

Testimony of
Angela Licata, Deputy Commissioner
New York City Department of Environmental Protection
before the
New York City Council
Committee on Environmental Protection, Resiliency, and Waterfronts
Nature-Based Solutions for Climate Resiliency and Disaster Preparedness
May 7, 2025

Good afternoon, Chair Gennaro and members of the Committees on Environmental Protection, Resiliency, and Waterfronts. I am Angela Licata, Deputy Commissioner of Sustainability at the Department of Environmental Protection (DEP). I am joined today by Deputy Commissioner of Public Affairs and Communication Beth DeFalco and several other colleagues from DEP and the Department of Parks and Recreation to talk about nature-based solutions for climate resilience and disaster preparedness.

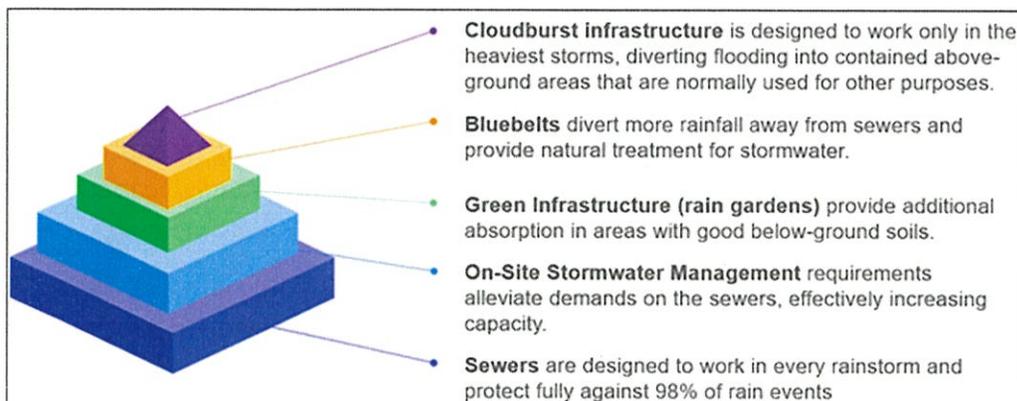
DEP has a long-standing history of using nature-based solutions to improve harbor water quality. Newer systems focus on managing stormwater in areas that are prone to flooding. Nature-based solutions can be advantageous when they are brought on-line more quickly and with less construction disruption than long-term sewer construction. They can also have meaningful local improvements, like creating natural habitats for local wildlife.

Before we talk more about these tools, we should talk about our changing climate.

Stormwater

Climate change is bringing more severe and frequent rainstorms to New York City. In 2020, NOAA reclassified New York City from a “coastal temperate” zone to a “humid subtropical” climate zone – a recognition that we now live in a different world than we were in a few decades ago.

These more severe rainstorms have brought new challenges to our stormwater management system.





Sewers (Gray Infrastructure)

Traditionally, sewers (often referred to as “gray infrastructure”) are the main line of defense in a storm. New York City has approximately 7,500 miles of sewers, which were designed to effectively manage stormwater for a temperate climate.

Our sewers continue to protect fully against 98% of rain events, but the system is not designed to handle the most extreme storms we now face. The sewer system can get overwhelmed when the amount of water produced by the storm is greater than the capacity of the pipes. That generally means that most of sewers can handle between 1.5 and 1.75 inches of rain per hour. This used to be rare for most of the city but is now a regular occurrence.

We have to expand our stormwater management system if we want to meet the needs of today, let alone tomorrow. Upsizing sewers alone is not financially and logistically feasible.

Building above ground is almost always cheaper and faster than building below. Our best strategy is to use a combination of both gray and green infrastructure in the right place and measure.

Green Infrastructure

Green infrastructure absorbs water into the ground in areas with good soil. It can also green neighborhoods, improve air quality, reduce extreme heat, and provide habitats for pollinators.

What green infrastructure **can't** do alone is capture and move as much stormwater as our sewers. And can't be used everywhere. Because the systems rely on water infiltrating naturally into the ground, green infrastructure can only be used where soil conditions allow infiltration. If an area is mostly bedrock or has a high groundwater table, for example, the water cannot be absorbed.

There are many forms of green infrastructure, including rain gardens and infiltration basins, large scale median projects, porous pavement, daylighting projects, and cloudburst management systems. We have installed these assets in public right-of-way areas, in partnerships with Parks, schools, and others, and have facilitated installations on private properties as well.

Our green infrastructure program started in 2012 to mitigate combined sewer overflows (CSOs). CSOs occur when combined sewers (those that manage both stormwater and wastewater) are inundated with so much stormwater that the system's capacity is exceeded and untreated water is released into a local waterway.

What we found is that green infrastructure also reduces street flooding by capturing and slowing stormwater before it enters the sewer system, freeing up drainage capacity and reducing CSOs.

A few years ago, we started to identify opportunities where we could site and design green infrastructure to go above and beyond CSO reduction to help our sewers perform in areas

where additional storage can reduce flooding. You'll find these strategies in large, underutilized medians and also as part of our cloudburst management program that we'll discuss below.

With over 16,000 green infrastructure assets constructed and over \$1.4 billion committed, the NYC Green Infrastructure Program is now the largest of its kind in the nation and continues to grow. In 2024 alone, we added 2,500 green infrastructure assets in our city through a combination of rain gardens and infiltration basins in our sidewalks, as well as new green infrastructure on public and private lots.

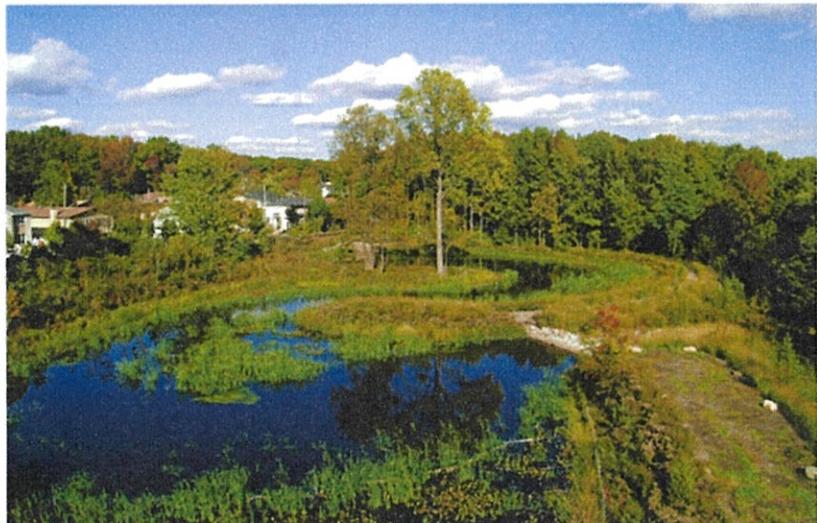
Different Types of Green Infrastructure and Nature-Based Solutions

In keeping with the topic of the hearing today, I would like to tell you a little bit about how DEP uses nature-based tools and discuss implementation challenges.

Bluebelts

DEP's Bluebelt program dates back to the early 1990s. Bluebelts are ecologically rich stormwater best management practices that work in tandem with our sewer infrastructure. They incorporate natural or engineered water features such as streams, ponds, and wetlands to convey, store, filter, and slow the flow of stormwater to manage and alleviate/prevent flooding. As an added benefit, Bluebelts include open spaces with native vegetation that reduce runoff and pollution and provide wildlife habitat.

Bluebelts are connected to storm sewer pipes, so they are part of the sewer system. They work with nature, preserving or restoring natural drainage corridors like streams, ponds, and wetlands, using these natural systems to store and filter stormwater. In addition to these stormwater benefits, bluebelt networks help improve the city's ecological health and, in some cases, provide community amenities.



Bluebelt in Blue Heron Park, Staten Island

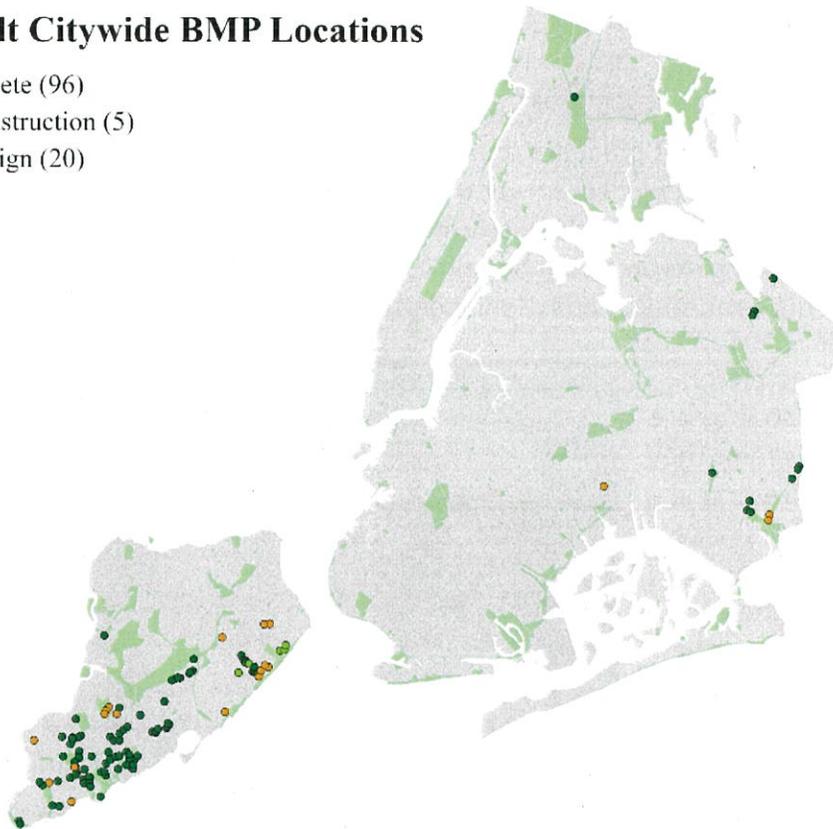
As Bluebelts use wetlands and ponds to manage stormwater, they are primarily sited at locations with existing waterbodies and separate storm sewer networks. Most of them are on Staten Island, because Staten Island has more intact watercourses and waterbodies than the other boroughs. Over the last ten years, DEP has built Bluebelts for approximately one third of Staten Island's land area. In Staten Island, we are continuing to build out Bluebelts in New Creek, Lemon Creek, Arden Heights, and Butler Manor watersheds. USACE is commencing construction of Bluebelts in South Beach Watershed of Staten Island as part of the interior drainage of their South Shore of Staten Island Seawall.

DEP has completed 96 Bluebelts assets across three boroughs. In addition to Staten Island, DEP has created some Bluebelts in Queens and the Bronx and is looking to expand the program in other boroughs. DEP is currently analyzing potential Bluebelts sites for implementation in the current 10-year plan.

DEP looks for opportunities to implement Bluebelts in watersheds near to flood-vulnerable areas. Many times, these flood vulnerable areas are nearby or within existing or historic waterways. These are often located on NYC Parks property, so DEP is partnering with Parks to identify opportunities where parkland could provide the space necessary to detain stormwater. Where there is no obvious Parks partnership, DEP looks for other city-owned or vacant land opportunities.

Bluebelt Citywide BMP Locations

- Complete (96)
- In Construction (5)
- In Design (20)



In addition to the stormwater and flooding benefit, the Bluebelt program is also a community amenity. The majority of Bluebelt sites are open to the public and offer an open space experience. The public can access the sites via gravel walking paths that afford access to green spaces rich with wildlife, wildflowers, and wetlands. The program also leads multiple educational tours each year and hosts an annual citizen science project where local students learn hands on about fish migration, water quality, and scientific methods. A popular Adopt-A-Bluebelt project gives the community an opportunity to get involved by adopting sites and keeping them free of litter and weeds. The Bluebelt program also supports local community groups each year by sponsoring clean-up events on City properties.

Rain Gardens, Green Medians, Porous Pavement

Green infrastructure comes in a variety of shapes and sizes, including curbside rain gardens, greened medians with underground stormwater retention, porous pavements, and infiltration basins.

Each of these installations, or assets, allows water to flow in and then seep through layers of engineered soil and stone into the ground underneath.

Green Infrastructure Medians on Beach 67th St, Rockaway



Medians under construction, August 19, 2022
Source: NYC Water flickr



New green infrastructure, May 10, 2023
Source: NYC Water flickr

We have installed more than 16,000 green infrastructure assets in public right-of-way (ROW) areas around the city. The majority of these (about 7,000) are rain gardens.

We are building more than just the rain gardens you see in our sidewalks and porous pavements on streets. We have also retrofitted over 250 public parks, playgrounds, and NYCHA properties with green infrastructure and we have over 100 additional properties in planning and design. This includes projects funded through our public-private partnership with the Trust for Public Land, which has delivered 54 green community schoolyards.

Information about various types of green infrastructure and a map of ROW assets around the city are included at the end of this testimony.

As we have spoken about before, maintaining green infrastructure is critical; it can also be a challenge. We strive to keep our rain gardens healthy and performing by visiting rain gardens every 4-6 weeks. Rain gardens are designed so that water flows into them. If there is litter on the street, that water can bring litter into the garden. As you might imagine, high pedestrian traffic areas tend to accumulate litter in the rain gardens. We use a data driven approach to maintenance crew deployment and routing. Where our inspection data shows high-need areas, we send crews more frequently and where the data show less need, we deploy crews less frequently. We also supplement litter control with borough-based contractor support.

More time spent on litter control means less crew time available for other work like soil enhancement, tree pruning, plantings and horticultural services that are important for maintenance staff recruitment, job satisfaction, training and advancement.

Private Property

We cannot meet the city's stormwater management needs with infrastructure only in public space. There must be stormwater management systems on private property, as well, so DEP provides financial incentives for installing green infrastructure on private property.

Through our capitolly funded GI Grant Program, we've funded projects at 32 different sites – primarily building green roofs. To complement this program and fund even more green infrastructure on private lands, in 2021 we launched Resilient NYC Partners. This program offers an innovative pay for performance contract, to fund even larger projects on private lands with large amounts of site level impervious area. Property owners who have participated in our program include Green-Wood Cemetery, H+H Jacobi Medical Center, and Pratt Institute. DEP is currently working on a project at the Brooklyn Navy Yard and is coordinating with several new potential partners.

**PS 50 Southeast Queens Green Playground
GI Renovation**



Source: [NYC Water flickr](#)

Stormwater Rule

The City alone cannot manage stormwater because most property in the city is privately owned. That makes the Unified Stormwater Rule one of our new most powerful tools for onsite stormwater management. Started in early 2022, it requires every site that disturbs 20,000 square feet or more of soil or adds 5,000 square feet or more of new impervious surfaces to maintain a certain amount of stormwater on their site.

They must submit a stormwater pollution prevention plan, or a SWPPP, which requires controls to be in place during construction to protect our sewers and waterbodies and the use of green



infrastructure for runoff reduction strategies. As sites redevelop, they are performing better during wet weather than they were before development.

Since this rule was implemented, over 1,400 sites are meeting the new onsite stormwater management requirements, and an additional 200 sites have constructed or will soon be constructing green infrastructure to further reduce their stormwater runoff.

Examples of these projects can be found all over the city. One example includes 585 Union Street in Gowanus. This nine-story, 230,000-square-foot building will occupy the entire lot. Before the stormwater rule was in effect, a development like this likely would have just managed stormwater in an underground detention tank. With our rule, they are building a 6,000-square-foot green roof and a robust detention system. We even noticed them touting their green roof under building amenities on their website.

Daylighting

We also have our largest green infrastructure project to date nearing design completion, the Tibbetts Brook daylighting project. Tibbetts Brook originates in Yonkers and flows through Van Cortlandt Park in the Bronx before discharging into Hester and Piero's Mill Pond. In the early 1900s the brook was diverted into an 8-foot-diameter tunnel that connects to a combined sewer flowing to Wards Island WRRF. Burying streams and creeks and merging them with sewers underground was a common strategy as our city developed, but a century later we are experiencing unforeseen consequences. Flowing a waterway into a combined sewer reaches that sewer's capacity quickly. The Tibbetts Brook connection has led to significant issues over the years. Instead of building more infrastructure, like storage tanks, to try to hold a brook, we are going to daylight the brook – disconnecting it from the sewer and allowing it to flow more naturally.

Once completed, not only will this project reduce combined-sewer overflows to Harlem River by 220 million gallons a year, but it will allow for the creation of a new public greenway between Van Cortlandt Park and West 230rd Street and enhancing connectivity and access as part of the Empire State Trail.

Cloudburst Management Systems

A cloudburst is a sudden, heavy downpour in a short amount of time. Cloudbursts can overburden the sewer system and cause flooding. Cloudburst management systems capture stormwater until the sewers can handle the flow.

Cloudburst management projects often feature special community amenities and open spaces that can be used by the public on dry days. For example, the cloudburst project designed for NYCHA's South Jamaica Houses is a sunken basketball court that will absorb and divert stormwater during future storms. Most days, the basketball court will provide recreation for residents. During cloudburst events, the stormwater will intentionally be diverted to the court,

which will hold the water safely until the rain is over, taking that rainwater off the street and out of the sewers.



Cloudburst hubs are large scale cloudburst projects, generally designed for a multi-block area where directing, collecting, storing, and transferring stormwater can have a meaningful benefit on localized flood attenuation and the added benefit of CSO reduction. We use existing land and retrofit public spaces to allow for more enhanced stormwater management. These can be implemented more quickly than larger nature-based solutions that may rely on identification of vacant lands or property acquisition. These projects require close coordination with our colleagues at Parks, DOT, DOE, SCA, and NYCHA.



Status of Cloudburst Hubs			
Hub	Status	Construction Start (FY)	Source of Funding (City v Fed)
Corona	In design	FY27	City + FEMA BRIC
Kissena	In design	FY27	City + FEMA BRIC
Parkchester	In design	FY27	City
East New York	In design	FY27	City
Brownsville	Design start FY26	FY28	Mostly federal – HUD CDBG-DR
Montbellier	Design start FY29	FY32	City (CoY)

Status of Cloudburst Projects			
Project	Status	Construction Start (FY)	Source of Funding (City v Fed)
South Jamaica Houses	In construction	FY25	City
St Albans ROW	In design		City
Rufus King	Construction procurement	FY26	City
Archie Spigner	Construction procurement	FY26	City
Clinton Houses	Construction procurement	FY26	Construction is FEMA BRIC

Stormwater Master Plan and 2024 Stormwater Analysis

DEP’s green and gray infrastructure teams are coordinating to develop a stormwater master plan for New York City that will lead to a more resilient system overall. This comprehensive stormwater master plan that will assess necessary upgrades, engineer amended drainage plans, and set funding priorities. This planning process will take years, but the result will be targeted approaches to capital investments, including nature-based solutions where it could help manage surface flooding and longer-term gray infrastructure upgrades.

