

Building an Equitably Green New York City

2022



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Introduction

The future livability of New York City depends on whether the city is willing to invest significant resources into new infrastructure that sustainably absorbs and manages rainfall events. Such “green infrastructure” often refers to soil and vegetation installations that can soak up precipitation and increasingly includes non-vegetated permeable surfaces like porous pavement and stormwater management techniques. The absorbed stormwater infiltrates into deeper soil layers to be slowly released into surrounding waterbodies or evaporates, lessening inundation of our sewer system and capturing carbon and cooling the City in the process.



“Green Infrastructure” often refers to soil and vegetation installations that can soak up precipitation and increasingly includes non-vegetated permeable surfaces like porous pavement and stormwater management techniques.

Not only does green infrastructure absorb hundreds of millions of gallons of stormwater citywide, but its co-benefits have major implications for residents and wildlife alike. It can mitigate localized local flooding damage by detaining and slowing stormwaters. Vegetated green infrastructure reduces the urban heat island effect by reflecting sunlight, lowering the temperature through evapotranspiration, and providing tree canopy shade. It protects human health by improving air quality and providing shaded green space and greenways that lower temperature in urban neighborhoods. Plant and soil cover creates a more robust, diverse ecosystem for New York City’s ecological communities by building an interconnected system of pollinator gardens and wetland and woodland habitat. Vegetated green infrastructure even has the added bonus of sequestering carbon.



Photo on this and previous page provided by Shino Tanikawa

Just as importantly, the construction and on-going maintenance of green infrastructure assets—both vegetated and non-vegetated—can create livable wage jobs, reduce energy consumption and spur other local economic benefits. If planted and maintained equitably, green infrastructure can help to reduce disproportionate environmental hazards in underserved low-income communities and communities of color. And if designed on a large scale with local involvement, green infrastructure can create community cohesion that improves social well-being in an equitable way.

New York City has been in many ways a leader in green infrastructure installation. In the eleven years between 2010 and 2021, the Department of Environmental Protection (DEP) has constructed 11,553 assets totaling more than 2,000 greened acres. The majority of these assets are sidewalk rain gardens, but constructed

permeable surfaces and other stormwater management techniques are becoming increasingly important to the city’s program. The DEP has also created a financial incentive program for the construction of green roofs on private property and has partnered with other agencies such as the Department of Parks and Recreation (Parks) and the New York City Housing Authority (NYCHA) to retrofit their properties and with other organizations such as Trust for Public Land, the School Construction Authority (SCA) and the the Department of Education (DOE) to retrofit school yards with green practices. The sheer number of assets created makes New York’s the largest green infrastructure program in the country.

Despite these remarkable efforts, the city has not met the milestones to abate sewer overflows according to the intended timeline of its Clean Water Act



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Consent Order with New York State Department of Environmental Conservation (DEC). The Green Infrastructure Program was initially created to fulfill the city’s regulatory requirement to reduce raw sewage and polluted stormwater discharges to waters in and around the city. Meeting these requirements is critical to one day achieving the goals of the Clean Water Act: swimmable and fishable waters for all. Most recently, DEP reported that it failed to meet its 2020 goal to implement green infrastructure to absorb the equivalent of one inch of rainfall on 4% of the impervious surfaces in the combined sewer system areas of the city. The DEP has designed a contingency plan to ultimately meet that 4% target.¹

As the Green Infrastructure Program matures it is clear that changes are necessary to reach these milestones. And in the face of climate change and its

disproportionate impacts on the city’s most underserved communities, it is incumbent upon the city to set its sights on goals much higher than minimum water quality requirements by optimizing community co-benefits and prioritizing green infrastructure in environmental justice neighborhoods.



As the Green Infrastructure Program matures, it is clear that changes are necessary to reach these milestones.

