stem • Plants grow as a low roselike form, but can have upright flower stalks. • Yellow flowers bloom from July–September 	<ul style="list-style-type: none"> • Remove entire plant by digging out taproot
<p>Dandelion (<i>Taraxacum officinale</i>)</p>  <p><small>Image credit: Umass Extension</small></p>	<ul style="list-style-type: none"> • Perennial weed 10"-12" tall • Leaves have toothed margins and grow in a roselike form • Yellow flowers on stalks bloom from June to October 	<ul style="list-style-type: none"> • Remove entire plant by digging out taproot, ideally before seed set
<p>Smooth Brome (<i>Bromus tectorum</i>)</p>  <p><small>Image credit: Dean Gulstad</small></p>	<ul style="list-style-type: none"> • Perennial cool season grass 2'–4' tall • Leaves have a wrinkle resembling a "W" midway through the leaf blade • Seed produced in semi-compact 5" long seed heads 	<ul style="list-style-type: none"> • Remove entire plant by pulling out rhizomes
<p>Yellow Nutsedge (<i>Cyperus esculentus</i>)</p>  <p><small>Image credit: Umass Extension</small></p>	<ul style="list-style-type: none"> • Perennial grasslike plant 2'–2½' tall • Stems are triangular in cross section • Yellow seed heads 	<ul style="list-style-type: none"> • Remove entire plant by pulling out rhizomes before seed set in April and May

WEED	CHARACTERISTICS	MANAGEMENT
<p>Barnyardgrass (<i>Echinochloa crus-galli</i>)</p>  <p style="writing-mode: vertical-rl; transform: rotate(180deg); font-size: small;">Image credit: Umass Extension</p>	<ul style="list-style-type: none"> • Annual grass up to 5' tall • Stems are thick and have reddish joints • Leaves are rolled into shoots • Reddish seedheads are coarse looking 	<ul style="list-style-type: none"> • Remove entire plant by pulling out fibrous root
<p>Japanese stiltgrass (<i>Microstegium vimineum</i>)</p>  <p style="writing-mode: vertical-rl; transform: rotate(180deg); font-size: small;">Image credit: Forestry Services</p>	<ul style="list-style-type: none"> • Invasive annual grass 2'–3½' tall with a sprawling habit • Leaves are pale green, lanced shaped, and have shiny midrib • Flowers bloom in early fall from August to October • Seeds grow in the spring 	<ul style="list-style-type: none"> • Hand pull entire plant and tillers (running roots) • Large infestations require chemical control
<p>Giant foxtail (<i>Setaria faberi</i>)</p>  <p style="writing-mode: vertical-rl; transform: rotate(180deg); font-size: small;">Image credit: Wikipedia</p>	<ul style="list-style-type: none"> • Clump-forming annual grass 3'–4' tall • Has round stem • Nodding seed heads are hairy and fluffy, resembling a fox tail 	<ul style="list-style-type: none"> • Remove entire plant by pulling rhizomes
<p>Johnson grass (<i>Sorghum halepense</i>)</p>  <p style="writing-mode: vertical-rl; transform: rotate(180deg); font-size: small;">Image credit: Rutgers Ag Experimentation Station</p>	<ul style="list-style-type: none"> • Perennial grass up to 6' tall • Hairless leaves are rolled and are attached to a round stem • Has thick, fibrous roots 	<ul style="list-style-type: none"> • Remove plant pulling rhizomes