In 2024, DEP released the [2024 Stormwater Analysis](#), which is the first building block for the master plan. This stormwater management update highlighted the City’s challenges with managing stormwater in a changing climate and examined stormwater challenges and solutions in four case study locations.

Of course, stormwater management cannot be done by DEP in a silo. Work will need to be coordinated among city agencies. Fundamental policy decisions will need to be made, in particular the acceptable levels of service and the level of acceptable flooding in our environment. DEP’s work will inform these decisions.



Financing (including BRIC grants)

Most of DEP's work is paid for by water and sewer rates. We constantly think about how we balance our needs, the demands of New Yorkers for better services and especially floodwater protection, and the need to manage our water rates to be affordable.

DEP aggressively pursues outside funding for our work, and we have had strong successes receiving funding, including federal funding. In particular, our cloudburst projects have been receiving Building Resilient Infrastructure and Communities (BRIC) grants from FEMA. The federal government recently announced that FEMA is ending the BRIC program and canceling all BRIC applications from Federal Fiscal Years 2020 through 2023. We are still figuring out what impact this may have. We remain in close conversation with our city and state partners as it pertains to our federal funding streams and will work with these partners to try to mitigate and minimize impact as much as possible.

Legislation

Before I conclude, I will speak briefly about the two pieces of legislation being heard today. We have been discussing the bills with your staff, and look forward to continued discussions.

The first bill on today's agenda is **Int. 1253**, which would require DEP to notify the local Council Member 30 days before installing a bioretention system in a right-of-way. We generally support this bill, but want to make some edits. The Department of Design and Construction (DDC) manages most of DEP's GI projects. DEP and DDC both recognize the importance of speaking with the community and elected officials, and we have robust outreach plans already in place. We have spoken to DDC about this bill and are happy to supplement these outreach plans to fill any gaps. We would like to continue discussions with DDC and the Council to determine the best way to do that and to make some changes to the bill before it is passed.

The second bill is **Int. 1254**, which would require DEP to install 2,400 greened acres in MS4 areas by 2035. As we discussed with your staff last week, we are fully committed to expanding GI across the city, but we oppose the GI requirements in this bill.

As a quick background for those listening, MS4 stands for Municipal Separate Storm Sewer System. In this system, separate pipes carry wastewater and stormwater. In contrast, in combined sewer areas, wastewater and stormwater are carried by a single pipe. Approximately 60% of the city has combined sewers, and 40% are MS4 areas.

Our first concern is that we disagree with the use of greened acres as a metric. When our GI program began in 2012, there was a greened acre target, but we have since realized that greened acres are not a good metric, because the concept of greened acres does not fully capture what GI does. The greened acre metric has been removed from our CSO consent order with the state and replaced with reporting on the efficacy of our GI installations. We continue to report greened acres in our [NYC Green Infrastructure Annual Report](#) for informational and comparative purposes, but we do use it as a metric for meeting our goals.



Another concern is that we do not know if GI is the best tool to address stormwater management and water quality needs in all MS4 areas. As I have described today, DEP has developed a suite of tools, because different tools are best suited for different goals and for different areas. Mandating a fixed amount could be counterproductive because it could require us to install GI where it is not going to be effective.

Finally, the bill's mandate may not even be achievable. For the past 13 years, we have been installing GI across combined sewered areas. With our 16,000 assets, we have just reached 2,800 greened acres. The bill requires nearly the same amount of greened acres to be installed in MS4 areas over the next 10 years. There may simply not be enough space in MS4 areas. A minority of the city is MS4, and GI is not appropriate for much of the area. For example, we know that many areas with separate sewers in the city, like Southeast Queens, have high groundwater tables, which makes them ineligible for GI.

We share the Council's goal of expanding stormwater management infrastructure through MS4 areas, and we appreciate the Council's continued support of our efforts. We have already started installing GI in strategic MS4 areas, such as schoolyards and street medians, with partners like DOT, DOE, and Trust for Public Land.

As the Council is aware, it is important to remember that, while green infrastructure provides many community benefits, the goal of the program is not to simply green the city. These are engineered systems that are built to enhance the way the city manages stormwater, by reducing CSOs, improving water quality, and reducing flooding where possible.

Thank you again to the Council, especially to this committee and Chair Gennaro, for your continued support of nature-based solutions for stormwater management and other challenges. My colleagues and I are now happy to answer any questions that you have.

Examples of Green Infrastructure

Rain Gardens



Rain gardens resemble typical curbside tree beds but are engineered to capture and store up to 2,500 gallons of rainwater that then percolate into the ground, preventing flooding.

Infiltration Basins



Infiltration basins are designed to store and absorb rainwater into the ground below, but at sidewalk level they have a walkable surface that blends into the surrounding conditions.

Greened Medians / Stormwater Greenstreets



Greened medians, or Stormwater Greenstreets, are planted areas designed to collect and manage stormwater that runs off the streets and sidewalks. Unlike curbside rain gardens, these are typically constructed in the roadway, are usually larger than rain gardens, and have varying lengths, widths and soil depths based on the characteristics of the existing roadway.

Permeable Pavement



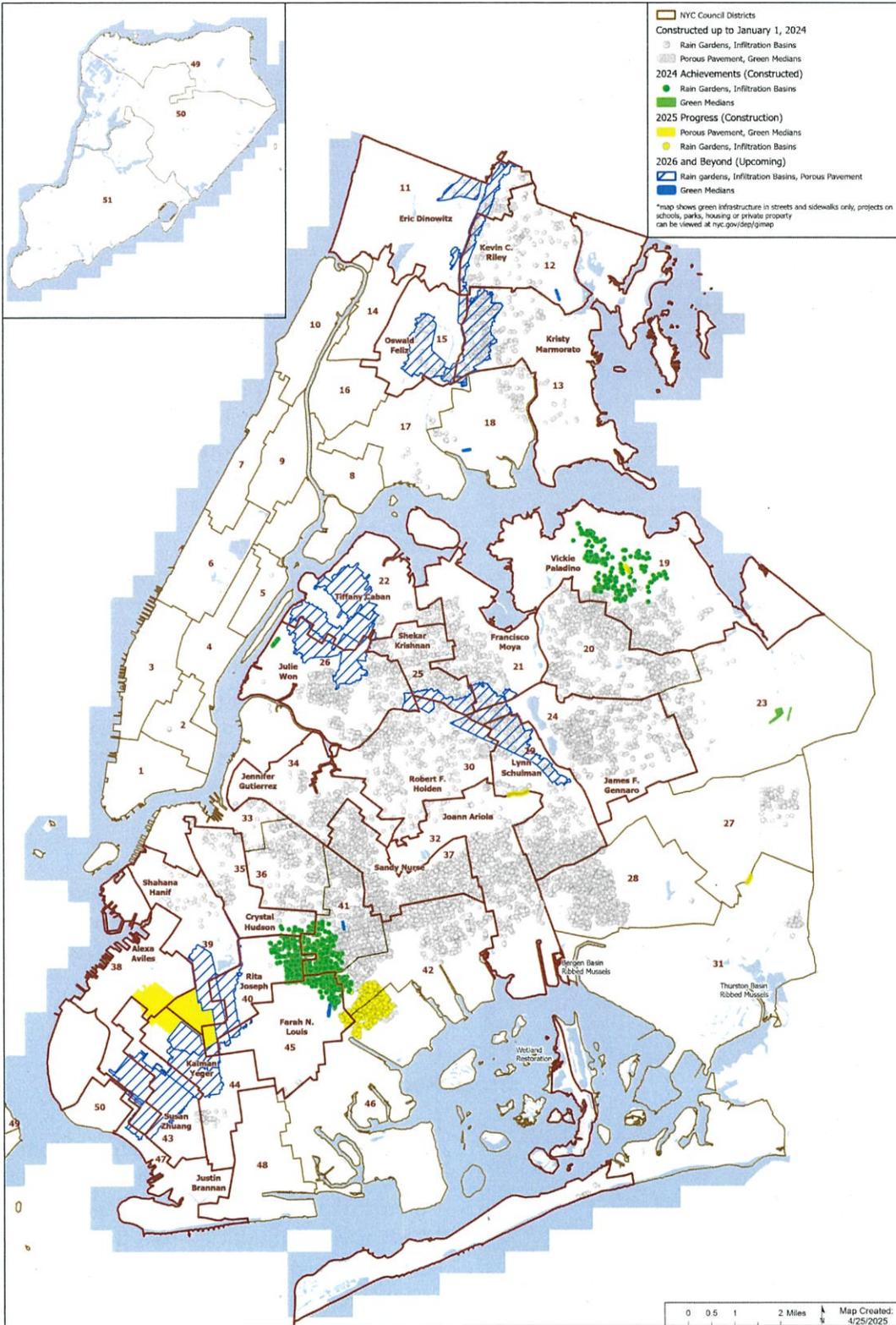
Permeable pavers and porous concrete allow water to seep in between the paving materials and be absorbed into the ground. DEP installs porous concrete in parking lanes in residential neighborhoods.

Green Roofs



Green roofs are made up of a top vegetative layer that grows in an engineered soil, which sits on top of a drainage layer. A green roof can be “intensive,” with thicker soils that support a wide variety of plants, or “extensive,” covered in only a light layer of soil and minimal vegetation.

2025 ROW GI Program Update



Committee on Environmental Protection Resiliency and Waterfronts Oversight Hearing Testimony

May 8th, 2025

At City Parks Foundation, we lead free sports, arts, environmental education, and community building programs - including Partnerships for Parks, a joint program with NYC Parks. Our programs encourage New Yorkers to use and care for our neighborhood parks and green spaces. Recognizing the importance of accessible and equitable parks, we're also a proud member of the Play Fair Coalition - working to ensure that parks remain inclusive, fair, and enjoyable for all city residents.

While I understand this committee does not oversee the NYC Parks budget directly, the success of the city's first-ever Urban Forest Plan is deeply connected to NYC Parks and also to this committee's work. This plan is a critical tool for public health, climate adaptation, and environmental justice - all of which are currently under threat due to local and national budget cuts.

Through the Urban Forest Plan, New York City is committed to reaching 30% tree canopy cover across all boroughs. That goal is not arbitrary - it's rooted in the very real power of trees to mitigate against extreme heat. Trees can lower neighborhood temperatures by as much as 45 degrees during extreme heat events. In a city where more than 500 people die from preventable heat-related deaths every year, this canopy is a literal lifeline. And as climate change intensifies, these deaths—and the deep disparities behind them—will only grow.

The Urban Forest Plan will lay out a clear blueprint to grow, maintain, and equitably distribute our city's tree canopy across public and private land, from streets to schoolyards, homes to campuses. It will outline strategies to:

- Prioritize historically underserved neighborhoods that suffer most from heat, flooding, and air pollution;
- Strengthen public health through cooling, air quality improvements, and green infrastructure;
- Engage residents and local stakeholders in shaping and stewarding their urban forest;
- Integrate canopy goals into broader citywide climate resilience and stormwater strategies.

At City Parks Foundation, we are proud to be leading the community engagement portion of the plan's development, working closely with the Mayor's Office of Climate & Environmental Justice, NYC Parks, the Natural Areas Conservancy, and other city and community stakeholders. Just recently we kicked off our first community input sessions on Staten Island and in Far Rockaway, Queens. We're ensuring local voices - especially in the neighborhoods most impacted by environmental inequities - are at the center of this process.

But without staff to carry out the Plan, the long term success of this work is at serious risk.



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The Mayor's preliminary budget proposes cutting 125 forestry and natural areas staff positions from NYC Parks. These are the very people – arborists, maintenance crews, natural resource staff – who will make the Urban Forest Plan possible. City Parks Foundation is doing our part, coordinating engagement, building partnerships, and supporting communities. But this can't be done with volunteers alone. NYC cannot scale or sustain a citywide climate strategy without a trained, stable workforce.

That's why I'm urging this committee to be a champion for the Urban Forest Plan. I am asking you to use your voice to call for full funding and interagency collaboration to implement the Plan. The Urban Forest Plan cannot be an unfunded mandate. If we let it fail, it will be a step backward in protecting the communities and infrastructure this committee is tasked with safeguarding.

Thank you.



New York City Council

Oversight: Nature-Based Solutions for Climate Resiliency and Disaster Preparedness

Committee on Environmental Protection, Resiliency and Waterfronts

May 7, 2025

Testimony By: Emily Walker, Natural Areas Conservancy, Senior Manager of External Affairs

My name is Emily Walker, and I am the Senior Manager of External Affairs at the Natural Areas Conservancy (NAC). Thank you to Chair Gennaro—and the members of the Committee on Environmental Protection, Resiliency and Waterfronts—for the opportunity to submit testimony.

We are submitting this testimony to speak about the importance of investing in the city's existing natural areas, which constitute approximately 11% of New York City's land, and one third of our parks system. The 12,000 acres of natural forests, grasslands, and wetlands within the city's park system provide a myriad of benefits to New York, but we are concerned that ongoing disinvestment in their care will result in the loss and degradation of these important resources.

Our research has found that natural forests and wetlands contain 5 million of our city's 7 million trees, capture 70% of its carbon, and absorb almost 25% of the city's stormwater. Our natural forests have also been found to be almost 13 degrees cooler than surrounding streetscapes during extreme heat events, offering respite and cooling benefits to local communities citywide.

These numerous benefits, however, require a level of care and management that cannot be sustained with current levels of City funding for our natural areas. In the FY25 Adopted Budget, the Natural Resources Group lost 51 forest management positions. These positions represented approximately 80% of the on-the-ground staff with the necessary training and knowledge to restore and manage our natural forests.

In 2024, the NAC and NYC Parks conducted the second Ecological Assessment (EA) of our forested natural areas, and found troubling signs of declining forest health in the decade since our first EA was completed. We found invasive vines present in 92% of the forest plots that our researchers surveyed, and also found that our forest midstory is showing a decline in the number of native tree species. Both of these data points indicate that forest regeneration is suffering in our natural areas. The vast presence of vines is also a reflection of insufficient staffing to care for our forests - with more permanent on-the-ground staff for forest care, NYC Parks would better be able to manage this threat to our trees.

The City is currently in the process of creating NYC's first Urban Forest Plan, required by Local Law 148. This law mandates that the City meet a 30% canopy target for the five boroughs. Simply put, the City will be unable to meet this goal if we allow our mature forests to go unmanaged due to a lack of staff. We believe that the City must step up and allocate \$2.5M in funding to restore and baseline these positions in the FY26 budget.

NYC's wetlands also provide crucial protection for coastal frontline communities, helping to absorb carbon and attenuate flood risk. In a city that has lost 99% of its historic freshwater wetlands and 90% of its salt marshes, the importance of preserving our remaining wetlands cannot be overstated. However our EA findings for NYC's salt marshes show an alarming loss of



190 acres of wetlands since 1974 . It is of vital and urgent importance that the city do more to proactively preserve and protect our existing tidal salt marshes and wetlands. More staff is needed for ongoing monitoring and management, and we also urge the city to explore new approaches to wetland mitigation with our regulatory partners at the NYS Department of Environmental Conservation.

We believe that healthy natural areas are a key component to protecting the city from some of the worst impacts of climate change, but the chronic disinvestment in natural areas management shows that policy makers are not doing enough to conserve these spaces. We urge the Council to consider these crucial benefits as we approach the final stretch of budget negotiations. Thank you again for your leadership and for the opportunity to express our support for increased investment in NYC Parks and our natural areas.





New York City Environmental Justice Alliance Testimony for NYC Council Committee on Environmental Protection, Waterfronts and Resiliency's oversight hearing on Nature-Based Solutions for Climate Resiliency and Disaster Preparedness

May 7, 2025

Good afternoon members of the council. My name is Shравanthi Kanekal and I'm the Senior Resiliency Planner at the New York City Environmental Justice Alliance. We acknowledge the leadership of Chair Gennaro and other members of the committee who support and encourage the use of nature-based solutions to build climate resilience and address a range of climate and environmental justice issues and thank you for holding a hearing on this important topic.

The New York City Environmental Justice Alliance (NYC-EJA) is a citywide membership network linking grassroots organizations from low-income communities of color in their struggle for environmental justice. NYC-EJA empowers its member organizations to advocate for improved environmental conditions and against inequitable environmental burdens by the coordination of campaigns to inform City and State policies. Through our efforts, member organizations coalesce around specific common issues that threaten the ability for low-income communities of color to thrive.

NYC-EJA is a leading member of [Forest for All NYC](#), a coalition of over 170 organizations committed to helping the city reach 30% tree canopy cover citywide by 2035 in an equitable manner. Reaching this goal will require sustained and baselined funding for the staff and programs which care for and grow the NYC urban forest.

As a proponent of creative and multifaceted green infrastructure solutions for mitigating various climate and environmental hazards like flooding, poor air quality, and heat-related emergencies and other threats in NYC's most environmentally burdened communities, NYC-EJA is a long standing supporter of the use of nature based solutions for climate resiliency and disaster preparedness. There are a range of related co-benefits associated with the use of nature based solutions, including improved air quality, reducing temperatures in urban heat-vulnerable communities, carbon sequestration, and biodiversity benefits, as well as benefits to society such as improved health outcomes, job creation, and reduced energy consumption (which in turn can reduce energy cost burdens on low income households).

Extreme heat is the leading cause of weather-related deaths in NYC. Each summer, an estimated 580 New Yorkers die prematurely because of extreme heat in New York City. Black New Yorkers are more likely to die from heat stress, with death rates two times higher than

among white New Yorkers. With scientists and researchers predicting warmer summer temperatures in the coming years, the City must deploy more nature-based solutions, that are equitably distributed, to address the severe conditions that lay ahead. Black and Brown communities in New York have access to [33 percent less](#) park space than residents in largely white neighborhoods. The disproportionate heat burden and risks that environmental justice and frontline communities experience due to the lack of trees and green space, increased pavement, and air pollution underscores the significance of and need for green infrastructure in these neighborhoods.

Incorporating nature-based solutions and their multiple co-benefits to the largest extent possible is an important way to nurture the natural environment in mitigation efforts and based on our work in and with community members is a preference for frontline and EJ communities.