Goals of these Recommendations

The purpose of the recommendations herein is to help improve and sustain New York City's Green Infrastructure Program to best serve our waters and all New Yorkers, prioritizing low-income communities and communities of color who face disproportionate exposure to environmental hazards. It has become clear following Hurricane Ida that the city must set a new programmatic goal for climate resilience and climate justice, in addition to the existing goal of water quality protection. As the city is quickly running out of space for new green infrastructure on city-owned properties, it must continue to innovate. Other city agency partners must be funded to greatly expand their efforts to pitch in where DEP is limited. And the city must expand its efforts to properly maintain the assets it has invested in over the last decade; otherwise these investments will be wasted. Our organizations are counting on the Adams Administration to set a new trajectory for the city's Green Infrastructure Program, not only to meet its Clean Water Act goals, but to restore ecological habitats, advance climate justice and provide benefits to local communities. The Administration is currently engaged in a number of crucial studies as part of its city strategic planning agenda, which includes:

**PowerUp NYC
Long-Term
Energy Plan²**

**Environmental
Justice for All
Report³**

**NYC Panel on
Climate Change
4th Assessment⁴**

**Renewable
Rikers Island
Feasibility Study⁵**

**Cloudburst
Feasibility
Studies⁶**

**AdaptNYC
Report**

Each of these efforts is crucial to preparing the city for climate change. Our recommendations will focus on the forthcoming AdaptNYC report, which will evaluate and plan for potential climate hazards and to adapt communities in ways that protect them from disasters while improving day-to-day quality of life. While the AdaptNYC report will serve as only one component in the strategic planning process, we believe that it could, in fact, provide a binding framework for all of these studies listed above. AdaptNYC should transform the city’s various climate change plans, reports and studies into a roadmap for climate justice and resilience. In doing so, green infrastructure will be a key piece of the puzzle, given its

capability to address multiple potential hazards and social injustices.

We appreciate that the Adams Administration has committed to taking a hard look at drainage in the context of the “New Normal” of increased precipitation and has released the Rainfall Ready NYC Action Plan.⁷ Mayor Adams must pursue aggressive action to address the growing harms posed by increased precipitation storms. Major opportunities lie just ahead for the city, including the daylighting of Tibbetts Brook from Van Cortlandt Park to the Harlem River in the Bronx and cloudburst projects to manage extreme rain events in vulnerable neighborhoods.



Photo provided by the Bronx River Alliance

Green Infrastructure and Climate Justice

We greatly appreciate AdaptNYC’s anticipated prioritization of climate justice and the acknowledgment of the impact that structural racism has had on the city’s low-income communities and communities of color. As noted in Mayor’s Office of Climate and Environmental Justice’s (MOC-EJ) presentation of AdaptNYC to the Rise to Resilience coalition in January 2022 the AdaptNYC “framework acknowledges history, seeks to repair and build relationships, and shift power and resources” and the agency is aware that “uneven impacts [of climate change] are caused by history, demographics, and geography.” MOC-EJ promises that AdaptNYC will make recommendations for neighborhoods based on their history and socio-economic demographics, in addition to their soil type and flooding vulnerability. We fully support MOC-EJ’s effort to ensure that the city’s climate adaptation plan is equitable, and we believe that green infrastructure and nature-based solutions can play an important role in achieving these climate justice goals.



HOW A HEALTHY AND EQUITABLE URBAN FOREST CAN HELP COMMUNITIES THRIVE

NYC Environmental Justice Alliance and The Nature Conservancy's 'Just Nature' Mini Report outlines the importance of green infrastructure and nature based solutions for environmental justice, climate justice and racial equity.

According to the NYC Environmental Justice Alliance and The Nature Conservancy’s “Just Nature NYC” mini report, “Environmental Justice communities are low-income communities and communities of color who face disproportionate exposure to environmental hazards due to both intentional design and structural racism.”⁸ The mini report outlines the critical role that equitably planted and maintained trees and green spaces can have on reducing these environmental hazards and on correcting the long history of environmental racism in New York City. Equitable green spaces can reduce the urban heat island effect, absorb particulate matter in air pollution, prevent water pollution through stormwater management and help to mitigate flooding. The social impacts of equitable green spaces for environmental justice communities include improving mental health through visible greening, promoting an active lifestyle and increasing spaces for social cohesion. These benefits can be maximized where green infrastructure is designed thoughtfully and in conjunction with community partners.

