



TOWN OF
SAUGUS
MASSACHUSETTS

Town of Saugus, Massachusetts

MS4 Green Infrastructure and Low Impact Development Report

**An Assessment of Green Infrastructure and Low Impact
Design Guidelines in the Town of Saugus**

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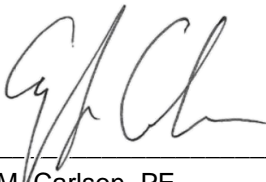
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Acronyms and Abbreviations

DPW	Department of Public Works
DCIA	Directly Connected Impervious Areas
EPA	United States Environmental Protection Agency
GI	Green Infrastructure
IA	Impervious Area
IDDE	Illicit Discharge Detection and Elimination
LID	Low Impact Development
MCM	Minimum Control Measure
MS4	Municipal Separate Storm Sewer System
NPDES	National Pollutant Discharge Elimination System
ROW	Rights of Way

1 Introduction

The Town of Saugus, Massachusetts, with a population of 28,385 (2018), is a suburban community with urban pockets located 10 miles north of the City of Boston. The Town's proximity to Boston, coastal beaches, major regional highways, and well-maintained public facilities makes Saugus a thriving community.

The Town of Saugus is a listed permittee under the 2016 National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) permit. The permit includes a required assessment report of each permittee's rules, regulations, and local ordinances which address green infrastructure and low impact development (GI & LID) practices within their jurisdiction. The present report, fulfilling this requirement, reviews the various rules, regulations, and local ordinances which influence the development of green infrastructure. As required by the permit, recommendations, and implementation schedule of the recommendations are provided.

1.1 MS4 Permit

The Town's stormwater is discharged to surface waterbodies throughout Saugus and is covered by the MS4 permit, which became effective on July 1, 2018. The Town is currently in Year 4 of the 5-year MS4 permit term. The MS4 Permit includes six (6) minimum control measures (MCMs) that must be addressed by the Stormwater Management Program. These minimum control measures are:

- MCM 1 – Public Education and Outreach
- MCM 2 – Public Involvement and Participation
- MCM 3 – Illicit Discharge Detection and Elimination (IDDE) Program
- MCM 4 – Construction Site Stormwater Runoff Control
- MCM 5 – Stormwater Management in New Development and Re-development
- MCM 6 – Good Housekeeping and Pollution Prevention for Permittee Owned Operations

As part of the MCM 5 – Stormwater Management in New Development and Re-development requirements, the Town must develop a report which assesses local regulating documents surrounding GI & LID practices. This report is due by the end of Year 4 of the NPDES MS4 permit term, on June 30, 2022. The requirements of this report, per the MS4 permit, are:

“Within four (4) years from the effective date of the permit, the permittee shall develop a report assessing existing local regulations to determine the feasibility of making, at a minimum, the following practices allowable when appropriate site conditions exist:

- Green roofs;*
- Infiltration practices such as rain gardens, curb extensions, planter gardens, porous and pervious pavements, and other designs to manage stormwater using landscaping and structured or augmented soils; and*
- Water harvesting devices such as rain barrels and cisterns, and the use of stormwater for non-potable uses.*

The assessment should indicate if the practices are allowed in the MS4 jurisdiction and under what circumstances are they allowed. If the practices are not allowed, the permittee shall determine what hinders the use of these practices, what changes in local regulations may be made to make them allowable, and provide a schedule for

implementation of recommendations. The permittee shall implement all recommendations, in accordance with the schedules, contained in the assessment. The permittee shall report in each annual report on its findings and progress towards making the practices allowable.”

There are several primary goals of evaluating regulatory documents which promote the use of green infrastructure and using low-impact development design principles, they are:

1. reducing the hydraulic loading on stormwater conveyance infrastructure,
2. reducing the potential for flooding,
3. extending the useful life of existing stormwater infrastructure, and
4. reducing contaminant loading in natural waterways.