We have previously called on the US Army Corps of Engineers (USACE) to make greater use of nature-based solutions in the [NYNJHATS](#) in order to holistically address flood risk management and deliver multiple co-benefits. The role of NBS is increasingly recognized at a national and international level, as demonstrated by President Biden's statement at COP27 and the previous *Federal Roadmap for Nature-Based Solutions*. Prioritizing nature based solutions can support the creation of new waterfront parks in environmental justice communities and more resilient industries along the waterfront. These site specific solutions can include living shorelines, freshwater wetlands, berms, vegetated dunes/beaches, salt marshes, maritime forests/shrubs, oyster reefs, submerged aquatic vegetation, green infrastructure for stormwater management, and more.

NYC-EJA has also called on USACE to account for the costs of damages to trees, parks, sports fields, community gardens, and other green elements present within floodplains which are not captured within present models. Internationally recognized [Ecosystem Accounting](#) methods exist to measure the monetary value of ecosystem services provided by these natural features, and might be utilized for this purpose.

Additionally, the application of widespread nature-based solutions has the potential to create new local job opportunities. Through our [Just Nature NYC](#) partnership with The Nature Conservancy's Cities Program in New York, we released [Opportunities for Growth: Nature-Based Jobs In NYC](#), a report which illustrates just how many jobs there are in City government that revolve around nature-based solutions and illustrate the societal benefits those jobs help create. Additionally, Earth Economics in partnership with NYC-EJA and THE POINT CDC, released [\(Green\) Infrastructure Today, for Resilience Tomorrow](#) highlighting the importance and value of nature based solutions. Riverkeeper has produced a report, [Building an Equitably Green New York City](#), with recommendations for the implementation of green infrastructure and nature based solutions in NYC. And, this report, [Nature-Based Solutions for Climate Change in the UK](#), while prepared overseas, is extremely relevant and useful in building an understanding of how valuable nature can be in helping us fight climate change.

With a myriad of co-benefits, nature based solutions are a critical element of equitable climate adaptation and must be a part of any overarching climate resiliency planning in New York City.



**Testimony of Alia Soomro, Deputy Director for New York City Policy
New York League of Conservation Voters
City Council Committee on Environmental Protection
Oversight Hearing on Nature-Based Solutions for Climate Resiliency
and Disaster Preparedness
May 7, 2025**

My name is Alia Soomro and I am the Deputy Director for New York City Policy at the New York League of Conservation Voters (NYLCV). NYLCV is a statewide environmental advocacy organization representing over 30,000 members in New York City. Thank you, Chair Gennaro and members of the Committee on Environmental Protection for the opportunity to comment.

[New York City is vulnerable to multiple types of climate change-related risks](#), including, but not limited to, extreme rainfall, sea level rise, coastal and inland flooding, extreme heat, high groundwater tables, or a mix of all of the above. [Climate change can also amplify the impacts of environmental injustice](#); preexisting social and economic challenges combined with the uneven distribution of climate change impacts can make low income and communities of color more vulnerable than others. In addition to the human costs associated with climate change, the financial, property, and insurance risks of climate hazards cannot be ignored. According to a [recent report](#), more than 80,000 homes on Staten Island, in southeast Queens and in the suburbs east of New York City could be lost to floods over the next 15 years, exacerbating the city's housing and cost of living crisis. Making matters worse, the costs of inaction are far greater. Studies [estimate that the cost of inaction in the state will be \\$55 billion in the next decade](#) for coastal storms and flood-event-related damages.

With a climate-denying presidential administration actively cutting environmental and climate [regulations](#) and [funding](#), NYLCV urges New York City to work with the State to prioritize and invest in multi-hazard climate resilience and mitigation measures, including a mix of green and gray infrastructure, and natural and nature-based solutions along the City's coast, such as wetlands restoration, oyster reefs, dunes, maritime forests, bluebelts, and other living shoreline approaches that could protect residents from coastal and inland flooding. Centering environmental justice and equity must be a key part in all climate and environmental planning and policies—whether for smaller-scaled green infrastructure or larger gray infrastructure projects.

Green Infrastructure

NYLCV recommends the City continue investing in smaller [stormwater management solutions](#) such as rain gardens, bioswales, permeable pavement, water squares, and wetland restoration. Green infrastructure (GI), which uses vegetation, soils, and natural processes to manage water

and reduce the risk of flooding, such as rain gardens, green roofs, and bioswales should continue to be prioritized and funded by DEP. These projects should be expanded and implemented equitably so that all neighborhoods can receive the environmental benefits that come with them, with priority for frontline communities that have borne the brunt of environmental racism and climate injustices, including NYCHA campuses. While the GI program has made progress over the past few years, funding for maintenance and operations is key.

When it comes to related legislation, NYLCV opposes Intro 1253, a bill that would require DEP to notify the local Council Member when DEP installs a new bioswale, rain garden, or other bioretention system in the public right-of-way. Given the urgency of the climate crisis, we think that a bill requiring notice for small-scale projects like bioswales, rain gardens, and other GI solutions would slow down the City's existing work. Moreover, the public is already notified of the installation of new GI assets in the right of way through the NYC Department of Design and Construction (DDC), which is responsible for the construction of these installations. That includes a 14-day public notice which is sent out to local elected officials as well as those signed up to receive notifications from DDC through the DDC Anywhere portal.

If the goal of Intro 1253 is to further transparency about GI, DEP already maintains the [online GI Map](#) which lists upcoming and constructed GI projects. DEP has already successfully installed thousands of GI projects throughout the City—what is needed instead is funding for GI maintenance and operations.

Cloudburst Infrastructure

Cloudburst infrastructure is designed to manage extreme rainfall events too intense for traditional stormwater infrastructure, such as stormwater retention basins and permeable pavements. The City must ensure there is dedicated and sufficient funding and staffing for this program, especially since the [Trump Administration's recent cuts impact the Cloudburst program](#) (nearly \$200 million of the grant cancellations affect four so-called [cloudburst projects](#) — three in Queens and one in Manhattan). We hope the City can work to find a solution to fill these funding gaps. These programs can not only help to reduce stormwater runoff and complement existing stormwater infrastructure, but can also help to improve air and water quality, enhance biodiversity, and reduce urban heat island effects.

Bluebelt Program

We also want to highlight the importance of continuing to expand the City's [Bluebelt Program](#) to reduce stormwater flooding with careful design and coordination for bluebelts on City parkland. The bluebelt program preserves natural drainage corridors such as streams, creeks, and ponds, and reconstructs them to help control, storm, or filter stormwater runoff. Bluebelts also provide open green space and a habitat for wildlife.

Voluntary Housing Mobility Program

As [PlaNYC: Getting Sustainability Done](#) outlined, the City needs to launch an equitable, voluntary housing mobility and land acquisition program to provide housing counseling and facilitate future land acquisition for at-risk homes in the most vulnerable areas of the City. We

urge the City to leverage funding from the New York State Environmental Bond Act of 2022. The City must begin working with residents, regional, state, and federal officials to identify funding and proactively begin stakeholder engagement and education about the risks to properties and residents' financial options. The City should also consider what happens to the land post-buyout, such as wetland and open space restoration, as well as site remediation if it was contaminated.

Parks, Open Space, Tree Canopy

As a co-founder of the Play Fair for Parks Coalition, we also want to emphasize the connection of investing in our parks system with the City's resiliency efforts. Unlike traditional types of concrete playgrounds and pavements that contribute to flooding and the urban heat island effect, parks and playgrounds with GI features help absorb or hold large volumes of stormwater, especially as storms and extreme rainfall become more frequent and severe with climate change. The City needs to strengthen the coordination of planning and maintaining our parks and GI systems.

Investing in the City's tree canopy mitigates the impacts of extreme heat, lowers temperatures, reduces carbon emissions, furthers environmental justice, removes pollutants from the atmosphere, and improves public health. As members of the Forest for All coalition, we urge the City to continue implementing and funding Local Law 148 of 2023, requiring the City to create an Urban Forest Plan that expands the tree canopy from the current 22% coverage to 30% coverage, ideally by 2035 in accordance with Forest for All NYC.

DEP Climate Infrastructure Funding

NYLCV appreciated that DEP is receiving a total of \$3 million over three years for Stormwater Resiliency Mapping as part of City of Yes (\$500,000 in FY26, \$1.5 million in FY27 and \$1 million in FY28). However, as outlined in [DEP's 2024 Stormwater Analysis](#), citywide sewer upgrades will require expansion or separation of sewer systems; installation of GI such as bluebelts; and retention of more stormwater on private property. These efforts will be long-term projects that will likely take 20 years or more to complete and cost roughly *\$30 billion*.

We agree with DEP that existing funding sources are insufficient to meet the scale of the investment required to address the risks of climate change, and the need for long-term, dedicated funding for climate infrastructure. We appreciate DEP's latest report, [Securing A Resilient New York City: Funding And Financing Shoreline Protection](#), which outlines strategies for new revenue generation and financial structures to support a citywide portfolio of coastal resilience projects.

Eliminate the Proposed Water Rental Payment

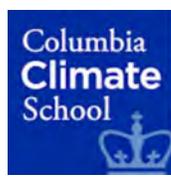
Lastly, when it comes to funding for water- and climate-related infrastructure, NYLCV would be remiss if we did not bring up the water rental payment budget issue since this issue connects with discussion about climate change and water infrastructure at hand. The Administration reintroduced the full water rental payment in 2024, taking a \$289 million rental payment for FY25 and adding that to the City's general fund, for unspecified, non-water-related purposes.

From 2026 through 2029, the City plans to charge the Water Board more than \$1.3 billion in rent over four years to lease the water system from the City, including \$303 Million in FY26.

[The NYC Independent Budget Office research found](#) that the City's practice of requesting rental payments from the Water Board indirectly leads to additional costs for property owners and renters. The original justification for this payment is no longer applicable, raising the question of whether the rental payment should continue. Continuing the rental payment also hurts the City's ability to leverage State clean water funding. We strongly encourage the City Council and Mayor's Office to reject the \$1.3 billion water rental payment in the City budget.

NYLCV urges New York City to work with the State to prioritize and fund multi-hazard climate resilience and mitigation measures, including a mix of green and gray infrastructure, and natural and nature-based solutions. We look forward to working with the City Council, Administration, and advocates to further resilience and environmental justice.

Thank you for the opportunity to comment.



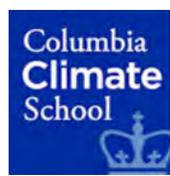
Testimony of the Resilient Coastal Communities Project

Oversight Hearing on Nature Based Solutions for Climate Resiliency [5-7-25]
NYC Council Committee on Environmental Protection, Resiliency and Waterfronts

The [*Resilient Coastal Communities Project*](#) (RCCP), a partnership between the Columbia Climate School and the [*New York City Environmental Justice Alliance*](#), seeks to foster new collaborations between environmental justice communities, practitioners, and researchers, as envisioned in Columbia's [*Task Force Report on Directed Action*](#), to help develop actionable, fundable, and equitable solutions to flood risks that also deliver complementary benefits, like habitat restoration, job creation, and greater community cohesion – and put into practice the Climate School's commitment to [*fairness, social justice, and anti-racism*](#). The RCCP also unequivocally advocates for increased community voice and leadership in flood planning and response in New York City to deliver better and more just solutions.

The RCCP appreciates this opportunity to submit testimony on the issue of coastal resilience - specifically, natural and nature-based flood risk reduction measures. Our team has developed eight recommendations for scaling up green infrastructure implementation, detailed below. We emphasize the urgency for scaled-up, contextualized actions that are co-designed by, and focused on, historically excluded and high-risk communities.

New York faces a rapidly escalating climate crisis with flood risks growing in frequency, intensity, and complexity. The risks are no longer theoretical. Superstorm Sandy and Hurricane Ida revealed the vulnerability of countless New York City residents to the adversities of climate disasters. Sea levels have already risen 12 inches since 1900, and projections suggest up to 5.4



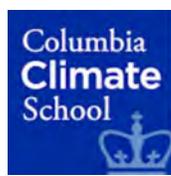
feet of additional rise by 2100, exacerbating threats from coastal surges, tidal flooding, and rising groundwater. Adding to this challenge is the projected 30% increase in annual rainfall, which is expected to bring more frequent and intense precipitation events pushing already strained drainage systems past their limits and putting both vital infrastructure and lives at serious risk.

The impacts of climate change disasters have not, and will not, be felt equally. The [MOCEJ](#) indicates that 57% of the population living within the 2020s 100- year coastal floodplain are within environmental justice (EJ) areas. Also in EJ areas are 69% of the population living within the 90th percentile projection of chronic tidal flooding for 2020s and 54% of the population living within the flood zone subject to potential flooding under the 2020s Moderate Stormwater Flood with Current Sea Levels scenario. In addition, EJ communities in New York City have access to [33 percent less](#) park space than residents in largely white neighborhoods. The disproportionate flood burden, risks, and impacts that environmental justice and frontline communities experience due to the lack of trees and green space, increased pavement, and lack of integrated flood mitigation infrastructure underscores the significance of and need for green infrastructure in these neighborhoods.

Additionally, the problem of protecting New York City from flooding is complex and multifaceted. To be effective, the city and its partners must deal with three distinct and compounding problems which our communities simply were not built for:

- *storm surge like we saw with Hurricane Sandy in 2012*
- *heavy downpours like Irene and Lee brought in 2021, and*
- *seas that will, as stated above, rise by roughly a foot or two higher by 2050 than they were at the turn of the century.*

At the same time, any effective flood protection plan for New York City must seek to achieve widely varying and potentially competing goals, including:

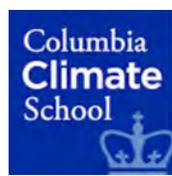


- *Protecting Public Health and Safety*
- *Safeguarding our Natural Systems and Biodiversity*
- *Providing all New Yorkers with access to their Waterfronts*
- *Protecting Community Character and Property, and*
- *Redressing Past Inequality and Building Social Cohesion*

These multiple threats we face and the wide-ranging goals we must achieve, coupled with the fact that there is no ready playbook, no concise formula and no precedent for dealing with these threats, makes the dangers we face from flooding a great example of what's often called a *wicked problem*.

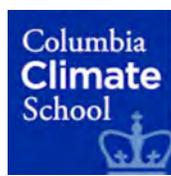
To solve this enormous and complex problem, we will need to learn from the past and wisely invest our region's considerable resources on a varied and comprehensive set of structural, non-structural and nature-based risk-reduction measures.

Communities across New York, particularly those that are historically burdened, now face escalating, compounding threats to life, health, and housing. Both coastal and inland neighborhoods remain highly vulnerable, and the systems we've relied on since forever—pipes, pumps, and seawalls are no longer sufficient to meet the complexity of today's 'wicked problem'. Without a transformative shift in how we plan, build, and invest in resilience, we risk repeating the past, this time with greater losses. The urgency of this moment demands solutions that are not only adaptive but also systemic in their impact. Green infrastructure (GI) and Nature Based Solutions are one such tool which are resilient, regenerative, and ready to be scaled. At a time when so many communities are already feeling the strain of climate impacts, the City of New York must act with urgency to make these solutions a core part of how we plan, protect, and care for the places we call home.



As illustrated in RCCP’s 2024 [Green Infrastructure Handbook](#), flood risks can be significantly lessened by deploying a wide range of nature-based solutions, including green roofs, permeable pavements, rain gardens, and urban wetlands. These solutions work in harmony with grey infrastructure to manage urban flooding and other environmental challenges. Unlike grey infrastructure, which primarily focuses on controlling water flow, GI can absorb and manage rainfall, reducing strain on the city’s sewer system and mitigating flood risks. Additionally, GI addresses other urban issues by combating the heat island effect, improving air quality, and enhancing biodiversity. New York must combine GI and engineered solutions to enhance economic value, societal benefits, and environmental sustainability. When implemented equitably, these projects address environmental injustices by reducing hazards in underserved communities and promoting social equity.

Cities that have fully invested in green infrastructure as a core flood mitigation strategy are better positioned to manage risk, improve public health, and reduce long-term costs. Hoboken, NJ and Portland, OR offer two powerful models for integrating green infrastructure and nature based solutions to reduce flood risk and build urban resilience. Hoboken’s “Resist, Delay, Store, Discharge” strategy and Green Infrastructure Strategic Plan use zoning-based interventions like rain gardens, bioswales, and wetlands to manage stormwater, with the “Resist” component alone projected to reduce flood damages from \$750 million to \$118 million. Portland’s Green Streets Program, built on a modest \$9 million investment, saved \$224 million in sewer upgrades while reducing peak stormwater flows by up to 94% and enhancing urban livability. *A key to Portland’s success is its community-led stewardship model*, fostering long-term care and public ownership. These cities demonstrate how both large-scale planning and localized, community-driven approaches can deliver measurable environmental, economic, and public health benefits.



New York has the tools, the data, and the power to do the same. The city's own Cloudburst Program stands out as a powerful local example. With nearly \$400 million committed and projects already underway in Queens, Manhattan, and Brooklyn, Cloudburst projects are designed to handle over two inches of rainfall per hour, the type of flash flooding that overwhelmed streets and homes during Hurricane Ida.

Yet the demand for such interventions far exceeds their current reach. Numerous communities in the five boroughs continue to face recurrent flooding without access to coordinated, systemic green infrastructure programs. What's needed now is the will and sustained investment to move from scattered pilot projects to coordinated, large-scale implementation, starting with an ambitious expansion of the Cloudburst Program and a clear, equity-driven mandate to integrate GI in every climate and infrastructure decision -and plan for stewardship- moving forward.

We urge the City Council to support the following natural and nature based measures, to reduce the growing risks New Yorkers face from climate disruption-driven flooding:

1. Scale up GI solutions, such as the NYC Cloudburst Program, that are flexible, modular, and tailored to local context.

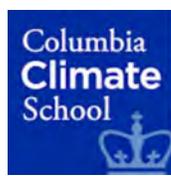
New York must reject one-size-fits-all approaches and instead adopt scalable GI strategies that reflect the unique environmental, geographic, and socio-economic conditions across the City.

2. Center equity by prioritizing historically underserved and high-risk communities.

Flood risk is not evenly distributed. The City must direct GI funding and technical support toward frontline neighborhoods that have historically been underserved and underrepresented.