WEED	CHARACTERISTICS	MANAGEMENT
<p>Barberry (<i>Berberis thunbergii</i>)</p>  <p style="writing-mode: vertical-rl; transform: rotate(180deg); font-size: small;">Image credit: Panoramic</p>	<ul style="list-style-type: none"> • Invasive shrub 2'–8' tall • Small greenish blue to purplish leaves are attached to brown, densely grooved stems with sharp spines • Pale yellow flowers in umbrella-shaped clusters bloom in spring • Bright red, round fruits are eaten by wildlife 	<ul style="list-style-type: none"> • Dig out entire plant carefully
<p>Shrub honeysuckle (<i>Lonicera spp.</i>)</p>  <p style="writing-mode: vertical-rl; transform: rotate(180deg); font-size: small;">Image credit: QuateGram</p>	<ul style="list-style-type: none"> • Invasive shrub 6'–15' tall • 1–2½" egg shaped leaves are oppositely arranged • White, fragrant, tubular flowers, usually in pairs, bloom in early to late spring • Reddish fruits ripen in summer and are eaten by birds and small animals 	<ul style="list-style-type: none"> • Dig out entire plant including roots
<p>Wineberry (<i>Rubus phoenicolasius</i>)</p>  <p style="writing-mode: vertical-rl; transform: rotate(180deg); font-size: small;">Image credit: New England Wildflower Society</p>	<ul style="list-style-type: none"> • Invasive shrub with 3'–9' long canes (flexible stems) with sharp spines • Purple hairs cover stems • Leaves are serrated (sawlike) leaflets • Small greenish flowers bloom in spring and red fruit clusters ripen in June and July • Seeds are spread by birds and mammals 	<ul style="list-style-type: none"> • Carefully remove plant by digging out root and runners
<p>Multiflora rose (<i>Rosa multiflora</i>)</p>  <p style="writing-mode: vertical-rl; transform: rotate(180deg); font-size: small;">Image credit: Appalachian/Ohio Weed Control Partnership</p>	<ul style="list-style-type: none"> • Invasive perennial shrub with prickly stems • Leaves divided into 5–11 smaller leaves • White clusters of flowers bloom in late spring from May–June • Leathery red fruits ripen in late summer • Plants can grow by seed or by stem touching soil and forming roots 	<ul style="list-style-type: none"> • Carefully remove plant by digging out root and runners

WEED	CHARACTERISTICS	MANAGEMENT
<p>Asiatic Tearthumb (<i>Persicaria perfoliata</i>)</p>  <p style="writing-mode: vertical-rl; transform: rotate(180deg); font-size: small;">Image credit: Wikimedia</p>	<ul style="list-style-type: none"> • Invasive annual vine climbing to 10' or more • Arrow-shaped leaves have small spines at the tips • Purple fruits are borne from mid-July to frost 	<ul style="list-style-type: none"> • Manually remove entire vine before fruiting. Note: Wear gloves as thorns can irritate skin.
<p>Pale swallow-wort (<i>Cynanchum rossicum</i>)</p>  <p style="writing-mode: vertical-rl; transform: rotate(180deg); font-size: small;">Image credit: Wikimedia Commons</p>	<ul style="list-style-type: none"> • Invasive perennial vine climbing to 10' or more • Has paired, dark green leaves • Red-brown to maroon star-shaped flowers bloom from June to August • Feathery seed heads are spread by wind 	<ul style="list-style-type: none"> • Manually remove entire plant including root • Large infestation requires chemical control

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GLOSSARY
& GREEN
INFRASTRUCTURE
TERMS

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Glossary & Green Infrastructure Terms

Below are terms used throughout this manual as well as additional terms that you may come across in regard to green infrastructure through interaction with DEP staff or during training for the Rain Garden Stewardship Program. For more information contact DEP at raingardens@dep.nyc.gov or visit nyc.gov/raingardens.

Absorption	The act or process by which one thing gradually takes in or soaks up a liquid or another substance.
Bedrock	The bottom layer of earth consisting of unbroken solid rock.
Blue Roof	Rooftops designed without vegetation for the primary purpose of detaining stormwater by creating temporary ponding and gradual release of the stormwater.
Catch Basin	Type of drain structure located next to the curb that collects stormwater runoff; designed to alleviate street flooding and efficiently capture stormwater that falls on streets and discharge it into the sewer system. There are more than 144,000 catch basins in New York City.
Cistern	A tank used for storing rainwater. It can be placed above or below ground.
Combined Sewer Overflow	A mix of excess stormwater and untreated sewage flow that discharges directly into public waterways at combined sewer outfalls.
Combined Sewer System	A sewer system that collects both sewage flow and stormwater runoff from properties and streets.
Compacted Soil	Dense soil; usually caused by pressure that displaces air and liquids from the pores between soil grains.
Engineered Soil	Specifically designed sandy soil that promotes the infiltration of stormwater.
Evaporation	The process by which a liquid becomes a vapor or a gas.
Evapotranspiration	Loss of water from the soil both by evaporation from the soil surface and by transpiration from the leaves of the plants growing on it.
Green Infrastructure	Practices designed and constructed to manage stormwater runoff; controls stormwater by collecting stormwater runoff before it enters sewer systems or local water bodies.
Green Roof (Vegetated Roof)	A vegetative layer on a roof that grows in specially designed soil to capture stormwater that falls on the roof.
Groundwater	Water located underground in pore spaces in soil and openings in rock.
Impervious	Not capable of being penetrated by stormwater.
Infiltration	The process by which stormwater gradually passes into soil or other porous media.
Inlet	A part of a rain garden that directs stormwater runoff into the vegetated area.
Municipal Separate Storm Sewer System (MS4)	A sewer system that collects stormwater runoff from properties and streets separate from the wastewater system.
Outfall	The discharge point of a waste stream into a body of water.
Permeable Pavement	Paving materials and techniques that allow stormwater to seep into spaces in or between the paving materials and infiltrate into the ground; also called porous pavement.