It is equally important that AdaptNYC reduce the potential for green gentrification, the paradoxical impact of displacing environmental justice

communities when increasing green spaces. The policy toolkit, “Sharing in the Benefits of a Greening City”⁹ outlines several of the ways that advocates, community organizations and policy makers can reduce or avoid the impacts of green gentrification. Some of these tools, such as creating job training programs, are included in this report’s recommendations. Others, like forming community land trusts, are noted in other city reports, such as the Department of City Planning’s Comprehensive Waterfront Plan. Taken together, the implementation of these tools can help to prevent green gentrification while allowing for the creation of more green spaces in underserved communities.

When created in coordination with multiple agencies, co-designed with local communities and understood broadly as nature-based solutions, DEP’s Green Infrastructure Program has the potential to not only absorb stormwater, but to also play a role in reducing the disproportionate impacts of climate change in environmental justice communities. While this report couches its recommendations in terms of DEP’s regulatory mandate to manage stormwater, we believe that DEP’s green infrastructure program is an underused tool for climate justice and adaptation.



DEP’s green infrastructure program is an underused and overlooked tool for climate justice and adaptation.

Needs for Stormwater Control

The city's Green Infrastructure Program is designed to construct green infrastructure assets to capture and prevent stormwater from entering the combined sewer system to reduce by 1.67 billion gallons the raw sewage and polluted stormwater discharges to the city's waters every year.¹⁰ The program is critical to reducing "combined sewer overflows."¹¹ Roughly 60% of the city is underlain by combined sewers, in which stormwater runoff from our roofs, sidewalks and streets mixes with household and industrial sewage. The other 40% of the city is served by separate sewers, where polluted stormwater is not mixed with sewage and is discharged without treatment directly to surface waters.

On sunny days, city wastewater treatment plants have capacity to treat all of its sewage. However, when it rains, the combined sewers are overcome by as little as one tenth of an inch of rain in some areas, leading to discharges of a mixture of untreated sewage and polluted stormwater. On roughly one of every three days, the city's combined sewer system is discharging,¹² and the discharges amount to a total yearly average volume of more than 20 billion gallons of raw sewage and stormwater entering surface waters in the city. These combined sewer overflow discharges pose dangers to human health and impair the habitats of fishes and other aquatic organisms.

While water quality impacts remain ongoing, New York has also recently endured catastrophic local flooding, concentrated largely in inland environmental justice communities. Tropical Storm Ida dropped 3.15 inches of rain per hour and showed New Yorkers that the city is not ready for major storms.¹³ Pluvial (or precipitation-related) flooding caused 11 deaths and millions of dollars of property damage in the city. Given the overdevelopment of the city's hardscape, and the design of the sewer system to handle only 1.75 inches of rain per hour, inland residences and structures have been shown to be just as vulnerable to flooding as those in low-lying areas. These problems are going to get much worse with more frequent and more intense rainstorms as a result of climate change.



These combined sewer overflow discharges pose dangers to human health and impair the habitats of fishes and other aquatic organisms.

Insufficiencies of New York City's Green Infrastructure Program

The Clean Water Act Combined Sewer Overflow Control Policy requires that the city significantly reduce its sewage discharges.¹⁴ Since 1986, the City has invested tens of billions of dollars to improve water quality, but the waters are still largely unsafe for human contact following precipitation, and much more remains to be done.

There are a few methods to reduce sewage overflows. One such method is known as “gray infrastructure,” which includes capturing stormwater and sewage in large storage tanks and tunnels during storms and pumping it out for treatment after the storm subsides. A key goal of green infrastructure is to prevent stormwater from overwhelming the sewer system in the first place, thereby reducing the need for large scale gray infrastructure, which tends to cost more and has fewer co-benefits than green infrastructure.

As part of its combined sewer overflow reduction obligations, the city revised a Consent Order in 2012 with the state DEC.¹⁵ The Consent Order lays out milestone requirements for the Green Infrastructure Program, leading to an overall requirement that the city manage the equivalent of stormwater generated by one inch of precipitation on 10% of the impervious

surfaces in the combined sewer areas.