3. Expand use of real-time data tools to drive targeted GI deployment.

Initiatives like FloodNet have already demonstrated



how low-cost, real-time sensors can radically improve stormwater management. We urge the City to scale such technologies and integrate them into GI planning and evaluation ensuring that projects are responsive, adaptive, and informed by lived realities on the ground. We also advocate to plan for data systems that can integrate community-reported flood information, prioritize information that community-based organizations want, and which have feedback mechanisms into organizations which can disseminate knowledge to residents.

4. Commit to long-term, sustained funding for GI implementation and maintenance.

The success of green infrastructure depends on financial continuity. It is crucial to establish permanent, dedicated funding streams that support not just project construction, but also expansion, long-term operations and maintenance.

5. Invest in education and workforce development to build long-term capacity.

To meet the scale of GI expansion we envision, New York must invest in the people who will build, maintain, and innovate this infrastructure. We urge the creation of training programs, curriculum integration, and certification pathways to grow a local green workforce , particularly in environmental justice communities.

6. Center community co-design in all GI and resilience planning. Community trust, buy-in, and local expertise are essential to the long-term success of these investments. Communities have the best knowledge of their neighborhoods, as well as the knowledge of what interventions might work and partnerships could sustain them.

7. Foster cross-sector collaboration and continuous innovation.

New York must harness the strengths of its academic institutions, community organizations, and design professionals to advance GI



research, monitor outcomes, and refine practices. Institutionalizing feedback loops will help the city adapt to evolving climate realities and scale what works.

8. Treat green infrastructure as essential climate infrastructure.

Green infrastructure and Nature based solutions are core to how we must now think about flood resilience, public health, urban equity, and long-term sustainability. Green infrastructure must be embedded across all levels of planning, policy, and capital investment to ensure New York is not only reacting to disaster, but actively shaping a safer, greener future.

Respectfully submitted,

The Resilient Coastal Communities Project

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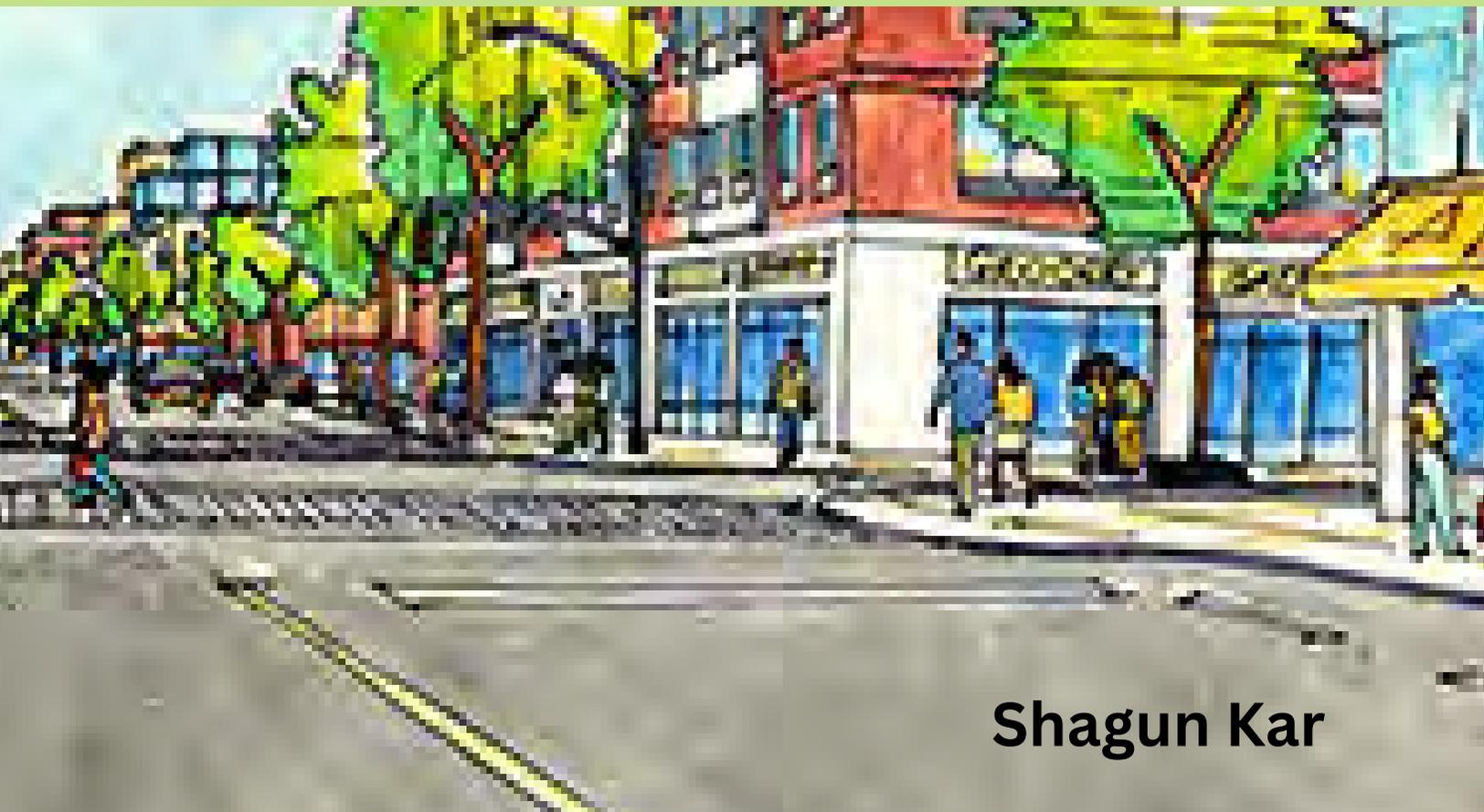
Hellas Lee, Columbia Climate School

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GREEN INFRASTRUCTURE HANDBOOK



Shagun Kar

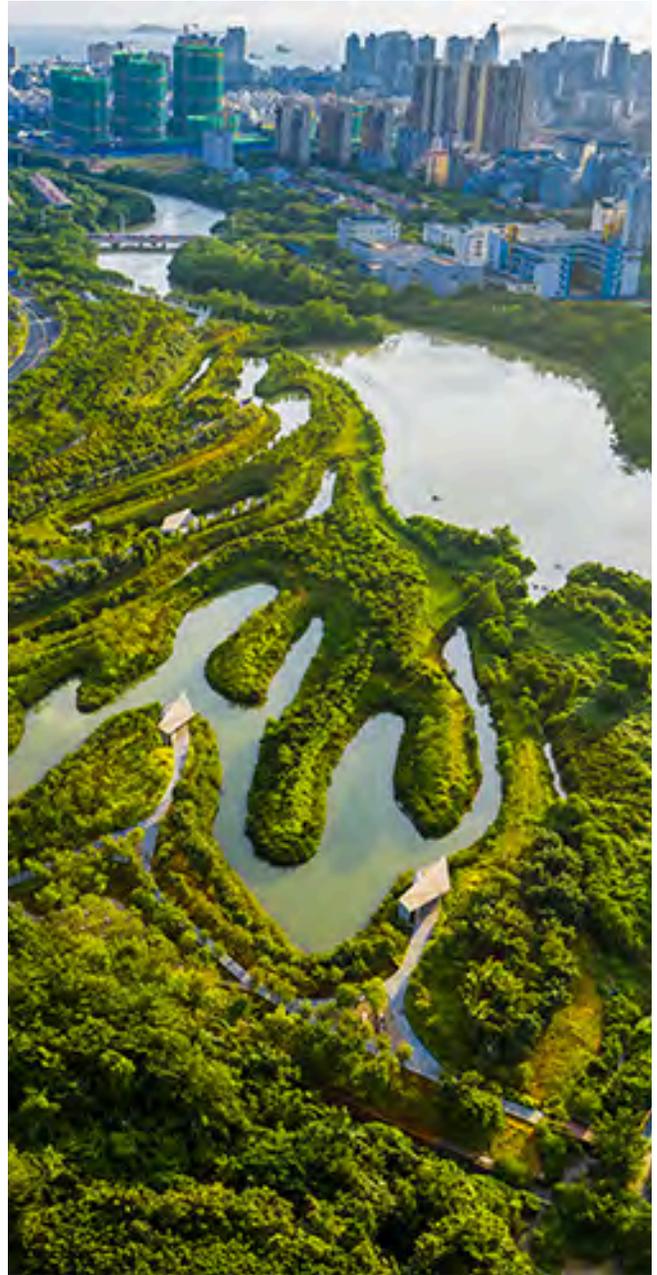
INTRODUCTION

In an era where concrete jungles dominate and climate challenges intensify, the need for sustainable urban landscapes is ever more prominent. Traditional infrastructure—our sprawling networks of concrete and steel—has long formed the backbone of our cities, but as these structures strain under the pressures of increased storm frequency and urban heat islands, a transformative approach is crucial. This is where the concept of green infrastructure emerges as not just an alternative, but a necessity.

Green infrastructure represents a paradigm shift, turning to the very essence of nature to solve problems that human engineering alone cannot. It's about making the city a part of the ecosystem, rather than bending the ecosystem to fit the city. This handbook is your guide through the verdant realms of green roofs, permeable pavements, rain gardens, and urban wetlands, exploring how these features not only combat flooding and cleanse our air but also weave nature into the urban fabric, creating spaces that nourish both the planet and our well-being.

As you turn the pages of this handbook, you will encounter case studies and practical examples from across the globe that demonstrate the transformative power of integrating green infrastructure into urban planning. From the flood-prone streets of Hoboken to the bustling avenues of New York, these stories not only highlight successful implementations but also outline how cities can tailor these green solutions to meet their unique environmental challenges.

Join us on this journey to reimagine our urban environments. Through this handbook, we aim to inspire city officials, urban planners, and community activists to champion green infrastructure—turning the grey of our cities green and forging a future where nature and urban life thrive in harmony.



“It is possible to build. It is possible to invest in people; it is possible to invest in Green Infrastructure; it is possible to change.”

- Naomi Klein



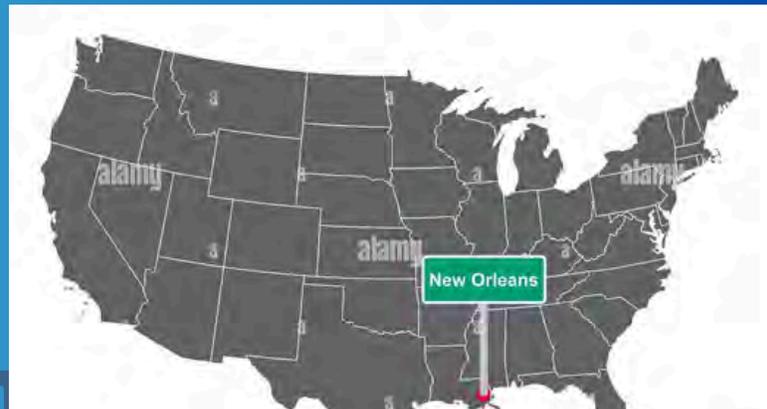
WHY GREEN-INFRASTRUCTURE?

Conventional "grey" infrastructure, such as seawalls and storm surge barriers, is insufficient to handle the multifaceted challenges presented by the climate crisis. To effectively address these challenges, our communities need a multihazard approach that integrates green infrastructure (GI) with traditional grey solutions, creating a resilient, sustainable, and equitable urban environment.

Green infrastructure (GI) encompasses a range of nature-based solutions, including green roofs, permeable pavements, rain gardens, and urban wetlands. These solutions work in harmony with grey infrastructure to manage urban flooding and other environmental challenges. Unlike grey infrastructure, which primarily focuses on controlling water flow, GI can absorb and manage rainfall, reducing strain on the city's sewer system and mitigating flood risks. Additionally, GI addresses other urban issues by combating the heat island effect, improving air quality, and enhancing biodiversity.

This handbook emphasizes the importance of GI in creating resilient urban environments and provides practical guidance on implementing GI in various scenarios. It includes specific case studies and practical examples, demonstrating how these solutions can be tailored to different urban areas. By detailing how GI can be applied in diverse situations, the handbook aims to clarify paths forward for other cities facing similar challenges.

Combining natural and engineered solutions enhances economic value, societal benefits, and environmental sustainability. GI creates livable wage jobs, reduces energy consumption, and stimulates local economies. When implemented equitably, these projects address environmental injustices by reducing hazards in underserved communities and promoting social equity. Despite challenges in meeting regulatory milestones, continued investment in GI is crucial for safeguarding against climate change, enhancing community health, and achieving a sustainable and equitable urban future.



GREEN INFRASTRUCTURE CASE STUDIES



NEW YORK CITY

New York City, with its extensive 520-mile coastline and low-lying areas, faces significant flooding risks from coastal surges, extreme rainfall, rising groundwater, and tidal effects. Historical data shows a 12-inch rise in sea level since 1900, with projections suggesting an increase of up to 5.4 feet by 2100, intensifying the risk of coastal flooding. Additionally, climate change is expected to increase the frequency and severity of extreme rainfall events, potentially leading to a 30% rise in annual rainfall by century's end. This escalation in rainfall could exacerbate urban flooding, posing serious threats to the city's infrastructure and communities.

New York City has made substantial strides in integrating green infrastructure to enhance urban resilience, manage stormwater, and promote environmental justice. The city's commitment to sustainable urban planning is evident through various initiatives and programs designed to mitigate the impacts of climate change and improve the quality of life for its residents.

CloudBurst NYC

NYC Mayor Eric Adams announced the expansion of the Cloudburst Program, targeting improved resiliency in flood-prone communities with a focus on stormwater management and green infrastructure. This initiative, highlighted by Chief Climate Officer Rohit T. Aggarwala as the largest capital investment in cloudburst design in the U.S., underscores the mayor's commitment to environmental social justice. The program, which has already begun work in South Jamaica and St. Albans (Queens) and East Harlem (Manhattan), will expand to include Corona and Kissena Park (Queens), Parkchester (Bronx), and East New York (Brooklyn), with nearly \$400 million in capital funds allocated. Designed to handle up to 2.3 inches of rainfall per hour, these projects use grey/green infrastructure and open spaces to store excess stormwater until drainage systems can manage it, protecting residents and property from extreme weather. Construction on the new sites is set to start in 2025. The city has completed 2,300 new curbside rain gardens, started construction on another 1,000, finished four new Bluebelts, and installed 31 FloodNet sensors, with plans to increase to over 500 sensors in the next five years. The green infrastructure program has greened over 2,000 acres, implemented more than 17,000 linear feet of porous pavement, and has an additional 300,000 linear feet in the design phase. NYC Parks Commissioner Sue Donoghue emphasized that these projects are crucial for environmental justice communities and will enhance access for pedestrians and cyclists.



NYC Green Infrastructure Plan

NYC's 2010 Green Infrastructure Plan, building on PlaNYC and the 2008 Sustainable Stormwater Management Plan, aims to improve water quality in New York Harbor and create a sustainable city. By 2012, an updated consent order with NY State integrated green infrastructure into water quality compliance. Over 10,000 green infrastructure practices have been implemented, managing 1,200 greened acres through collaborations with various city agencies. The Right-of-Way (ROW) Green Infrastructure project, launched in 2012, focuses on rain gardens and infiltration basins, with expansions to manage larger precipitation events. Public property retrofits include nearly 200 green infrastructure projects on schoolyards and other properties. Private initiatives, such as the Green Infrastructure Grant Program, aim to manage stormwater on private properties equivalent to 200 greened acres. NYC's 700,000 street trees intercept over 1 billion gallons of stormwater annually, reducing CO₂ emissions by over 600,000 tons, and providing annual benefits estimated at \$109 million. The NYC Million Trees initiative has planted 220,000 street trees. The 2019 NYC Climate Mobilization Act led to mandates for sustainable roofing, expected to manage an additional 1M gallons of stormwater annually. Green roof tax abatements offer incentives for installations, with enhanced abatement for areas prone to extreme heat and CSO reduction. Parks and DOT have added over 2,500 Greenstreets and 74 pedestrian plazas, increasing green space. The Bluebelt program manages runoff through natural drainage systems, covering one-third of Staten Island. Water conservation and reuse efforts, such as the "Wait..." Program, aim to save potable water and reduce sewer system loads, enhancing the city's resilience against climate change.



KEY TAKEAWAYS

Expansive and Innovative Cloudburst Program

New York City's Cloudburst Program represents a significant investment in urban resilience, addressing flood risks in vulnerable neighborhoods through advanced stormwater management and green infrastructure. With nearly \$400 million allocated for expansion, the program's scope is substantial, yet the need for a broader rollout remains evident to ensure city-wide coverage.

Integration of Green Infrastructure

The city's integration of green solutions, including curbside rain gardens, Bluebelts, and porous pavements, has shown promising results in managing stormwater. Over 2,000 acres have been greened, demonstrating the effectiveness of these initiatives in enhancing urban resilience. However, the distribution and implementation of these projects vary across neighborhoods, highlighting the need for a more uniform approach to ensure that no area is left vulnerable.

Enhanced Public and Private Sector Collaboration

While the Green Infrastructure Grant Program has incentivized stormwater management on private properties, scaling these efforts is crucial. Strengthening collaborations between city agencies, private sectors, and communities will drive broader adoption and integration of green infrastructure practices across all neighborhoods.

Data-Driven and Technology Enhanced Approaches

The use of FloodNet sensors and other technologies to monitor flood risks is a step in the right direction. Yet, the expansion of this network and the incorporation of real-time data analysis can further enhance the city's ability to predict and respond to flood events more effectively.

Community Involvement and Environmental Justice

The expansion of green spaces, pedestrian plazas, and other public infrastructures has improved community access and environmental conditions. Nevertheless, ensuring that these benefits reach environmental justice communities equitably remains a challenge. Increased focus on these communities can help mitigate the disproportionate impacts of climate change.

Need for a Multi-Hazard Approach

Given the complex and multifaceted nature of flood risks in NYC, including coastal surges, heavy rainfall, and rising sea levels, a multi-hazard approach is essential. This approach should not only focus on resisting water but also on utilizing nature-based solutions to absorb and manage water through green infrastructure.

Sustainability and Long-Term Resilience

While New York City has made commendable strides in green infrastructure development, the continual evolution of climate patterns calls for an adaptive management strategy that anticipates future challenges. Long-term resilience will depend on the city's ability to innovate and scale these green initiatives effectively.