2 Regulatory Documents in Saugus

A review of the current language in relevant local bylaws and regulations was performed to identify improvements and changes to encourage expanded use of GI and LID in the future. Saugus currently has the following relevant regulatory document in the Town:

- **Stormwater Bylaw (2018)** and **Stormwater Management Rules and Regulations (2018)**, govern stormwater management during construction activities and stormwater management requirements for new development and re-development within the town. Bylaw Section 705.00 Stormwater was adopted in 2018.
- **Rules and Regulations Governing the Subdivision of Land (2010)** govern subdivision site are outlined in Sections 2, 4, and 5 of these regulations.
- **Zoning Bylaws of the Town of Saugus, Massachusetts (May 2021)** provides requirements for building rehabilitation and site design, as well as impervious area requirements. Town Zoning Bylaws Articles 17 – Historic Mills Mixed Use Overlay District, Article 18 – Waterfront Mixed Use Overlay District, and Article 21 – Business Highway Sustainable Development Zoning District were reviewed as part of this assessment.
- **Wetland Protection Bylaw (2001)** protects the wetlands, water resources, and contiguous land areas of the Town of Saugus by controlling activities deemed to have a significant effect upon wetland values.
- Additional relevant bylaws were reviewed, they include: Town Zoning Bylaws Section 6.8 – Hillside Protection, and Article 12 – Special Permits and Conditions.

Each regulatory document was reviewed for language which directly impacts the accessibility and feasibility of implementing the three primary GI and LID practices outlined in the MS4 permit:

1. Green Roofs,
2. Infiltration Practices, and
3. Rainfall Harvesting.

Opportunities for adjustment to the Regulations and Bylaws are described in detail in Section 4.




3 Local Considerations and Challenges

3.1 Guidance for Green Infrastructure & Low Impact Design

There exists a broad range of design concepts and land-use planning concepts which can be classified as Green Infrastructure and Low Impact Design. An extensive list of Green Infrastructure and Low Impact Design elements which are encouraged by the United States Environmental Protection Agency (EPA) in multiple land-use conditions such as individual residential properties, subdivisions, municipal uses, etc, are provided in Table 1. The priority benefits of properly installed and properly maintained Green Infrastructure as defined by the EPA include: Cleaner Waterways, Enhanced Water Supplies, Community Benefits, Reduced Urban Temperatures, and Cleaner Air.


The design concepts highlighted in Table 1 have been divided into practice areas identified within the MS4 Permit requirements for this report (Green Roofs or Green Building practices, Rainwater Harvesting, and Infiltration practices).

Table 1. Design Elements of Green Building Practices

MS4 Practice Area	Design Element	Description	
Green Roofs/ Green Building	Green Roofs	Roofs covered with vegetation that absorbs rainfall and promotes infiltration.	
Green Roofs/ Green Building	Urban Tree Canopy	Planting of trees to promote interception of rainwater and its absorption in leaves.	
Green Roofs/ Green Building	Land Conservation	Protection of open space reduces flooding risk and improves water quality through natural filtration and absorption.	

MS4 Practice Area	Design Element	Description	
Rainwater Harvesting	Rain Barrels	Storage system that accumulates rainwater to be used for non-potable applications in future.	
Infiltration & Rainwater Harvesting	Downspout Disconnection	Redirection of rooftop drainage into rain barrels, cisterns, or permeable areas as opposed to stormwater drainage systems.	
Infiltration	Rain Gardens	Areas in which stormwater runoff can naturally infiltrate ground; basins designed to soak up runoff.	
Infiltration	Planter Boxes	Rain gardens situated in parking lots, sidewalks, or streets; effective in areas with limited space.	
Infiltration	Vegetated Swales and Bioswale	Drainage channels designed to convey, treat, and promote infiltration of runoff.	
Infiltration	Permeable Pavements	Porous or permeable materials allow stormwater runoff to infiltrate the surface.	

MS4 Practice Area	Design Element	Description	
Infiltration	Green Streets & Alleys	Integration of several methods of infiltration and provide space for stormwater accumulation (e.g., Permeable pavement street, bioswale, & rain garden on a block of a neighborhood).	
Infiltration	Green Parking	Integration of aspects parking lot design (e.g., Permeable pavement, rain gardens, & bioswales in a parking lot design).	
Infiltration	Constructed Wetlands	Similar to natural wetlands, filter stormwater and contribute to habitats for wildlife.	
Infiltration	Riparian Buffers	Protect areas where development is prohibited from disturbances.	
Infiltration	Vegetated Filter Strips	Dense areas of vegetation that direct runoff, commonly used in sloped areas.	
Infiltration	Sand and Organic Filters	Utilizes sand to remove contaminants from stormwater before entering the groundwater.	