The requirement equates to a reduction of combined sewer overflows by 1.67 billion gallons annually through green infrastructure. But the city has never been on track to meet its 2030 goal for this milestone.

The Consent Order provides little guidance about how the city should implement its Green Infrastructure Program. As the purpose of the Order is to abate combined sewer overflows, one clear directive is that its requirements are limited to the combined sewer areas of the city, leaving the separately sewered areas (roughly 40% of the city) without much impetus for green infrastructure construction. (While another Clean Water Act permit covers the separately sewered areas of the City and applies to all City agencies, the separate sewer permit's green infrastructure provisions are limited.) The city has chosen to delegate the program solely to one agency with one funding stream via water rates, leaving other city agencies largely free to ignore the requirements.

In the city's Green Infrastructure Program the term “green infrastructure” refers only to assets that meet DEP's narrow technical requirements, based on

limitations in the DEC Consent Order. The assets that qualify for credit under the program typically include infiltration installations in the public right-of-way and on city-owned properties; developments on private property that receive city funding, and those created by the strengthening of stormwater regulations on new development. Yet there are acres of other types of green infrastructure being developed, too, which can detain, slowly release, and treat waters to reduce scour, improve water quality and remove floatables. These other types of green infrastructure are sometimes referred to as “nature-based solutions,” “open space,” “green space,” or “park space” and include street trees, wetlands and forests, in addition to upstream bioretention basins and sand filters, etc. These assets often prioritize urban heat island effect mitigation, green and wild space, or habitat, rather than solely optimizing stormwater control. Nature-based solutions can fall under the varied jurisdiction and management of city agencies, such as DEP or Parks, depending on the asset’s location, initial funding stream, and other factors. As the term “green infrastructure” is often defined differently by those agencies, it leads to the prioritization of different benefits, confusion, and sometimes conflict.

All types of green infrastructure are critical to the livability of New York City; they make up our urban ecological system. The

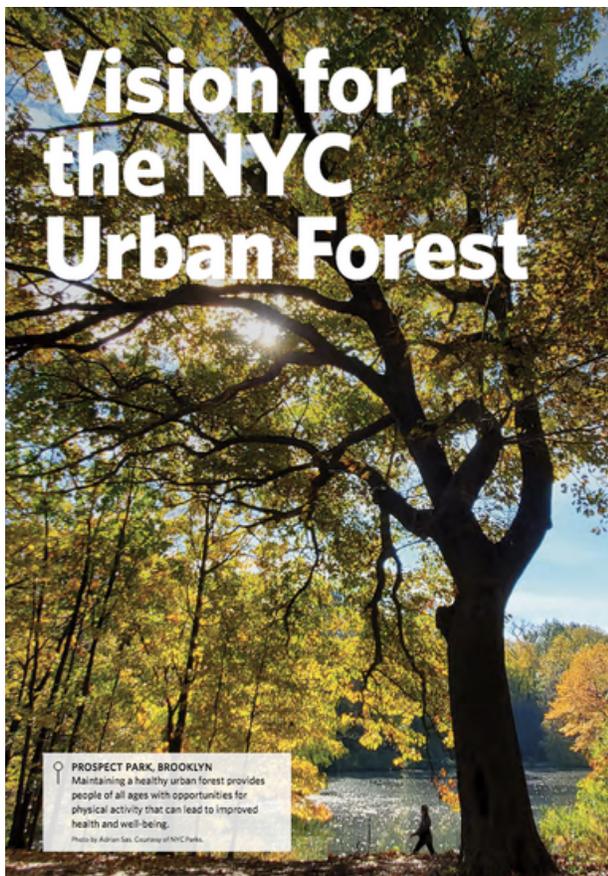
city needs a cohesive strategy for all green infrastructure and nature based solutions to thoughtfully balance their myriad benefits; facilitate systems for inter-agency coordination; develop unified goals and priorities; and match financial needs with appropriate funding for all agencies. The funding demand necessitates increasing Parks’ budget and developing additional funding mechanisms beyond water rates for DEP, the largest developer of green infrastructure.