NEW YORK CITY'S PROACTIVE MEASURES IN FLOOD MANAGEMENT AND GREEN INFRASTRUCTURE ARE COMMENDABLE, YET THE FULL POTENTIAL OF THESE INITIATIVES CAN ONLY BE REALIZED THROUGH A MORE EXPANSIVE AND INCLUSIVE ROLLOUT. AS THE CITY CONTINUES TO FACE DIVERSE AND ESCALATING FLOOD THREATS, SCALING UP GREEN INFRASTRUCTURE AND ENSURING ITS EQUITABLE DISTRIBUTION ACROSS ALL NEIGHBORHOODS WILL BE KEY TO BUILDING A TRULY RESILIENT URBAN ENVIRONMENT.

HOBOKEN

Hoboken is a small, densely populated city on the east coast of the United States. Its drainage system have experienced severe problems, manifesting in flash flooding on the streets of low lying areas in the city and the appearance of numerous combined sewer overflows throughout the year. The devastating impacts of Hurricane Sandy in 2012 underscored the need for a different approach to flood management. According to Federal Emergency Management Agency (FEMA), approximately 80% of Hoboken is located within the flood zone affected by events with 100 years return period. Two main sources of flooding are coastal flooding from the Hudson River and pluvial flash flooding during excessive rainfall

In response, Hoboken has adopted two comprehensive planning approaches that integrate green infrastructure: the "Resist, Delay, Store, Discharge" (RDSD) Comprehensive Urban Water Strategy and the Green Infrastructure Strategic Plan. Although these strategies are new, their implementation is already underway.

Resist, Delay, Store, Discharge (RDSD) Strategy

The RDSD Comprehensive Urban Water Strategy incorporates green infrastructure in its "Store" and "Delay" components. The "Delay" aspect advocates for stormwater detention through measures such as green roofs, bioswales, stormwater collection facilities, rain gardens, and increased park space. These measures aim to slow down stormwater runoff. The "Store" component proposes the creation of a green circuit around Hoboken to retain water using bioretention basins and constructed wetlands. This holistic approach views the city as a complex system and aims to capture 40% of excess water through the "Store" component, 10% through the "Delay" component, and 60% through the "Discharge" component. Implementing the "Resist" part of the strategy alone could reduce Hoboken's current flood risk from \$750 million to \$118 million.



Green Infrastructure Strategic Plan

The Green Infrastructure Strategic Plan offers a conceptual framework for a green infrastructure network, dividing the city into three zones based on geological characteristics. This plan employs various green infrastructure measures, including green roofs, rain barrels, constructed wetlands, bioswales, and stormwater planters. Special opportunities for incorporating these measures are identified in designated redevelopment areas, which represent larger scales that can capture significant amounts of excess rainfall. Additionally, the plan identifies priorities and potential funding sources for executing these projects.



KEY TAKEAWAYS

Comprehensive Flood Risk Management:

Hoboken's adoption of the "Resist, Delay, Store, Discharge" (RDSD) strategy and the Green Infrastructure Strategic Plan represents a holistic approach to managing the city's significant flood risks. These strategies are tailored to address both coastal and pluvial flooding threats, which are critical given that 80% of the city is located within a 100-year flood zone as identified by FEMA. The strategic integration of these plans shows Hoboken's commitment to innovative and sustainable urban planning.

Multi-Component Green Infrastructure Implementation:

The RDSD strategy effectively incorporates green infrastructure across its four components, with a notable emphasis on the "Store" and "Delay" elements. By aiming to capture a significant portion of excess water (40% through "Store" and 10% through "Delay"), the city plans to mitigate flood risks by slowing and controlling stormwater runoff using green roofs, bioswales, and other sustainable practices. This not only helps in managing water but also contributes to enhancing urban green spaces.

Significant Reduction in Flood Risk and Economic Impact:

The implementation of the "Resist" component of the RDSD strategy alone is projected to dramatically reduce potential flood damage costs from \$750 million to \$118 million. This substantial decrease highlights the effectiveness of strategic flood defenses in urban settings and underscores the economic benefits of investing in such infrastructure improvements.

Zoning and Strategic Planning in Infrastructure Development:

The Green Infrastructure Strategic Plan outlines a zoning approach based on geological characteristics, which guides the distribution and implementation of green infrastructure. This method ensures that the specific environmental and topographical needs of each zone are addressed, optimizing the effectiveness of the installations. Special redevelopment areas offer larger-scale opportunities for significant stormwater capture and are prioritized in the plan, indicating a targeted, efficient allocation of resources.

Funding and Execution Framework:

The plan also outlines a clear framework for prioritizing projects and identifying potential funding sources, which is crucial for the sustained success of any large-scale urban infrastructure initiative. By clarifying these aspects, Hoboken enhances the feasibility and continuity of its green infrastructure projects.

Enhancing Urban Resilience and Sustainability

Through these comprehensive strategies, Hoboken not only addresses immediate flood risks but also contributes to the long-term resilience and sustainability of the urban environment. The integrated approach serves as a model for other cities facing similar challenges, showcasing how multifaceted strategies can effectively mitigate complex environmental issues.



PORTLAND

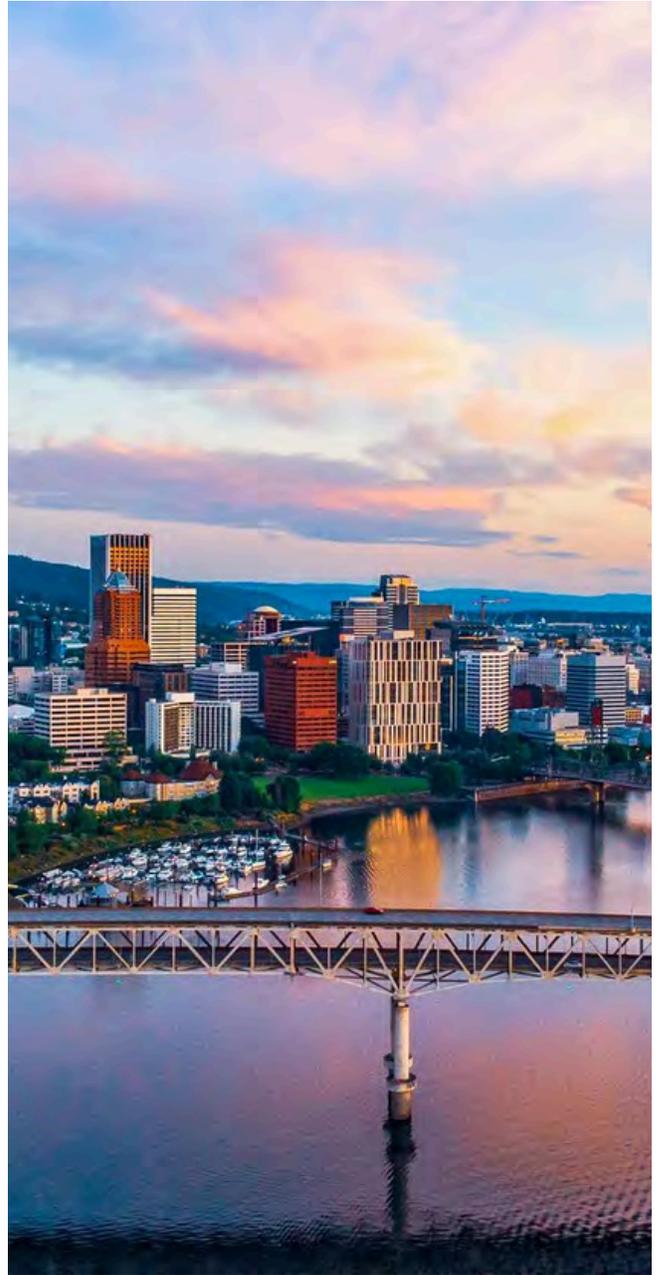
Portland, Oregon, is recognized as a leading example of green stormwater management. The city's proactive approach includes encouraging small-scale green infrastructure applications, which saved taxpayers \$224 million in combined sewer overflow (CSO) repairs and maintenance costs from an initial \$9 million investment up to 2010.

Green Streets Program

In 2003, Portland launched its Green Streets Program, beginning with pilot demonstration projects evaluated by the Bureau of Environmental Services (BES). By 2005, the program expanded into a citywide initiative with a two-phase effort. The first phase identified opportunities and challenges, recommended solutions, and built public awareness. Phase two formalized permitting processes, integrated Green Streets into city plans, and established a fund for construction. Technical guidance documents and standard designs were made available on the program's website, aiding adaptation for new projects.

The Green Streets Program integrates functional and aesthetically pleasing stormwater management systems into public spaces. It has received international recognition and design awards, including the American Society of Landscape Architects (ASLA) General Design Award of Honor for multiple projects. Furthermore, the Green Streets Stewardship Program involves the community members as a central pillar in the maintenance of the green streets, hence creating a sense of ownership and partnership amongst the community .

The Green Streets Program has significantly impacted Portland by reducing polluted stormwater entering rivers and streams, improving pedestrian and bicycle safety, diverting stormwater from the sewer system to reduce basement flooding and combined sewer overflows, and decreasing impervious surfaces to allow stormwater infiltration. Additionally, it has increased urban green space, improved air quality, reduced air temperatures, lowered demand on the sewer system, and reduced costs of constructing pipe systems. Meeting federal and state regulations to protect public health, the program also creates opportunities for industry professionals. Notably, Green Streets have reduced peak flows by 80-94%, filtered out 90% of total suspended solids, organic pollutants, and heavy metals, and offer a 40% cost reduction compared to traditional pipe projects, making Portland a model for urban resilience through integrated green infrastructure.



KEY TAKEAWAYS

Cost-Effective Urban Infrastructure Solution:

Portland's investment in green infrastructure has proven highly cost-effective, saving taxpayers \$224 million by avoiding extensive sewer system repairs. The initial \$9 million investment into small-scale green applications exemplifies a strategic, economically prudent approach to urban planning, showing significant long-term savings and environmental benefits.

Comprehensive and Integrated Approach:

The Green Streets Program is a citywide initiative that not only addresses stormwater management but also enhances urban livability. By integrating functional and aesthetically pleasing elements into public spaces, the program contributes to safer and more enjoyable pedestrian and bicycle paths, reduces impervious surfaces, and increases green space. This approach aligns with broader urban development goals of sustainability and improved quality of life.

Significant Environmental Impact:

The program has been instrumental in reducing the volume of polluted stormwater entering local rivers and streams. With reductions in peak flows by 80-94% and the ability to filter out significant percentages of pollutants, the Green Streets installations play a critical role in meeting federal and state environmental standards and protecting public health.

Community Engagement and Stewardship:

A key component of the program's success is its emphasis on community involvement. The Green Streets Stewardship Program encourages local residents to participate in the maintenance of green infrastructure, fostering a sense of ownership and community partnership. This not only aids in the sustainability of the installations but also enhances community awareness and education regarding environmental issues.

Role Model for Urban Resilience:

Portland's program has received international recognition and multiple design awards, positioning it as a global leader in innovative stormwater management. The city demonstrates how integrating green infrastructure can significantly reduce dependency on traditional pipe systems, offering a replicable model for other cities aiming to enhance urban resilience through sustainable practices.

Economic and Professional Opportunities:

The Green Streets Program not only conserves financial resources but also stimulates the local economy by creating opportunities for industry professionals. This includes jobs in landscape design, construction, and maintenance, all of which contribute to the city's economic vitality.

Regulatory Compliance and Public Health Protection:

By effectively managing stormwater, the program helps the city comply with stringent regulatory requirements designed to protect water quality and public health. This proactive compliance avoids potential penalties and establishes Portland as a proactive and responsible urban manager.



SOUTHEAST LOUISIANA URBAN FLOOD CONTROL PROJECT (SELA)

Following the historic flood of 1995, the Southeast Louisiana Urban Flood Control Project (SELA) was initiated to mitigate flooding risks and enhance urban resilience. Authorized to reduce the risk of flooding from a 10-year rain event (9 inches over a 24-hour period), SELA works in conjunction with the City of New Orleans' drainage system. Key areas of focus include Jefferson Avenue, Louisiana Avenue, Napoleon Avenue, and South Claiborne Avenue. These corridors have been selected for their historical significance and their susceptibility to flooding.

The SELA project incorporates extensive green infrastructure to manage stormwater and reduce flood risks. The green space designs along Jefferson and Louisiana Avenues involve the implementation of green roofs, bioswales, stormwater collection facilities, rain gardens, and the addition of park space to delay and store stormwater runoff. Bioretention basins and constructed wetlands create a green circuit, designed to capture and retain excess water. The green space implementation plan also takes into account pre-construction landscape conditions, maintenance requirements, and adherence to the Americans with Disabilities Act.

The Green Space Program involves significant public participation, with input from residents, the Sewerage and Water Board of New Orleans, the Department of Public Works, and other local authorities. This collaborative approach ensures that the green infrastructure measures are well-integrated into the community and meet the needs of various stakeholders.



The implementation of green infrastructure in Southeast Louisiana under the SELA project has led to various benefits:

- Reducing polluted stormwater entering rivers and streams
- Enhancing pedestrian and bicycle safety
- Diverting stormwater from the sewer system, reducing issues like basement flooding and sewer backups
- Decreasing combined sewer overflows to the Willamette River
- Allowing stormwater to recharge groundwater and surface water by decreasing impervious surfaces
- Increasing urban green space, improving air quality, and mitigating urban heat island effects
- Lowering demand on the city's sewer system and reducing costs associated with expensive pipe systems
- Ensuring compliance with federal and state regulations
- Creating opportunities for industry professionals
- Green streets reducing peak flows by 80-94% and filtering water to remove pollutants

Offering a 40% cost reduction compared to traditional pipe projects, showing economic efficiency in urban flood management.



KEY TAKEAWAYS

Strategic Integration with Existing Infrastructure:

SELA is designed to work in tandem with New Orleans' existing drainage system. This integration is crucial for enhancing the city's capacity to manage significant rainfall events—specifically those expected to occur once every ten years. By focusing on critical urban corridors like Jefferson Avenue, Louisiana Avenue, Napoleon Avenue, and South Claiborne Avenue, the project targets areas with historical susceptibility to flooding, thereby maximizing impact where it is most needed.

Implementation of Green Infrastructure:

The project extensively employs green infrastructure to mitigate flood risks. Key elements include green roofs, bioswales, stormwater collection facilities, rain gardens, and additional park spaces. These components are essential for reducing surface runoff and enhancing water retention and absorption. Such measures not only help manage water flow during storms but also contribute to the aesthetic and ecological value of the urban landscape.

Consideration of Pre-construction Conditions and Compliance:

The green space designs account for pre-construction landscape conditions, ensuring that the implementation is sensitive to the existing environment. Furthermore, the project adheres to maintenance protocols and compliance with the Americans with Disabilities Act, demonstrating a commitment to sustainability and accessibility.

Collaborative and Participatory Approach:

SELA emphasizes significant public participation, involving residents, the Sewerage and Water Board of New Orleans, the Department of Public Works, and other local authorities. This collaborative approach not only ensures that the infrastructure developments are well-received and utilized by the community but also aligns the project with local needs and expectations, enhancing its effectiveness and sustainability.

Enhancement of Urban Resilience:

Overall, SELA represents a proactive approach to urban flood management, emphasizing resilience and sustainability. By combining advanced engineering solutions with community engagement and environmental considerations, the project sets a benchmark for urban flood control efforts, potentially serving as a model for other cities facing similar challenges.



Parks & Playgrounds



Vacant Lots



Streets & Corridors



Open Spaces



Home & Property Improvements

PHILADELPHIA

Philadelphia, historically plagued by stormwater management issues, has embarked on an ambitious green infrastructure project to address these challenges. Instead of expanding its traditional "gray" infrastructure, Philadelphia is investing \$2.4 billion to create a citywide network of rain gardens, green roofs, wetlands, and other green infrastructure. This initiative, part of the "Green City, Clean Waters" program, aims to reduce combined sewer overflows (CSOs) by 85% over 25 years.

Philadelphia's approach integrates green infrastructure into urban spaces, from simple home rain barrels to complex bioretention swales. The city's Green Streets Program has created nearly 1,100 "greened" acres, with plans to add 1,300 more within three years. Projects range from infiltration trenches and rain gardens in parks to large-scale green roofs, such as the one atop the Cira Centre South, which also serves as a public park.

The city has adopted and adapted technologies developed in smaller scales elsewhere, such as bioretention and low-impact development designs. The initiative includes public and private partnerships, with incentives like grants and stormwater fee reductions encouraging private property owners to implement green infrastructure.

Philadelphia's green infrastructure projects have significantly reduced stormwater runoff and pollution. These initiatives have cut stormwater overflow by 1.7 billion gallons, nearly three times the initial target. They also provide social and economic benefits, such as job creation and improved public spaces. The program supports 430 jobs and is projected to have a \$3.1 billion economic impact over its first 25 years.

The cumulative effect of these green initiatives is not only environmental but also social, enhancing urban spaces and contributing to the city's overall resilience. By focusing on sustainable development and integrating green infrastructure, Philadelphia sets a model for other cities facing similar stormwater management challenges.

Philadelphia's Green City, Clean Waters program demonstrates the effectiveness of green infrastructure in urban stormwater management. With its comprehensive approach, the city is transforming its landscape, improving environmental quality, and fostering community resilience.



KEY TAKEAWAYS

Philadelphia's ambitious green infrastructure (GI) initiative exemplifies how cities can transform their approach to stormwater management, aligning perfectly with the broader narrative of this handbook. The following takeaways from Philadelphia's program illustrate how GI can be applied effectively in diverse urban scenarios:

Significant Investment: Philadelphia's \$2.4 billion investment in GI underscores the importance of dedicated funding to achieve substantial environmental improvements, highlighting the necessity of investment in GI to create resilient urban environments.

Citywide Integration: The integration of GI throughout urban spaces, from home rain barrels to bioretention swales and large-scale green roofs, demonstrates the practical applications of GI solutions.