MS4 Practice Area	Design Element	Description	
Infiltration	Bioretention Areas	Landscaped basins designed to pond rainwater and runoff and allow it to naturally infiltrate into the ground.	

4 Review of Improvement Alternatives

The following section outlines opportunities for improvement to existing regulatory documents governing GI & LID design elements during land development and re-development within Saugus.

The review of regulating documents for the Town of Saugus did not identify any barriers to implementation of green infrastructure, low impact design principles, green roofs, or rainwater harvesting. As such, the following recommendations are provided as opportunities to increase the application of these design elements where appropriate.

The Department of Public Works relies heavily on consultants and contractors to assist with implementation of stormwater management program components. The DPW would require additional resources (funding and/or staffing) allocated to the department to implement any improvements in the Town's regulatory documents or programs around green infrastructure.

4.1 Stormwater Management

The Stormwater Bylaw and Stormwater Management Rules and Regulations provide robust requirements for stormwater management in new developments and re-development. The rules require new and re-development sites to capture and treat stormwater runoff generated during specified precipitation events and/or remove specified percentages of Total Suspended Solids and Total Phosphorus in accordance with the MS4 permit. The regulatory documents also require that non-structural stormwater management strategies be implemented to the maximum extent practicable for new and re-development projects. Non-structural stormwater management strategies include minimizing impervious surfaces, providing low-maintenance landscaping that encourages retention, and other techniques. Low Impact Development (LID) site planning and design strategies must also be used to the maximum extent practicable.

The Town of Saugus has implemented an inter-departmental working group known as the Stormwater Committee which consists of Town department heads/representatives who typically review development projects that meet quarterly to review upcoming development projects to ensure they are meeting the requirements of various relevant permits and regulations within Town. These meetings are an opportunity to increase the level of community commitment to green building practices. It is recommended that the Stormwater Committee and those charged with reviewing developments continue to review applicants' proposed non-structural stormwater management strategies and ensure developments are meeting the goals of the Stormwater Management regulatory documents. Applicants should prove that GI & LID techniques are not feasible if they are not proposed, and the Town can consider implementing a waiver process for GI & LID to strengthen this requirement.

Further, when the Stormwater Management Rules and Regulations are updated in the future, it is recommended that the Purpose section specifically identify encouragement of GI and LID practices as a purpose of the regulations.

4.2 Green Roofs & Green Building Practices

The Town of Saugus regulatory documents do not limit the application of green roofs (where feasible), and actively require or encourage the use of green building techniques in three specific zoned districts.

Currently, the Zoning Bylaws in Saugus require or promote GI & LID practices, along with innovative and sustainable site design, in the following districts:

- Historic Mills Mixed Overlay District (Article XVII Section 17)
 - *“As feasible, building rehabilitation and site design will incorporate green building techniques (such as those developed by the U.S. Green Building Council) and Low Impact Site design techniques aimed at protecting and enhancing the existing natural resources and buffer zones, particularly the areas adjacent to the Saugus River.”*
- Waterfront Mixed Use Overlay District (Article XVIII / Section 18)
 - *“As feasible, building rehabilitation and site design shall incorporate green building techniques (such as those developed by the U.S. Green Building Council) and Low Impact Site design techniques aimed at promoting coastal resiliency while protecting and enhancing the existing natural resources and buffer zones, particularly the areas adjacent to the Saugus River, Pines River, waterfront and estuaries. Developers seeking a special permit are required to review appropriate resources including the guidance document, Development Strategies for Promoting Coastal Resiliency and Sustainability, published by the Saugus River Watershed Council in conjunction with Geosyntec Consultants and the Massachusetts Environmental Trust. A copy of the document will be available on the Town of Saugus’ website.”*
- Business Highway Sustainable Development Zoning District (Article XXI / Section 21)
 - *“It is desirable that new buildings incorporate green building techniques (such as those developed by the U.S. Green Building Council) to the maximum extent possible.”*

In addition to language requiring and encouraging the use of applicable green infrastructure technology, the Town’s Bylaws also consider impacts of tree removal and clearing on erosion and runoff dynamics on hillsides (Hillside Protection District).