While they are critical stakeholders, Parks and DEP are not the only agencies for which potential Green Infrastructure Program synergies are being lost through lack of adequate coordination. For instance, the Department of Transportation (DOT) is a crucial partner in developing meaningful green infrastructure. For example, DEP is developing three green roadway medians in Arverne with bioretention areas and subsurface stormwater storage.¹⁶

Following the example set by these projects, city streets will become one of the most important opportunities for new green infrastructure. Yet the city has set up roadblocks to meaningful DOT involvement in green infrastructure; there are no mandates for green infrastructure on DOT right-of-way developments smaller than an acre, despite the fact that roads and sidewalks are constantly being redeveloped.¹⁷ Opportunities for better stormwater management practices are being wasted.



All types of green infrastructure are critical to the livability of New York City; they make up our urban ecological system. The city needs a cohesive strategy for all green infrastructure and nature based solutions.



Just as it has become apparent that greater inter-agency coordination is necessary, it is also clear that maintenance of green infrastructure assets in perpetuity must become a priority, which will manage more stormwater, create jobs and promote co-benefits. Now that thousands of assets have been constructed, their upkeep has become a pressing need. The City Comptroller documented that poor maintenance is undermining successes of program installations.¹⁸ Especially where there is no engagement with local communities, the assets are left to wither —plants die, the areas become full of trash, and the sidewalk rails are broken. Unless the vegetation is healthy, the day-to-day co-benefits for local neighborhoods cannot be felt. With high turnover at DEP, the learning curve is steep and training insufficient to continuously nurture the assets. However, it is important to acknowledge the success of DEP’s pilot program with the RAIN Coalition (The HOPE Program, Bronx River Alliance, Newtown Creek Alliance, and Gowanus Canal Conservancy), in which the city is partnering with local non-profit organizations to maintain assets. The program is showing promise in protecting the vegetation and function of the assets, and it has the potential to create hundreds of local green jobs, particularly in environmental justice areas where the majority (78%) of rain gardens have been installed.

The 2022 NYC Urban Forest Agenda emphasizes the importance of the urban tree canopy, a social- ecological benefit often overlooked by the traditional Green Infrastructure Program

Recommendations for Improving New York City's Green Infrastructure Program

1. Expand DEP's Green Infrastructure Program to comply with existing water quality laws.

The city is not meeting its minimum requirements under state and federal law to reduce sewage overflows that cause water quality impairments. The DEP's Combined Sewer Overflow Long-Term Control Plans (LTCPs) concede that the city will not meet water quality standards for dissolved oxygen and pathogens in many waterway reaches; DEP reports it could not do so even with 100% sewer overflow abatement, in part because separate sewer discharges and other sources also pollute the waters. DEC notes in its Flushing Creek LTCP that existing primary contact water quality standards for fecal coliforms cannot be met even with full sewage¹⁹ capture. The LTCPs for Westchester Creek, Hutchinson River, and Bronx River, among others, reach similar conclusions. Of course, the state DEC must address both discharges from within the city as well as those upstream in from Westchester communities.

One opportunity to bring the city closer to remedying the water quality impairments is to expand green infrastructure development in all areas of the city where additional green infrastructure could have a marked improvement on stormwater and sewage discharge reduction. These areas include our streets, parks and wetlands. It is important that the city take advantage of these opportunities, especially where they are cheaper than sewage and stormwater capture.

2. Integrate green infrastructure development throughout all relevant agencies and for all development and construction projects.

The DEP does not have the capacity, resources, or—most importantly—the sole authority to implement green infrastructure across all development for the city. Tasking DEP to develop enough green infrastructure to meet stormwater management requirements ignores both the magnitude of the issue and the co-benefits of equitably-designed and maintained green infrastructure assets. Other relevant agencies should be both supported and made accountable for incorporating the development of new green infrastructure assets into their capital projects and provided the budgets to do so, including funds for operation and maintenance. These crucial agency partners include, but are not limited to, DOT, the Department of Design and Construction (DDC), Parks, and NYCHA. There are economies of scale and potential for additional funding streams when multiple agencies are working together.