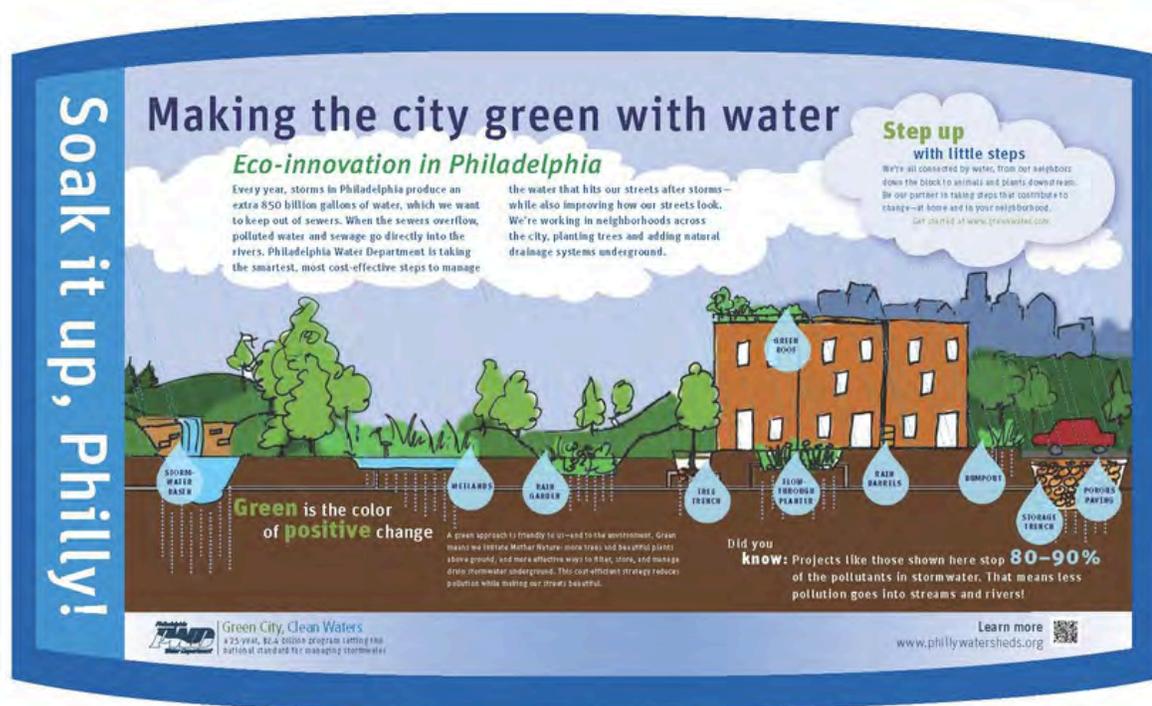
Innovative Technologies: By adopting and adapting technologies like bioretention and low-impact development designs, Philadelphia showcases innovative approaches to GI, emphasizing on how GI can be applied in diverse situations, offering pathways forward for other cities.

Public and Private Partnerships: The program's inclusion of incentives like grants and stormwater fee reductions for private property owners highlights the importance of collaborative efforts between public and private sectors showcasing the need for community-driven and collaborative GI efforts.

Environmental Impact: The significant reduction in stormwater runoff and pollution in Philadelphia, cutting stormwater overflow by 1.7 billion gallons, exemplifies the environmental benefits of GI. This reinforces the handbook's message on the effectiveness of GI in managing urban stormwater and enhancing environmental quality.

Economic and Social Benefits: Supporting 430 jobs and projecting a \$3.1 billion economic impact over 25 years, Philadelphia's initiative demonstrates the economic and social advantages of GI. This aligns with the handbook's focus on the broader societal benefits of GI, including job creation and improved public spaces.

Philadelphia's comprehensive approach to integrating GI serves as a model for other cities facing similar stormwater management challenges where implementation of GI measures can yield results in all aspects- environment, society and economy.



LOS ANGELES

LA has been replacing impermeable surfaces like concrete with permeable ones, such as dirt and plants, to absorb and manage stormwater more effectively. The city has developed "spreading grounds" where water accumulates and soaks into the earth, enhancing local water capture and storage capabilities. Traditional dams, combined with new spongy infrastructure, have allowed the city to capture 8.6 billion gallons of stormwater during this event, enough to supply water to 106,000 households for a year. For the entire rainy season, LA accumulated 14.7 billion gallons.

The Los Angeles Department of Water and Power (LADWP) is leading the effort to locally produce as much water as possible, shifting reliance away from distant snowmelt and river water. Engineers have created permeable medians and roadside areas to soak up stormwater, diverting it from streets and sewers to replenish underground aquifers.

The green infrastructure initiatives have significantly impacted stormwater management in LA. By treating stormwater as an asset rather than a liability, the city has turned patches of its concrete jungle into functional green spaces. These efforts have resulted in capturing 8.6 billion gallons of stormwater during a single extreme rain event, highlighting the effectiveness of its spongy infrastructure. Additionally, spreading grounds and green spaces allow stormwater to soak into aquifers, providing a natural underground reservoir that can hold up to 28 billion gallons of water. Green spaces also reduce the urban heat island effect, improving physical and mental health for residents by lowering summer temperatures. By increasing permeable surfaces, LA mitigates neighborhood flooding and reduces the strain on traditional sewer systems. Moreover, green infrastructure enhances urban biodiversity, supports local ecosystems, and reduces pollution runoff.

Los Angeles is leading the way in stormwater management by transforming into a sponge city. The city's comprehensive approach, which includes the use of permeable surfaces, spreading grounds, and green spaces, not only addresses immediate flooding issues but also promotes long-term sustainability and resilience. As climate change continues to intensify rainstorms, LA's innovative solutions provide a model for other cities to follow, demonstrating that integrating green infrastructure can lead to a more sustainable and livable urban environment.



KEY TAKEAWAYS

Los Angeles' innovative approach to stormwater management exemplifies how green infrastructure (GI) can be integrated into urban planning to create resilient and sustainable cities. The following takeaways highlight key aspects of LA's strategy:

Permeable Surfaces: By replacing impermeable surfaces with permeable ones, LA effectively absorbs and manages stormwater, enhancing local water capture and storage capabilities.

Spreading Grounds: LA's development of "spreading grounds" for water accumulation and infiltration showcases a practical example of GI. Capturing 8.6 billion gallons of stormwater during a single extreme rain event highlights the effectiveness of these strategies, as detailed in the other case studies and examples.

Water Self-Sufficiency: The Los Angeles Department of Water and Power's efforts to locally produce water by replenishing underground aquifers through permeable medians and roadside areas demonstrate how GI can reduce reliance on distant water sources, reflecting on the narrative that GI can be implemented for multiple co-benefits including local resource sustainability.

Urban Heat Island Effect: LA's green infrastructure initiatives reduce the urban heat island effect, improving residents' physical and mental health, hence providing proving grounds for the effectiveness of GI in addressing multiple hazards.

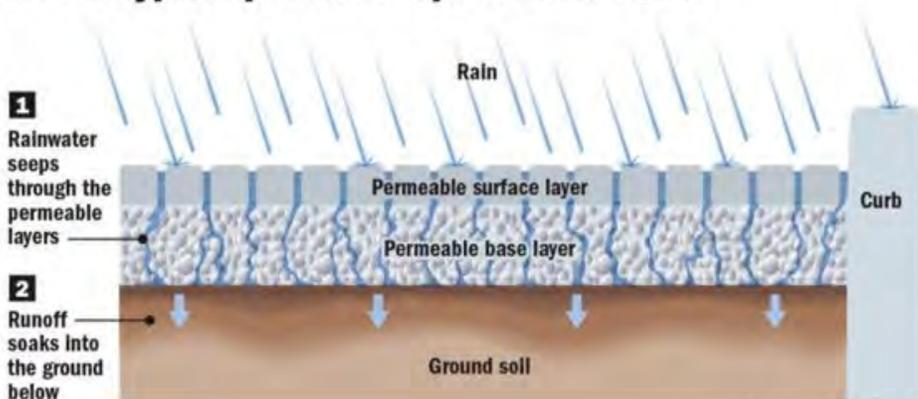
Neighborhood Flooding Mitigation: Increasing permeable surfaces helps LA mitigate neighborhood flooding and reduce the strain on traditional sewer systems, illustrating the practical benefits of GI in flood risk mitigation.

Biodiversity and Ecosystem Support: Enhancing urban biodiversity and supporting local ecosystems through green infrastructure showcases the environmental benefits of GI, aligning with the handbook's focus on nature-based solutions.

Sponge City Model: LA's comprehensive approach to stormwater management, integrating permeable surfaces, spreading grounds, and green spaces, providing practical guidance and pathways for cities facing similar challenges.

By detailing Los Angeles' successful implementation of green infrastructure, this handbook demonstrates how cities can apply GI solutions to diverse scenarios, addressing immediate environmental challenges while promoting long-term resilience and sustainability.

How a typical permeable pavement works



MERIDA

In 2016, the city of Merida in Yucatan, Mexico embarked on an ambitious journey to develop a Green Infrastructure Plan that embodies a comprehensive vision of urban greenery and urban forest conservation. This dedicated urban planning document aims to enhance biodiversity, increase resilience and human well-being, and mitigate climate change in the city. A central pillar of the Plan is the promotion of a network of urban trees, complemented by actions such as creating water bioretention areas and improving runoff management. Additionally, the Plan promotes citizen involvement and reforms the legislative framework to better support green infrastructure.

An updated version of the Plan, published in 2018 and covering the period up to 2021, outlines four key areas of action: conducting studies and urban technical documents, implementing programs and projects, promoting citizen participation, and strengthening the legal framework. To implement the Plan's actions, the city administration gathered support from national and international institutions, including the Cities4Forests initiative by the World Resources Institute.

Green infrastructure (GI) in Merida includes green roofs, permeable pavements, rain gardens, and urban wetlands, all designed to absorb and manage rainfall, reducing flood risks and easing the strain on the city's sewer system. These solutions also combat the urban heat island effect, improve air quality, and enhance biodiversity, creating a more sustainable and livable urban environment. The Plan highlights how these nature-based solutions offer flood reduction, microclimate regulation, and biodiversity support, making them vital complements to traditional grey infrastructure.

The Plan emphasizes community-driven efforts, with programs encouraging citizen participation in tree planting and maintenance. Activities include a volunteer program where citizens support tree planting and an initiative allowing citizens to adopt specific trees in the city. The city administration has also launched the "Y'axtal" project, also known as the "Great Lung of Merida," aiming to create a network of public spaces over 22 hectares, benefiting more than 150,000 inhabitants. The first area of action under the Plan involved conducting an inventory of trees in the city, which was completed in 2019 and revealed over two million trees. Other studies included analyzing trees in parks and conducting a multi-criteria analysis of green infrastructure in the city. The second area focused on implementing a tree planting program, providing guidance for planning and pruning trees, and establishing a sustainable urban drainage system. The third area promoted citizen participation through information campaigns and volunteer programs. The final area aimed at strengthening the legal framework to support green infrastructure, including regulations and tax incentives for environmental protection.



ACHIEVEMENTS & IMPACT

By June 2021, Merida had successfully planted over 200,000 trees, achieving a significant milestone set out in the Plan. The Green Infrastructure Plan has established routes to enhance nature-based solutions (NBS) in the urban area, focusing on protecting and fostering urban forests. This has been facilitated by the creation of the Sustainable Development Unit and the Urban Tree Department within the city administration.

KEY TAKEAWAYS

Merida's Green Infrastructure Plan serves as an exemplary model, showcasing how green infrastructure (GI) can be effectively integrated into urban planning to create resilient and sustainable urban environments. The following takeaways highlight the key aspects of Merida's approach and illustrate how these strategies align with the broader narrative of this handbook:

Comprehensive Vision: Merida's plan emphasizes a holistic approach to urban greenery and forest conservation, which enhances biodiversity, resilience, and human well-being while mitigating and adapting climate risks.

Green Infrastructure Solutions addressing multiple hazards: The plan incorporates a range of nature-based solutions, such as green roofs, permeable pavements, rain gardens, and urban wetlands. These solutions are essential for managing rainfall, reducing flood risks, and combating urban heat island effects, exemplifying the practical applications of GI in urban settings to incorporate a multi-hazard solution.

Community Involvement: Active citizen participation is a cornerstone of Merida's plan, with volunteer programs and initiatives like the "Y'axtal" project fostering community engagement and ownership.

Strong Legislative Framework: The plan includes reforms to the legislative framework, supporting GI with regulations and tax incentives for environmental protection. This underscores the necessity of policy support for successful GI implementation.

Significant Achievements: By June 2021, Merida had planted over 200,000 trees, significantly enhancing urban forests and benefiting more than 150,000 inhabitants. These achievements highlight the tangible impact of GI initiatives, reinforcing our belief on the potential of GI to transform urban areas.

Collaborative Success: Ongoing cooperation with international experts and organizations, coupled with strong political support, has been crucial for the Plan's success. This reflects on the importance of partnerships and political will in advancing GI projects.

Merida's Green Infrastructure Plan demonstrates how cities can tailor GI solutions to their unique contexts, addressing diverse environmental challenges while promoting resilience and sustainability. The practical examples and case studies provided aim to guide other cities in implementing similar strategies, clarifying paths forward and inspiring action in the face of climate change.



CONCLUSION

In the bustling cities of the world, from the high rises of New York to the historic streets of Merida, a revolution is unfolding—one where concrete and steel are giving way to green roofs and rain gardens. This handbook has traversed through these urban landscapes, uncovering the transformative power of green infrastructure. As we reflect on these journeys, the narrative that emerges is compelling and instructive, offering a blueprint for cities worldwide facing the dual challenges of urbanization and climate change.

The stories of cities like Portland and New York illustrate a profound shift in urban planning philosophy. In Portland, a modest investment in green streets has reaped vast economic savings and environmental benefits, demonstrating that the upfront costs of green infrastructure are far outweighed by its long-term gains. Similarly, New York's proactive Cloudburst Program underscores a commitment to not only manage stormwater more effectively but also to enhance urban resilience against increasingly frequent climate events.

Moreover, these initiatives are not just about managing water or beautifying urban spaces; they are about redefining the social fabric of cities. In Philadelphia and Merida, community engagement has been pivotal. The involvement of local residents in shaping and sustaining these projects ensures that green infrastructure does more than just function; it thrives, fostering a sense of community ownership and environmental justice.



Yet, the journey is not without its challenges. The variance in implementation across different neighborhoods highlights a critical need for equitable urban development. Every community, regardless of its economic status, deserves to benefit from the protective and regenerative benefits of green infrastructure. Thus, as we move forward, the call to action is clear: green infrastructure must become a universal standard in urban development.

As cities continue to grow, so too does the imperative for sustainable and resilient urban planning. The examples detailed in this magazine are not merely isolated success stories; they are part of a growing narrative that advocates for a holistic approach to urban challenges, one that integrates nature-based solutions at every level of urban planning. This is the future of city life—a future where our urban environments are not just livable but are vibrant, resilient, and inclusive spaces that celebrate the synergy between nature and urbanity.

BRINGING IT ALL TOGETHER

The synthesis of best practices in green infrastructure (GI) underscores the transformative potential of comprehensive and integrative urban planning. Cities highlighted in this handbook serve as exemplary models in this regard, showcasing how GI can address multifaceted urban challenges while promoting sustainability and resilience. [Key practices involve the integration of GI from the outset of urban planning, fostering public-private collaborations, and actively engaging communities in both the planning and maintenance phases.](#) For instance, New York’s Cloudburst Program and Philadelphia’s Green City, Clean Waters initiative illustrate the benefits of large-scale investment in GI, not only for stormwater management but also for enhancing urban resilience and environmental justice.

[Sustained funding and investment emerge as critical factors for the success of GI projects. Long-term financial commitment, as seen in Portland’s cost-effective Green Streets Program, is necessary to support the planning, implementation, and maintenance of GI systems.](#) Additionally, the adaptability and scalability of GI solutions are paramount. The diverse applications of GI in Philadelphia, ranging from home rain barrels to large-scale green roofs, highlight the need for flexible design principles that can be tailored to various environmental and socio-economic contexts.

[Inclusive and equitable development is another crucial aspect. Ensuring that all communities, especially underserved ones, benefit from GI is essential for addressing environmental justice concerns.](#) Merida’s community-driven efforts and volunteer programs exemplify how citizen involvement can foster a sense of ownership and stewardship, leading to the sustained success of GI initiatives.

[The role of technology and data-driven approaches cannot be overstated.](#) The use of real-time monitoring tools, like NYC’s FloodNet sensors, enhances the effectiveness of GI by enabling better prediction and management of urban water flow. Regulatory support and incentives also play a vital role, as evidenced by Merida’s robust legislative framework that includes tax incentives and compliance mandates to support GI.

Looking ahead, cities must prioritize securing [diverse funding sources, equitable and inclusive development, and continuous innovation and research](#) to advance green infrastructure (GI) technologies. Essential to this effort is securing sustained financial commitment through various channels such as public funds, private investments, and international grants. GI solutions need to be [scalable and adaptable](#), with flexible design principles tailored to specific environmental, social, and economic contexts. Educational initiatives play a significant role in this process. [Raising awareness about the benefits of GI and integrating these concepts into educational curricula and professional training programs will help train the next generation of professionals in sustainable practices.](#)

By focusing on these areas—securing funding, ensuring inclusive development, leveraging technology, and promoting education—cities can create vibrant, resilient urban environments that harmonize with nature. As urbanization accelerates and climate change intensifies, adopting GI is not just an option but a necessity for transforming cities into sustainable havens that support both human and ecological health, paving the way for a greener, more resilient future.



Testimony of Riverkeeper, Inc.
before the
New York City Council Committee on Environmental Protection, Resiliency and
Waterfronts
Oversight Hearing on Nature Based Solutions for Climate Resiliency
May 5th, 2025

My name is Em Ruby, and I am the Advocacy and Policy Coordinator at Riverkeeper. Thank you, Chairperson Gennaro and Members of the Committee, for your leadership to promote nature-based solutions for climate resiliency, and to improve stormwater infrastructure to reduce local flooding and improve water quality throughout the city. I appreciate the opportunity to testify today.

Riverkeeper is a member-supported watchdog organization dedicated to protecting and restoring the Hudson River from source to sea, expanding recreational access in waters throughout New York City, and safeguarding drinking water supplies, through advocacy rooted in community partnerships, science and law.

Nature based solutions for climate resiliency are absolutely critical for New York City's adaptation to climate change. Unlike engineered grey solutions, green and nature based solutions to inland flooding, coastal flooding, and extreme heat bring multiple co-benefits to communities, while strengthening local ecosystems. While grey infrastructure is often designed to address one problem, such as stormwater capture or coastal storm surge, nature based solutions can simultaneously address flooding, reduce the urban heat island effect, strengthen habitat for wildlife and improve local air quality. Further, nature based solutions offer increased quality of life benefits for communities.

While Riverkeeper strongly supports efforts by the Council and the DEP to expand the use of nature based solutions to address climate threats citywide, we have major concerns about the two bills being introduced today and how they propose to do so.