It is recommended that the Town assess the feasibility and applicability of extending similar regulating language from the Historic Mills Mixed Overlay District, Waterfront Mixed Use Overlay District, and Business Highway Sustainable Development Zoning District to the remaining zoned areas of the Town as a way to improve the application of green building techniques and low impact site design practices.

4.3 Infiltration Practices

The Town has numerous regulating documents which outperform EPA recommendations for required impervious cover in new developments. Decreasing the percent of impervious cover will increase the opportunities for infiltration. The Town of Saugus has also developed the *MS4 Street Design and Parking Lots Report* in tandem with the development of the present report. That report includes an extensive review of opportunities to limit expansion of impervious cover in the Town with an emphasis on increasing opportunities for infiltration.

Further, the Town’s stormwater management regulatory documents require developers to retain, infiltrate, or treat stormwater in accordance with MS4 permit performance standards. Developers are also required to employ LID techniques to the maximum extent practicable. The Massachusetts Wetlands Protection Act requires those with projects under the jurisdiction of the Saugus Conservation Commission to comply with the state’s Stormwater Standards, which include infiltration and groundwater recharge requirements.

The Town should continue to ensure that stormwater management and wetlands protection bylaws and associated regulations are enforced during development.

4.4 Rainwater Harvesting Devices

The Town of Saugus does not have regulatory language which inhibits the use of water harvesting devices such as cisterns or rain barrels. However, the Town also does not encourage or require the use of rainwater harvesting devices. Encouraging the use of these devices by homeowners or larger property managers for non-potable applications, such as landscaping, will decrease the volume of runoff entering the municipal system and promote on-site use and infiltration.

As an enhancement to the Town's stormwater program, the Town could consider developing public education materials and placing them on the Town's Stormwater Management webpage and at existing town building kiosks informing the public of the benefits of rainwater harvesting. This is likely to increase the utilization of such techniques.

Additionally, many towns in Massachusetts including nearby Lynn and Wakefield participate in the Great American Rain Barrel Company's community program for discounted purchasing and distribution of residential rain barrels to help residents conserve water and save on their water bills while also promoting rainwater harvesting practices. The Great American Rain Barrel Co. is a local food importing company that has been repurposing shipping drums into Rain Barrels since 1988. The Great American Rain Barrel Co. has been an approved vendor by the MASS DEP since 2010. The community program sets up program dates, takes orders and payments, and delivers rain barrels to the Town for a specified distribution event. The Town typically provides a storage location and set distribution date. This type of program could only be implemented in Saugus with additional resources (staffing) allocated to the DPW.

4.5 Incentivizing Green Infrastructure

To encourage the adoption of green infrastructure or low impact development elements, incentives are crucial for communities. Figure 1 highlights incentives from the EPA's Municipal Handbook, *Managing Wet Weather with Green Infrastructure*, that can be enticing for communities or developers and can be used to promote positive changes in development in a relatively short period of time.