DOT has broad authority over the public right-of-way infrastructure, including sidewalks, parking lanes, medians, and the roadway, where it has approved many of DEP's constructed assets. The right-of-way area makes up approximately 30% of the impervious cover in the city and generates stormwater runoff during rain events, representing an enormous opportunity area for green infrastructure. While DOT-sponsored projects larger than one acre are subject to the new Unified Stormwater Rule, there is an exemption in the Construction Design Manual for DOT projects, in which those greater than 20,000 square feet but less than an entire acre need not incorporate green infrastructure design or other prudent stormwater control measures.²⁰ Instead of attempting to avoid regulation, the DOT, in collaboration with DDC, should be leading on stormwater controls for all projects. It is important to acknowledge that there are some areas where DOT is doing just that. The Greenstreets Program enables Parks to implement green infrastructure assets on DOT property, funded by DEP.²¹ DOT's Greenway's Program, which plans and constructs safe and accessible corridors for active recreation on DOT property, funded by DOT, has also recently been identified as an excellent green infrastructure opportunity.

Another new addition to DOT's repertoire is the Cool it! NYC Streets Program,²² which, in coordination with Parks, identifies existing "cool" streets with the highest tree-based shade for the purpose of opening fire hydrant sprinklers for public use. The program is largely a desk mapping exercise, which should be broadened to identify where DOT could work with Parks to install green infrastructure and nature-based solutions to improve the conditions of "hot" streets and determine where maintenance of existing assets is necessary. DOT should incorporate responsibilities of green infrastructure development and maintenance into its budget. Given the tremendous authority, expertise, and

opportunity, DOT must be afforded appropriate funding to scale up in-house green infrastructure staffing.

Moreover, green infrastructure should be integrated into every feasible street redesign project overseen by DOT and/or designed by DDC. And at least 10% of New York City streets should be converted to permeable open streets, as recommended by Cornell University ILR School.²³ DOT and DDC need new agency-wide directives towards a citywide cohesive green infrastructure and nature based solutions strategy. Utility authorities also have a similar impact on the public right-of-way. Opportunities for public utilities to collaborate with DEP on green infrastructure goals should be explored.

Other agencies should take on similar roles. Parks and NYCHA are the two largest owners of open green space in New York City.²⁴ Given the large area of opportunity and the need to reduce flooding on these properties, it is crucial that green infrastructure be considered as part of all construction and landscape design. To their credit, DEP has already worked with both agencies to implement large scale green infrastructure projects, but better coordination is warranted.

Parks' inspection program defines maintenance of assets through a rating system that does not assess stormwater capture or health of vegetation. The rating system does capture weed overgrowth, however, which incentivizes employees to mistakenly kill green infrastructure assets. The budget for Parks—especially for operations and maintenance—should be significantly increased as parks and other large landholdings provide opportunities for creative adaptive design and city-wide stormwater management. These opportunities should be fully supported and maintained by knowledgeable Parks employees.

On NYCHA Property, the city should follow through on its plan to allocate \$2 billion over eight years to Parks to hire full-time staff with local hire requirements to transform, manage, and maintain NYCHA green spaces with edible community gardens; safer playgrounds for residents; and green infrastructure, including urban forestry. The fact that there are other funding streams for these allocations besides water rates allows flexibility for the program to achieve other city goals as well as water quality goals.

While not to the same scale as Parks and NYCHA, many other city agencies have large property holdings. Some, including DOE and SCA, have constructed significant green infrastructure assets. All city-owned properties should be inspected for their stormwater management and green infrastructure potential through a uniform approach to all properties, no matter the agency or where they are located. In both the combined and

separately sewered areas, agencies should have a coordinated review process for identifying such opportunities, as well as for their operations and maintenance.

3. Protect and restore the city’s existing forests and wetlands.

Involving other agencies in the Green Infrastructure Program will require DEP to support the priorities and requirements of their fellow agencies as they pertain to green spaces and construction. City forestry and wetland restoration and other programs conventionally under the direction of other agencies should be incorporated into the Green Infrastructure Program officially.