- I. Riverkeeper strongly opposes Intro 1253 to require the Department of Environmental Protection to notify the local Council Member when DEP installs a new bioswale, rain garden, or other bioretention system in the public right-of-way.**

Riverkeeper strongly opposes this bill, as mechanisms already exist to notify the public about green infrastructure (GI) installation, and because it could be counterproductive to

expanding GI across the city. The public is notified of the installation of new GI assets in the right of way through the Department of Design and Construction (DDC), which is responsible for the construction of these installations. That includes a 14-day public notice which is sent out to local elected officials as well as those signed up to receive notifications from DDC through the DDC Anywhere portal.

Further, by requiring DEP to notify local Council Members of new GI installations, this bill could have the unintended impact of slowing down the installation of GI by promoting NIMBYism from those who are opposed to such projects. Rain gardens, bioswales and other bioretention systems are small-scale projects with a small footprint, that nevertheless are essential for the City to meet its non-negotiable regulatory requirements to reduce Combined Sewer Overflows (CSOs) into our waterways under the CSO Consent Order. These assets do an incredible job of reducing CSOs and absorbing stormwater off the street, and also function to reduce local street flooding, improve air quality and enhance the visual appeal of neighborhoods. DEP has a proven method for the siting and planning of these assets, targeting areas where GI will most effectively reduce CSOs. This bill threatens to upend that success by functionally adding an extra layer of red tape for GI installations.

There have been concerns raised by both this Council and local environmental organizations that maintain GI assets on the ground, on the state of maintenance of these assets. Riverkeeper, alongside the SWIM Coalition, the RAIN Coalition, and the GI Working Group, have been raising the alarm for many years about the lack of funding for maintenance of GI. This lack of funding has led to decreased effectiveness of some GI assets where plantings cannot be maintained and also allowed trash to build up in these assets. The solution to addressing poor maintenance conditions is not adding layers of approval for installation, but rather securing additional funding in the FY '26 Budget and in future budgets for the operations and maintenance (O&M) of GI.

Currently, DEP's maintenance budget is not even 1% of the agency's overall budget. DEP, Parks and DOT regularly cite O&M costs as the reason for not implementing adaptive and effective green infrastructure solutions, although such arguments are never made for maintenance of roadways and other transportation infrastructure and grey sewer infrastructure, all of which require significant O&M. An agreed-upon administrative solution to O&M with adequate funding would make it easier for all agencies, as well as local maintenance organizations, to maintain GI citywide, and would contribute substantially to the success of the program.

II. Riverkeeper strongly opposes Intro 1254, to set a target, measured in greened acres, of stormwater managed by green infrastructure in the municipal separate storm sewer system (MS4) area.

Riverkeeper appreciates the Council's intent to ensure development of GI in MS4 areas. We have been a proponent of that goal, and supported its inclusion in the CSO consent order. Yet Riverkeeper strongly opposes Intro 1254 as the "greened acre" target goal would undermine DEP's efforts to reduce CSOs in the most polluted waters in the city, while failing to drive flood mitigation and other key benefits to communities within the MS4.

A "greened acre" is a unit that was created to measure the volume reduction of CSO for the CSO Consent Order Modification of 2012, between DEP and the State. It is a key target to ensure DEP is meeting its CSO volume reduction requirements to help remediate the impairments of most NYC waters. It is crucial to recognize that for pathogenic pollution, CSO discharge volume reduction has far more water quality benefit than managing stormwater in the MS4—roughly 40 times the benefit. The CSO contributions to heavily polluted waterways in environmental justice areas—including the Harlem River, Bronx River, Flushing Creek, etc.—must be reduced to the maximum extent practicable. The volume reduction calculations based on "greened acres" of GI are specific to CSO control for water quality improvement purposes and cannot be used for flood risk reduction. A greened acre can only be translated into the volume of CSO discharge diverted and not to the volume of flood water reduced.

Despite that, Riverkeeper firmly supports GI in the MS4 area for pollutant capture and its community benefits, such as local flood reduction, air quality, climate resilience and aesthetics. To achieve those important ends, there is no need at this time for a quantified GI target in the MS4 area. A discharge volume target such as "greened acres" would result in widely dispersed and poorly planned green infrastructure assets, having little benefit. Instead, GI in MS4 areas must be thoughtfully deployed, in conjunction with grey infrastructure and other assets, to ensure the most efficient and effective flood reduction, water quality improvement and other community benefits. For New York City neighborhoods, to use GI well to significantly reduce street flooding, strategies like the Cloudburst program are needed that coordinate resilience on a neighborhood scale. Installing GI rain gardens and bioswales will not have that kind of intended effect.

Further, this legislation would set a mandatory target of 2400 greened acres over 10 years in the MS4 area. Currently, DEP does not have the resources to meet this target, and would have to take funding from the CSO program to do so as there is no separate funding stream for GI in the MS4 area. As a result, there is a 1-to-1 tradeoff in which every dollar spent in the MS4 areas decreases the funding for GI in the CSO areas, which could risk DEP falling out of compliance with the CSO Consent Order. 2400 greened acres is a significant lift—in 13 years DEP staff have installed 2,800 greened acres in the CSO areas, totaling

12,000 GI assets, all of which still need continued funding for maintenance. While that is an impressive figure, DEP has much more to install to meet its mandated CSO milestones.

New York City faces increasing threats to inland flooding from extreme weather as a result of climate change, and Riverkeeper thanks this Council for bringing attention to this issue, and pursuing legislation to use Nature Based Solutions to address stormwater flooding. This is a critical issue of our time, and we firmly believe that green infrastructure is one of the best tools that can and should be used to mitigate flooding. Riverkeeper also acknowledges the hard work that DEP is doing on climate resiliency and stormwater management through Nature Based Solutions, including the Cloudburst and Bluebelt programs, and through implementation of the Unified Stormwater Rule. As we write, these programs are at risk due to more than \$300 million in cuts to New York's FEMA BRIC funding, and due to lack of funding in the City budget to support implementation of the Unified Stormwater Rule. To achieve the climate resiliency and stormwater management goals of both DEP and this Council, more funding for DEP should be secured in the FY '26 budget.

Two possible options include:

- Declining the \$303 Million rental payment from the NYC Water Board to ensure adequate funding for GI and other infrastructure. To the extent that foregoing the rental payment should prove unpalatable to the Administration, consider earmarking that funding to replace \$300 million in funds lost to green and grey infrastructure like the Cloudburst Program.
- Including an additional \$4 million to fund implementation of the Unified Stormwater Rule, including 15 additional staff. This will increase effectiveness of this program, speed up permitting delays, and allow for site inspection for compliance, ensuring that ongoing developer attempts to revoke the program are unsuccessful.

We appreciate the intent of this bill, however as written we believe that it would have significant negative effects including by diverting resources from the city's very successful GI program in CSO areas, while not significantly reducing stormwater pollution or street flooding in MS4 areas. We would be happy to work further with Council and DEP to find effective solutions.

Em Ruby, Advocacy Policy and Planning Coordinator · eruby@riverkeeper.org

· 20 Secor Road · Ossining, NY 10562 ·





SWIM Coalition

Stormwater Infrastructure Matters

May 7, 2025

Testimony of [Michelle Luebke](#)

On behalf of Stormwater Infrastructure Matters (SWIM) Coalition

Before the New York City Council
Committee on Environmental Protection, Resiliency and Waterfronts
Oversight Hearing on Nature Based Solutions for Climate Resiliency

My name is Michelle Luebke, and I am the Program Manager at the Stormwater Infrastructure Matters (SWIM) Coalition. Thank you for the opportunity to deliver public testimony and thank you to Chairman Gennaro and members of the Committee for your leadership on promoting nature-based solutions for climate resiliency and protecting water resources in NYC.

Stormwater Infrastructure Matters (SWIM) Coalition is a group of 70 organizations dedicated to ensuring swimmable and fishable waters around New York City through sustainable stormwater management practices — both green and grey infrastructure. SWIM Coalition member organizations endorse a truly sustainable view of watershed management, one that restores ecological systems, creates local economic opportunities and equitably distributes the benefits of green infrastructure. SWIM Coalition has long advocated for nature-based solutions to address flooding, stormwater, and climate resiliency, not only because green infrastructure has the capability to manage water in highly urbanized areas, but also because of the myriad co-benefits associated with greening our cities.

While the SWIM Coalition and member organizations like Riverkeeper typically support promoting green infrastructure throughout the city and have actively worked with the Council and the DEP to expand the use of nature-based solutions to address climate threats citywide, we have major concerns that the two bills being introduced today will not be effective solutions and may have unintended adverse impacts.

- I. **SWIM Coalition strongly opposes Intro 1253, requiring the DEP to notify local Council Members when they install a new bioswale, rain garden, or other bioretention system in the public right-of-way.**

The SWIM Coalition strongly opposes this bill, as mechanisms already exist to notify the public about green infrastructure (GI) installation, and because it could be counterproductive to expanding GI across the city. The public is notified of the installation of new GI assets in the

right of way through the Department of Design and Construction (DDC), which is responsible for the construction of these installations. That includes a 14-day public notice which is sent out to local elected officials as well as those signed up to receive notifications from DDC through the DDC Anywhere portal.

Further, by requiring DEP to notify local Council Members of new GI installations, this bill could have the unintended impact of slowing down the installation of GI by promoting NIMBYism from Council Members who are opposed to such projects. Rain gardens, bioswales and other bioretention systems are small-scale projects with a small footprint, that nevertheless are essential for the City to meet its non-negotiable regulatory requirements to reduce Combined Sewer Overflows (CSOs) into our waterways under the CSO Consent Order. These assets do an incredible job of reducing CSOs and absorbing stormwater off the street, and also function to reduce local street flooding, improve air quality, and enhance the visual appeal of neighborhoods. DEP has a proven method for the siting and planning of these assets, targeting areas where GI will most effectively reduce CSOs. This bill threatens to upend that success by functionally adding an extra layer of red tape for GI installations.

There have been concerns raised by both this Council and local environmental organizations that maintain GI assets on the ground, on the state of maintenance of these assets. Trash accumulation, attrition of plantings, plant theft, pet waste, and other issues blight the surrounding community and decrease the effectiveness, eroding public support for and decreasing co-benefits of GI assets. The SWIM Coalition, along with Riverkeeper, the GI Working Group, and the RAIN Coalition, have long been working to alleviate the disconnect between installation and maintenance, and have been strongly advocating for funding for maintenance of GI for many years. The solution to addressing poor maintenance conditions is not adding layers of approval for installation, but rather securing additional funding in the FY '26 Budget and in future budgets for the operations and maintenance (O&M) of GI.

Currently, DEP's maintenance budget is not even 1% of the agency's overall budget. DEP, Parks, and DOT regularly cite O&M costs as the reason for not implementing adaptive and effective green infrastructure solutions, although such arguments are never made for maintenance of roadways and other transportation infrastructure, nor grey sewer infrastructure, all of which require significant O&M. An agreed-upon administrative solution to O&M with adequate funding would make it easier for all agencies, as well as local maintenance organizations, to maintain GI citywide, and would contribute substantially to the success of the program.

II. SWIM Coalition strongly opposes Intro 1254, to set a target, measured in greened acres, of stormwater managed by green infrastructure in the municipal separate storm sewer system (MS4) area.

SWIM Coalition and member organizations like Riverkeeper, strongly oppose Intro 1254. The “greened acre” target goal does not accomplish what we understand the bill is intended to do, and may in fact result in worse water quality throughout the city.

The DEP created the “greened acre” to represent the volume reduction of stormwater managed by GI for the CSO Consent Order Modification of 2012. DEP uses this unit of measurement to account whether they are meeting target CSO volume reduction requirements as required by the State. In the combined sewer system (CSS), stormwater from street drains can overwhelm the treatment capacity, resulting in overflow events that release raw sewage, polluted stormwater, trash, and other pollutants into our waterways; stormwater in the municipal separate sewer system (MS4) will not trigger overflow events, since stormwater is not treated. Therefore, a greened acre can only be translated into the volume of stormwater discharge diverted from the system to reduce the likelihood of an overflow event, not the volume of flood water reduced, and is only applicable to the CSS, not the MS4, areas of the city. A more appropriate measure for the MS4 area would be pollutant loading reduction, what the DEP is calling ‘water quality volume’ to reflect the benefits to water quality as stormwater is captured before entering the system..

Moreover, we believe this bill would undermine DEP’s efforts to reduce CSOs in the most polluted waters in the city, while failing to drive flood mitigation and other key benefits to communities within the MS4. The CSO contributions to heavily polluted waterways in environmental justice areas—including the Harlem River, Bronx River, Flushing Creek, etc.—must be reduced to the maximum extent practicable.

Already facing a staffing shortage, DEP does not have the resources to meet this target, and would have to pull funding from the CSO program to do so as there is no separate funding stream for GI in the MS4 area. As a result, there is a 1-to-1 tradeoff in which every dollar spent in the MS4 areas decreases the funding for GI in the CSO areas, which could result in worsening water quality and ultimately failure to meet its mandated milestones. Further, this legislation would set a mandatory target of 2400 greened acres over 10 years in the MS4 area. For context, in 13 years DEP staff have installed 2,800 greened acres in the CSO areas, totaling 16,000 GI assets, all of which still need continued funding for maintenance.

The SWIM Coalition and member organizations fully support expanding the use of green infrastructure throughout the city to address pollutant capture, local flood reduction, air quality, climate resilience, and aesthetics. To achieve those important ends, there is no justification at this time for a quantified GI target in the MS4 area. If the intention of this proposed legislation is to address flooding, a discharge volume target such as “greened acres” is not meaningful in stormwater management in the MS4 area and would result in widely dispersed and poorly planned green infrastructure assets, having little benefit. Instead, GI in MS4 areas must be thoughtfully deployed, in conjunction with grey infrastructure and other assets, to ensure the most efficient and effective flood reduction, water quality improvement and other community benefits. In this case, to use GI well to significantly reduce street flooding, programs like the

Cloudburst program are needed that coordinate resilience on a neighborhood scale. Installing GI rain gardens and bioswales will not have that kind of intended effect.

New York City faces increasing threats to inland flooding from extreme weather as a result of climate change, and we thank this Council for bringing attention to this issue, and pursuing legislation to use Nature Based Solutions to address stormwater flooding. This is a critical issue of our time, and we firmly believe that green infrastructure is one of the best tools that can and should be using to mitigate flooding. SWIM Coalition also acknowledges the hard work that DEP is doing on climate resiliency and stormwater management through Nature Based Solutions, including the Cloudburst and Bluebelt programs, and through implementation of the Unified Stormwater Rule. As we write, these programs are at risk due to more than \$300 million in cuts to New York's FEMA BRIC funding, and due to lack of funding in the City budget to support implementation of the Unified Stormwater Rule. To achieve the climate resiliency and stormwater management goals of both DEP and this Council, more funding for DEP should be secured in the FY26 budget.

Two possible options include:

- Earmarking the \$303 Million rental payment from the NYC Water Board to replace \$300 million in funds lost to Cloudburst, coastal resiliency, and other climate projects being funded through the FEMA BRIC grant program.
- Including an additional \$4 million to fund implementation of the Unified Stormwater Rule, including 15 additional staff. This will increase effectiveness of this program, speed up permitting delays, and allow for site inspection for compliance, ensuring that ongoing developer attempts to revoke the program are unsuccessful.

We appreciate the intent of this bill, however as written we believe that it would have significant negative effects including by diverting resources from the city's very successful GI program in CSO areas, while not significantly reducing stormwater pollution or street flooding in MS4 areas. We echo our partners at Riverkeeper in extending the offer to gladly work further with Council and DEP to find effective solutions for our common goals.

Respectfully submitted,

Michelle A. Luebke
Program Manager
SWIM Coalition

**Testimony for the NYC Council Committee on Environmental Protection, Resiliency and Waterfronts
Oversight Hearing: Nature-Based Solutions for Climate Resiliency and Disaster Preparedness
Tami Lin-Moges, NY Cities Director, The Nature Conservancy
May 7, 2025**

My name is Tami Lin-Moges and I am the Director of The Nature Conservancy's Cities Program in New York. The Nature Conservancy is the world's largest conservation organization, and our diverse staff and more than 400 scientists conserve the lands and waters on which all life depends. We impact conservation in 76 countries and territories, directly and with partners. We have 90,000 members across New York State, 35,000 of whom reside in New York City. The Nature Conservancy runs urban conservation programs across the United States -- our New York City program was one of the first city programs and continues to be a leader in the Conservancy as we focus on the important role of nature in urban areas. We advance strategies that create a healthy, resilient and sustainable urban environment and are committed to improving New York City's air, land and water that sustain and support the people and nature of this great city.

At the heart of the New York City Program is to promote nature and advance nature-based solutions (NBS) to mitigate the impacts of climate change and enhance the quality of life of all New Yorkers. Green space is crucial for the livability of NYC and the health and safety of New Yorkers. In New York City, we convene and are a leading member of Forest for All NYC, a coalition of 175 organizations committed to growing the NYC urban forest to reach 30% canopy cover by 2035; we are leading practitioners on the science and policy of green roofs; and we are conducting an analysis the latest NYC tree canopy data that will be released early this summer.

I am writing on behalf of The Nature Conservancy to testify regarding the importance of nature-based solutions for climate resiliency and disaster preparedness and the related needs for sustained funding for trees and green spaces and job creation in this sector. As our city continues to face [significant increases in the number and intensity of heat waves](#) and extreme precipitation events in the coming decade, trees, parks, green roofs, bioswales, and other green spaces — when adequately maintained — offer critical nature-based solutions to mitigate the impacts of droughts, floods, heatwaves, and other extreme weather events. Green spaces are crucial for the health, safety, and livability of NYC. However, these many functional benefits cannot be fully realized through the simple existence of parks and green spaces; sufficient commitment to their operations and maintenance is required. Furthermore, adding nature and nature-based solutions (NBS), especially to improve the city's climate resiliency and preparedness for disasters from extreme weather, also present opportunities for job creation and workforce development.

As we consider opportunities for green spaces for climate resiliency, we must also look to NYC's rooftops. Green roofs help to cool the city, absorb stormwater, and reduce flooding. Of NYC's 1 million buildings that are home to about 40,000 acres of rooftop space (that's about equivalent to a whole borough), [our research](#) reveals of 2016, there are only about 730 green roofs totaling about 60 acres. Further, these are inequitably distributed. They are largely concentrated in a few areas of the city and not in communities that already have low green spaces and high vulnerability to extreme heat and flooding. While not all roofs may be appropriate for green roofs, we have a long way to go to take full advantage of this opportunity. It's crucial that the City advance its implementation of [Local Laws 92 & 94](#) and promote and support access to the [Green Roof Tax Abatement](#) to help expand green roofs, especially in neighborhoods that are most vulnerable to the effects of climate change and where a higher tax abatement is available.