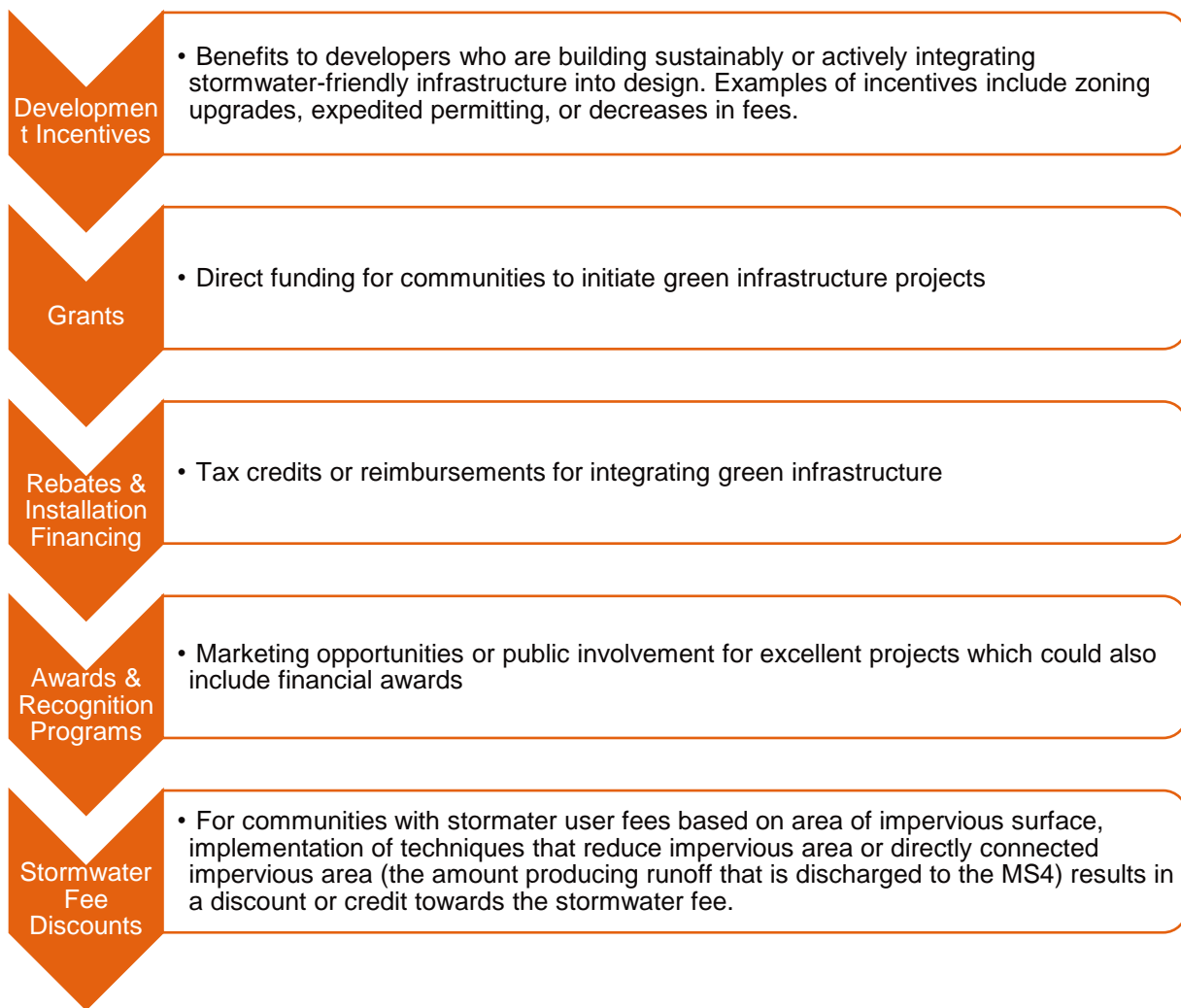


Figure 1. Sample Incentives for Stormwater-Friendly Infrastructure

In the State of Massachusetts, low impact development site design credits apply to projects that are subject to the Wetlands Protection Act and State Stormwater Standards. Site design credits are an incentive to encourage implementation of GI or LID into project plans. There are three types of credits that can be awarded as stated in Volume 3 Chapter 1 of the Massachusetts Stormwater Handbook.

- Credit 1, Environmentally Sensitive Development, rewards developers who scale down developments to preserve natural space on site.
- Credit 2, Rooftop Runoff Directed to Qualifying Areas, involves routing rooftop runoff to pervious areas where it can infiltrate instead of running off to municipal stormwater systems.
- Credit 3, Roadway, Driveway, or Parking Lot Runoff Directed to Qualifying Areas, which routes runoff from impervious roadways, driveways, and parking lots to pervious areas where vegetation provides filtration, and the ground provides exfiltration.

5 Recommendations and Implementation Schedule

The Town of Saugus has an existing robust approach to stormwater management and many established rules and regulations which promote application of innovative and sustainable site design, development, and re-development. There are also potential opportunities to improve regulatory documents, design standards, and public education to further encourage low impact development practices and improve stormwater runoff quantity and quality.

The recommendations below are provided in order of priority with proposed implementation schedules. The implementation schedule for changes to the rules and regulations allows for studies to determine exact parameters for inclusion in regulatory language. Recommended priority grading is based on the largest impacts and were assigned based on the following criteria:

- Anticipated impact to stormwater runoff
- Feasibility, effectiveness, and ease of implementation
- Impact to community
- Desirability

Recommendations of this report are listed in order of priority:

1. Continue regular interdepartmental Stormwater Committee meetings to review projects and ensure proper enforcement of existing regulatory and permit requirements for employing GI & LID techniques in new development and re-development. The schedule for this recommendation is to continue this ongoing management practice.
2. Implement impervious area reduction regulatory recommendations per *MS4 Street Design and Parking Lots Report*, which was developed in tandem with the present report. These recommendations should be completed within between 2 and 10 years, see *Street Design and Parking Lots Report* for detailed breakdown.