Pollutants	Harmful substances such as oils, chemicals, sediments, and trash that can contaminate or dirty water, air, and land.
Precipitation	Water that is released from the atmosphere, such as rain, sleet, or snow.
Public Health	The methods and sciences of preventing disease, prolonging life, and promoting health and well-being in society.
Rain Garden	Vegetated or landscaped depressions designed with an engineered soil layer that promotes infiltration of stormwater runoff into the underlying soil. May also be referred to as “bioswales.”
Right-of-Way	The public area between the two property lines along the street that includes the sidewalks and paved roadway.
Slope	A surface of which one end is at a higher level than another; to slant up or down.
Stormwater	Any water that originates from a precipitation event.
Stormwater Greenstreet	A street feature built with larger or multiple green infrastructure systems to create a corridor that manages stormwater while providing aesthetic value or traffic calming benefits.
Stormwater Runoff	Water from precipitation that lands on rooftops, parking lots, streets, sidewalks, and other impervious surfaces, and runs into sewer systems or local water bodies.
Rain Barrel	A rainwater harvesting tool that catches stormwater and connects to the existing downspout of a roof.
Rainwater Harvesting	Method of stormwater management that uses storage containers to catch and store stormwater from roofs and other impervious surfaces. Examples include cisterns and rain barrels.
Right-of-Way (ROW) Bioswale	A planted area in the sidewalk with a standardized design that collects and manages stormwater runoff from streets and sidewalks when it rains.
Right-of-Way (ROW) Rain Garden	See Right-of-Way (ROW) Bioswale
Sanitary Flow	Wastewater from buildings that is carried by the sewer system to wastewater treatment plants.
Saturated Soil	Soil with high water content that cannot absorb or infiltrate any more water.
Stormwater Detention	The act of holding back stormwater for a period of time before it is released into the sewer system.
Stormwater Management	Techniques aimed to mitigate the negative consequences caused by stormwater runoff.
Stormwater Retention	Continued holding of stormwater without releasing it into the sewer system.
Subsurface Detention System	A system that provides temporary storage of stormwater runoff underground. The system can have either an open bottom to allow water to infiltrate into the ground or a closed bottom to only detain water and release it slowly through a control structure.
Tributary	Smaller waterway, such as a stream or canal, that feeds into a larger body of water.
Uncompacted Soil	Loose, porous soil.
Unsaturated Soil	Dry soil; soil with low water content.

Urban Heat Island Effect	The phenomenon in which urban areas are warmer than other areas due to the presence of dark surfaces and asphalt pavement in cities that absorb light and radiation.
Vegetation	Plant life or total plant cover of an area or specific green infrastructure practice.
Wastewater	The used water from any combination of human uses, including domestic, commercial, industrial, and agricultural activities that must be treated before being released to the environment; also called sewage.
Water Cycle	The processes by which water evaporates from land and water bodies, condenses into rain or snow in the atmosphere, and falls back to the surface as precipitation.
Water Quality	The biological, chemical, and physical conditions of a body of water; a measure of a waterway's ability to support beneficial uses.
Watershed	The land that drains, or sheds, water to a particular stream, river, lake, or reservoir. It is a land feature that can be identified by tracing a line along the highest elevations between two areas, often a ridge.
Waterway	A body of water such as a river, stream, or canal.
Weir	A dam or barrier that slows down the flow of stormwater.