Back on the ground, the urban forest includes over 7 million trees on public and private property, with their canopy covering 23 percent of the city as of 2021. They are essential city infrastructure that provide many benefits including cooling the city, sequestering and mitigating carbon, removing air pollution, avoiding stormwater runoff,

and reducing energy costs. [Research published in 2018 by the US Department of Agriculture \(USDA\) Forest Service](#) for the NYC urban forest indicates that its benefits and services total over \$260 million per year and the cost to replace this resource if lost would be about \$5.7 billion. Nearly 54% of the urban forest canopy (found in parks and on streets) is managed by NYC Parks. NYC Parks also manages 14% of the city’s overall land area. And yet, despite the urban forest’s essential role in the health and resiliency of our city, it has faced chronic underfunding and has been vulnerable to disproportionate cuts during times of financial hardship. The NYC Department of Parks and Recreation (DPR) received an annual average of 0.34% of the total City Other than Personal Services (OTPS) expense budget from FY18 to FY22. The portion allocated to urban forestry work was only 0.04% of the total City OTPS expense budget (or an average of \$23 million per year, adjusted for inflation). This funding limits critical maintenance activities necessary to keep trees healthy, like pruning, stump removal, and pest and disease management, with the latter ever important as the changing climate brings new species to the NYC environment.

To successfully maintain, and ultimately expand, our natural assets and nature-based solutions, investment in people to take care of these resources are needed and would serve as a good job generator. The Nature Conservancy New York City Program has a collaborative partnership with NYC Environmental Justice Alliance, [Just Nature NYC](#), to advance our shared purposes of equitably increasing nature-based solutions across NYC. Together, in December 2021 we released the [Opportunities for Growth: Nature-Based Jobs in New York City report](#) that offers an in-depth look at the complexity and variety of “nature-based jobs” across the five boroughs. It was the first time a definition of “nature-based jobs” was formalized, where we defined them as jobs that directly contribute to natural infrastructure and nature-based ecosystems with the goal of enhancing human health and well-being and promoting biodiversity. The prior lack of a formal definition highlighted how these jobs managing nature and NBS are often overlooked and excluded in “green jobs” discussions. We also found that there was an estimated total of 761 jobs considered to have high NBJ representation in 2020, suggesting a substantial mismatch between the scale of the city’s natural environment and its capacity to manage it, and pointed to immense opportunities to grow this sector as the need for and number of NBS installations increase. The Nature Conservancy, in collaboration with [Forest for All NYC](#) coalition members, also released [Learning and Growing: Urban Forestry Workforce Training in NYC](#) in 2023, a report on urban forestry workforce training opportunities within New York City. This report identified 36 programs, offered by 26 organizations, that provide urban forestry skills and knowledge attainment. To reach the citywide goal, as codified in Local Law 148 of 2023, of equitably expanding the NYC urban forest to reach 30% canopy cover, there will need to be an investment in workforce training opportunities and creation of new full-time jobs in the public and private sectors.

Investing in nature-based solutions is critical to public safety, workforce development, community health and wellness, and climate resilience. Thank you to the Committee on Environmental Protection, Resiliency and Waterfronts for the opportunity to submit testimony. The Nature Conservancy is pleased to make ourselves available to advance this important discussion.



PUBLIC TESTIMONY OF WATERFRONT ALLIANCE

May 7, 2025

New York City Council Committee on Environmental Protection, Waterfronts, and Resiliency Oversight Hearing RE: Nature-Based Solutions for Climate Resiliency and Disaster Preparedness.

Submitted by Tyler Taba, Director of Resilience, Waterfront Alliance

My name is Tyler Taba, and I am the director of resilience at the Waterfront Alliance. Thank you, Chair Gennaro and Council Members, for hosting this hearing today.

Waterfront Alliance is the leader in waterfront revitalization, climate resilience, and advocacy for the New York-New Jersey Harbor region. Waterfront Alliance is committed to sustainability and to mitigating the effects of climate change across the region's hundreds of miles of waterfront. We convene the Rise to Resilience Coalition of 100+ groups advocating for policy related to climate resilience, we bring education focused on climate resilience to students in NYC DOE schools through our Estuary Explorers program, and we run the national Waterfront Edge Design Guidelines (WEDG®) program for promoting innovation in climate design.

I am grateful to submit testimony today in strong support of nature-based solutions and disaster preparedness. Starting with the former, Waterfront Alliance has long supported expanding the use of nature-based solutions for climate resilience in New York City. For both coastal and inland flood risks, nature-based solutions can provide significant reductions in flood risk. Nature-based solutions can help alleviate the burden on the City's aging sewer infrastructure during extreme rainfall events. For example, rain gardens have been proven to absorb thousands of gallons of stormwater during rainfall events. They can also help to cool temperatures, clean the air, promote biodiversity, and beautify neighborhoods. Other successful nature-based solutions can be found in the City's [Cloudburst Management](#) and [Bluebelts](#) programs, which are managed by the Department of Environmental Protection (DEP). In our preliminary budget hearing testimony, Waterfront Alliance strongly recommended that these programs be expanded across neighborhoods with high climate and social vulnerability.

Waterfront Alliance's [WEDG® \(Waterfront Edge Design Guidelines\)](#) standard provides best practices for designing resilient, ecological, and accessible waterfront projects. The standard



affirms the effectiveness of incorporating nature-based solutions on waterfront sites to help manage stormwater quantity, improve stormwater quality, reduce heat island effects, increase ecology and biodiversity, and absorb flooding and wave damage.

Eleven waterfront sites in New York City have achieved WEDG Verification for their stellar resilient design and success in implementing nature-based solutions, including: rain gardens and water-collecting lawns at Brooklyn Bridge Park, three acres of restored wetlands that provide aquatic habitat and help absorb water at Oak Point/McInnis Cement in the Bronx, and protective breakwater reefs that reduce shoreline erosion at Sunset Park Materials Recovery Facility in Brooklyn. The WEDG standard recognizes that nature-based solutions on waterfront sites can complement grey infrastructure and provide adaptability and resilience where current gaps exist.

Nature-based solutions and green infrastructure face a major challenge across New York City: operations and maintenance (O&M). Green infrastructure solutions often require more regular maintenance and upkeep. New York City has done an extremely poor job, to date, in funding the necessary O&M for these nature-based, green infrastructure assets. **Waterfront Alliance strongly encourages the City Council to dedicate significant funding to O&M for agencies like the Department of Parks and Recreation (Parks), Department of Environmental Protection (DEP), Department of Transportation (DOT), and Department of Education (DOE) to ensure that nature-based solutions can be successful.** Many neighborhoods rely on volunteers to clean and maintain rain and street gardens, which is not a sustainable model.

We support legislative efforts to expand the use and success of nature-based solutions, but we do have concerns about the approach taken in the legislation introduced at today's hearing.

Waterfront Alliance strongly opposes Intro 1253, which would require the Department of Environmental Protection (DEP) to notify the local Council Member when the agency installs a new bioswale, rain garden, or other bioretention system in the public right-of-way. There is already public notification required for the installation of new green infrastructure assets, which is coordinated by the Department of Design and Construction (DDC). Additionally, these types of projects are relatively small scale and do not require an extra layer of notice for local Council Members. Waterfront Alliance believes that DEP has an effective methodology for planning and installing green infrastructure assets. This legislation threatens to slow down the rollout of these important assets across the city.

As mentioned earlier, there must be a significant increase in funding for O&M. If the Council is concerned with the state of green infrastructure assets, like rain gardens, bioswales, and other



bioretention systems, the solution is to invest in O&M—not to require additional notice of their installation.

Moreover, **Waterfront Alliance opposes Intro 1254, which would set a target, measured in greened acres, of stormwater managed by green infrastructure in the municipal separate storm sewer system (MS4) area.**

The greened acre is a unit that was created to measure the volume reduction of combined sewer overflow (CSO) for the [CSO Consent Order Modification of 2012](#). It is a key target to ensure DEP is meeting its CSO volume reduction requirements. The CSO contributions to heavily polluted waterways in Environmental Justice communities, including the Harlem River, Bronx River, and Flushing Creek, must be reduced to the maximum extent practicable. **The volume reduction calculations based on greened acres of green infrastructure are specific to CSO control for water quality improvement purposes and should not be used for flood risk reduction.**

It is crucial to recognize that for pollution, CSO discharge volume reduction has far more water quality benefit than managing stormwater in the MS4 area. A greened acre can only be translated into the volume of CSO discharge diverted and not to the volume of flood water reduced. A discharge volume target would result in dispersed and poorly planned green infrastructure assets.

Waterfront Alliance, instead, recommends that green infrastructure in the MS4 areas be planned strategically together with grey infrastructure to ensure the most efficient and effective flood reduction. The Cloudburst Management Program is an excellent example of the type of projects the City should expand to reduce flooding at the neighborhood scale. The Cloudburst Management Program was set to grow significantly in the coming years through funding from the Federal Emergency Management Agency's (FEMA) Building Resilient Infrastructure and Communities (BRIC) program. That program has been halted at the federal level and jeopardizes more than \$300 million in funding across New York.

To achieve the goals this hearing intends to raise, the City must allocate additional resources to DEP in the FY26 budget.

Waterfront Alliance believes in a holistic approach to addressing the impacts of climate change, recognizing that there is no single solution to respond to the climate crisis. While we continue to proactively build support for nature-based measures and a wide range of adaptive solutions to reduce our vulnerability, we are also grateful that this hearing highlights the critical importance of disaster preparedness. As extreme weather events like heat waves and flooding



increasingly affect New Yorkers, prioritizing preparedness must be a core part of our resiliency strategy.

To that end, Waterfront Alliance supports enhancing disaster preparedness through clearer communication, deeper community integration, and increased capacity at New York City Emergency Management (NYCEM). Preparedness materials must be concise, multilingual, and accessible to all New Yorkers. **As the City continues to plan and design climate resilience projects, we strongly urge the integration of emergency management resources into both infrastructure initiatives and community engagement processes—ensuring residents are not only protected by physical interventions but also empowered with the knowledge and tools to respond to such emergencies.**

Additionally, existing emergency management and preparedness resources require significant improvements and should be consolidated into a single website, managed by NYCEM. The [NYC DEP's Rainfall Ready NYC Action Plan](#) is intended to help New York City residents prepare for intense rainstorms, but it has several user issues. The page lacks a user-centered design and is not user friendly, focusing mainly on intense storms as a cause of flooding while neglecting other causes and key details about emergency management and weather-related events. Additionally, the page is difficult to find from the DEP's home landing page. The website is hard to navigate, and contains outdated information, making it less effective as a quick-reference resource during emergencies.

A comprehensive communication and preparedness strategy needs to be developed and integrated into all City agencies. At a September 2024 City Council hearing on citizen complaint program, Waterfront Alliance and the Rise to Resilience Coalition submitted testimony for how to improve the City's 311 flood reporting. When reporting a flood, NYC311 should directly connect residents to emergency management resources, such as [Notify NYC](#), [New York City Emergency Management \(NYCEM\) Preparedness Tips](#), [Know Your Zone](#), the [New York City Department of Environmental Protection's \(DEP\) Rainfall Ready NYC Action Plan](#), [FloodHelpNY](#) for flood insurance and retrofitting support, [FloodNet Sensor Suggestion Form](#), and other resources. By using existing resources, particularly FloodNet and the NYC311 public inventory, the City can ground-truth local science projections for extreme rainfall with local flood reports. If there are discrepancies, those sites can be further revised and researched.

Given the various challenges with reporting flooding and connecting to existing citywide resources, there are several quick fixes that could be easily prioritized to enhance the flood reporting system. That said, there are more thorough ways to improve the flood reporting system. For starters, an overall communications and website audit that evaluates the user



experience. This audit should include different audiences beyond app, web, and smartphone users (ex: people with disabilities and non-native English speakers). User experience testing is well-established as a method to map these features and prioritize them. It can take various forms (ex: in-person testing, virtual interviews, labs, software, etc.). These methods are widely used in the private sector and smart cities should leverage user experience research to expand access and improve reporting.

By organizing and integrating the currently available resources, the City can provide residents with more helpful information and thorough reports and responses on specific flooding instances. This becomes a more pressing and important issue in the face of climate change impacts, specifically increasing heavy rainfall, storm surges, and extreme weather events. With the roll-back of federal funding to NOAA and FEMA, it is ever more critical that the City invests in supporting local resources to establish strong preparedness to ensure better resilience to these weather events.

Thank you, Chair Gennaro and Council Members, for hosting this important hearing today. Waterfront Alliance continues to advocate for wider adoption of nature-based solutions and stronger disaster preparedness practices, and we look forward to partnering with you.

Tyler Taba

Director of Resilience, Waterfront Alliance

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May 7, 2025

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Testimony of WE ACT for Environmental Justice

To the New York City Council Committee on Environmental Protection

Regarding Nature-Based Solutions

Dear Committee Chair Gennaro and Committee on Environmental Protection, Resiliency, and Waterfronts:

WE ACT for Environmental Justice, an organization based in Harlem, has been fighting environmental racism at the city, state, and federal levels for more than 35 years. We recognize and fight to remedy the negative cumulative impacts of unjust policies that have plagued communities of color for decades.

Nature-based solutions are a critical part of fulfilling environmental justice. Deprivation from clean air, water, and the environmental benefits of vegetation further exacerbate health inequities in communities of color and low-income. Extreme heat, flooding, air pollution, and energy burden can all be mitigated by strategic and cost effective nature-based solutions that enhance safety and beautify communities. The same technologies that created urban flooding and the urban heat island effect cannot liberate us from their consequences. Equitable expansion of the urban canopy, permeable pavements, rain gardens, green/cool/solar roofs, and bioswales all have a role to play in making New York City resilient. Recognizing our place in natural systems and leveraging them—instead of working against them—is key to generational well-being. Our infrastructure decisions last decades. It’s time to take advantage of solutions that were here millenia before us and will be here long, long after us.

With this in mind, WE ACT is asking the City Council to oppose two bills that could potentially threaten the deployment of nature-based solutions that help manage stormwater and improve water quality in local ecosystems.

WE ACT strongly opposes Intro 1253, which would require the Department of Environmental Protection to notify the local Council Member when DEP installs a new bioswale, rain garden, or other bioretention system in the public right-of-way. WE ACT supports efforts to improve transparency and awareness about green infrastructure. However, this bill is redundant since public notification already occurs through the

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Department of Design and Construction, which sends local elected officials and residents subscribers notifications of new projects two weeks in advance. Adding an additional process creates unnecessary administrative burden and could result in delays to GI projects. Residents who don't understand the role bioswales, rain gardens, and other bioretention systems play in reducing Combined Sewage Overflow events, street flooding, and concentration of air pollutants may use this notification process to oppose green infrastructure projects.

This opposition has an outsized harm on flood prone environmental justice neighborhoods. A study conducted by RedFin in 2021 showed that formerly redlined neighborhoods in New York City shoulder [94 percent more flood risk](#) compared to non-redlined areas.

For these neighborhoods, flooding compounds environmental health hazards and social vulnerabilities. East Harlem, for example, is amongst the communities that face some of the most [health and safety housing issues](#), highest [heat vulnerability](#), and heightened [displacement risk](#) in addition to flood risk from sea level rise and extreme precipitation. The Vision Plan for a Resilient East Harlem quantifies the cost of inaction against climate hazards over the next 50 years at [\\$3.2 billion](#). Further, without community level solutions, low-income tenants have very little agency to protect their health and homes from devastating flood events. But green infrastructure can limit runoff making its way into buildings that would exacerbate living conditions where residents are already facing mold, leaks, and building envelope cracks. It is crucial that we avoid creating processes that could undermine EJNYC planning, implementation, and climate resiliency investments.

WE ACT strongly opposes [Intro 1254](#), which would set a target, measured in greened acres, of stormwater managed by green infrastructure in the municipal separate storm sewer system (MS4) area. The bill's "greened acre" target is misapplied in MS4 areas, as this metric was designed specifically to reduce CSOs in highly polluted waterways. Additionally, while well-intentioned, it is not clear how the 2,400-acre figure was decided upon with relation to existing stormwater management and water quality protection goals. For MS4 areas in particular, Cloudburst and Bluebelt programs are highly cost-effective, efficient in limiting urban flooding, and protecting the health of local waterways, yet they are increasingly vulnerable due to the recent loss of FEMA BRIC funding. Imposing a 2,400-acre target in MS4 regions could divert limited resources from critical CSO efforts, undermining DEP's ability to meet regulatory mandates.



Further, given that municipal resources are already spread thin, we caution against overburdening the Department of Environmental Protection to reach this greened acre target. DEP already must fulfill regulatory mandates to reduce CSOs, a goal toward which they have made significant progress. In 13 years they have installed 2,800 of greened acres in the CSO areas, totaling 12,000 GI assets. Instead of adding entirely new objectives, adequate funding must be allocated to maintenance of these assets, as the current budget for maintenance is a fraction of 1 percent of DEP's total budget.

WE ACT joins Riverkeeper, the SWIM Coalition, the RAIN Coalition, and the GI Working Group in advocating for the following solutions: redirecting the NYC Water Board's \$303 million rental payment, and allocating \$4 million to support DEP staff and implementation of the Unified Stormwater Rule.

Sincerely,

Caleb Smith

Resiliency Coordinator

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Lonnie J. Portis

New York City Policy & Advocacy Manager

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Appearance Card

[]

I intend to appear and speak on Int. No. _____ Res. No. _____

in favor in opposition

Date: 5/7/25

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Name: Matt Drury

Address: Chief of Citywide Legislative Affairs

I represent: NYC Parks

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Name: Marit Larson

Address: Asst. Commissioner of Natural Resources

I represent: NYC Parks

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Name: Christopher Leon Johnson

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I represent: Self

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Name: Peter Malinowski

Address: _____

I represent: Billion Oyster Project

Address: 10 South Street, New York, NY

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Name: Melissa Enoch

Address: _____

I represent: Dept of Environmental Protection

Address: _____

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Name: Beth DeFalco, Deputy Commissioner

Address: _____

I represent: NYC DEP

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Name: Angela Licata (PLEASE PRINT)

Address: _____

I represent: NYC DEP

Address: _____

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Name: Em Ruby

Address: _____ NY 11215

I represent: Riverkeeper

Address: 20 Selar Rd Ossining, NY 10562

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