In addition to the two recommendations to remove barriers to LID within the Town of Saugus stated above, the list below provides opportunities to further encourage LID during development. These recommendations are not required as part of the Town's MS4 permit, rather they are provided as information for future improvements to be pursued at the discretion of the Town, and as funding and staff resources allow.

1. Review districts and project types which are not currently required to incorporate green building techniques, and/or which would not be subject to the Stormwater Management Bylaw (less than 1 acre) or Wetlands Protection Bylaw (not under Wetlands Protection Act jurisdiction). Assess the feasibility and applicability of extending similar regulating language from the Historic Mills Mixed Overlay District, Waterfront Mixed Use Overlay District, and Business Highway Sustainable Development Zoning District to the remaining zoned areas of the Town as a way to improve the application of green building techniques and low impact site design practices.
2. Create rainwater harvesting public education materials for the Town of Saugus Stormwater Management webpage. Make materials available at existing Town building kiosks.
3. Evaluate a rain barrel distribution community program, such as the program offered by the Great American Rain Barrel Company, to determine if the Town would like to participate.
4. Evaluate opportunity to have the Town provide incentives to those who employ GI practices in excess of minimum requirements or where requirements are absent.

References

Image References for Table 1.

Design Element	Image Reference
Green Roofs	https://www.epa.gov/green-infrastructure/what-green-infrastructure#downspoutdisconnection
Urban Tree Canopy	https://www.google.com/url?sa=i&url=https%3A%2F%2Fwww.nrs.fs.fed.us%2Furban%2Futc%2F&psig=AOvVaw3r24LyD0LflbrFKIyP79kf&ust=1622818913709000&source=images&cd=vfe&ved=0CAMQjB1qFwoTCNjAgKPe-_ACFQAAAAAdAAAAABAD
Land Conservation	https://www.epa.gov/green-infrastructure/what-green-infrastructure#downspoutdisconnection
Rain Barrels	https://www.mass.gov/files/styles/embedded_full_width/public/rainwater_harvesting_1.jpg?itok=VXtKSk6M
Downspout Disconnection	https://www.researchgate.net/profile/Arturo-Casal-Campos/publication/280493291/figure/fig2/AS:614338012405760@1523481004135/Figure-S5-An-example-of-roof-downspout-disconnection-Source-US-EPA.png
Rain Gardens	https://bloximages.newyork1.vip.townnews.com/swnewsmedia.com/content/tncms/assets/v3/editorial/5/1b/51b1a1cf-4638-5446-95af-562b91445475/5e6ba15e8eb4a.image.jpg?resize=1200%2C900
Planter Boxes	https://semcog.org/desktopmodules/SEMCOG.Publications/GetFile.ashx?filename=LowImpactDevelopmentManualforMichiganSeptember2008.pdf#270
Vegetated Swales and Bioswale	https://www.watershedcouncil.org/uploads/7/2/5/1/7251350/2155340_9_orig.jpg
Permeable Pavements	https://www.epa.gov/sites/production/files/styles/medium/public/2015-09/permeable_pave_rev.jpg
Green Streets & Alleys	https://nacto.org/docs/usdg/2000_green_streets_epa.pdf
Green Parking	https://www.emht.com/news/2017/february/emht-engineers-dream-big-designing-a-sea-sized-green-parking-lot-to-manage-a-sea-of-stormwater/
Constructed Wetlands	https://www.biomatrixwater.com/wp-content/uploads/2019/02/aerial-wetland.jpg
Riparian Buffers	https://upload.wikimedia.org/wikipedia/commons/thumb/b/b6/Riparian_buffer_on_Bear_Creek_in_Story_County%2C_Iowa.JPG/330px-Riparian_buffer_on_Bear_Creek_in_Story_County%2C_Iowa.JPG
Vegetated Filter Strips	https://megamanual.geosyntec.com/npsmanual/image/vegetatedfilterstrips.jpg
Bioretention Areas	https://upload.wikimedia.org/wikipedia/commons/e/ed/Bioretention_cell_rain_garden_US_winter.jpg

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