The goals of the NYC Urban Forest Agenda and Parks’ Wetlands Management Framework are congruent with the goals of the city’s Green Infrastructure Program, and all city agencies should be working in coordination and not across purposes. The city should commit to the 30 x 35 tree canopy goals, which include tree planting, tree maintenance, prevention of tree loss, protection of existing trees and monitoring using LIDAR. The city should also invest and plan for community-scale urban forest plans, co-designed by local organizations and community boards, prioritizing underserved neighborhoods.

Moreover, the city should protect Forever Wild parklands by prohibiting any development that results in tree loss or creation of impervious surfaces. Protection from a green infrastructure standpoint also means ensuring there is adequate upstream capture to slow and reduce polluted discharges to downstream streams and wetlands. Green infrastructure needs to be evaluated at a larger scale than just an individual site and needs to consider the entire catchment for this to be feasible.

Because DEP and Parks have differing green infrastructure and nature based solution definitions and directives, there are often missed green infrastructure opportunities. For example, a DEP green infrastructure asset may be planted with small trees rather than quality shade trees to support Park’s tree canopy goals. Conversely, Parks may be unwilling to support a water conveyance adapted green infrastructure design on its property. In response to these conflicting priorities, the Green Infrastructure Program should develop multi-pronged criteria that balance, for instance, Parks’ tree planting priorities and DEP’s stormwater control needs collaboratively, rather than leave the two agencies to compete for space. The combined sewer overflow benefits of new tree plantings should be modeled by DEP, and the agency should seek appropriate credit from the state DEC for these installations. In doing so, the NYC Urban Forest Agenda goals of planting and nurturing tree canopies throughout the city will have the co-benefit of absorbing stormwater.²⁵

Each agency has people, ideas, and hopes of more imaginative and equitable green infrastructure and nature-based solutions for the city. The staff have the expertise necessary to rise to meet the demands of climate change, and although collaboration between DEP and Parks occurs today, it has shown to be insufficient. The city must create the collaborative space and provide the funding needed so that inter-agency collaboration does not equate to compromised directives or competition.

4. Restructure water rates to separate stormwater management and treatment fees from drinking water fees.

The city currently charges for water, sewage, and stormwater on the basis of a customer's potable water usage.²⁶ This outdated approach does not treat customers fairly and equitably. Instead, it places too much of the responsibility on property owners who contribute little stormwater runoff into public sewers while giving the real culprits a free ride. An apartment owner may theoretically pay more for its use of water than a big-box retailer with a large roof and parking lot that creates a significant amount of polluted stormwater. The current rate structure also fails to incentivize sustainable water management practices, such as green infrastructure that captures runoff before it can overwhelm local sewers.

Ithaca, New York, has successfully implemented a rate structure that separates stormwater charges from potable water charges, following the lead of cities nationwide, such as Philadelphia and Baltimore. Approximately 800 cities around the U.S. already use, or are phasing in, a parcel-based billing approach with credits available for retrofits. Such rate structures ensure owners of large impervious properties that generate significant volumes of stormwater pay their fair share for managing stormwater, maintaining the sewer system and cleaning up local waterways.

A separate stormwater fee could reduce costs for most homeowners and owners of multifamily buildings, including for one-, two-, and three-family homeowners.²⁷ Such a rate structure would generate revenue from nearly 100,000 properties that currently pay little or nothing for their large amounts of stormwater runoff. A rebate incentive for installing permeable practices and other green infrastructure could also help incentivize additional green infrastructure on private and public properties alike. These measures could be coupled with affordability programs for low- and moderate-income households to ensure rates are equitable and all New Yorkers have access to clean, safe drinking water.

To its credit, DEP is undertaking a comprehensive water rate study. However, the study so far has failed to acknowledge the city Water Board's broad authority to restructure its fees to separate out stormwater conveyance and treatment costs. Therefore, the city must take steps either to exercise its broad ratemaking authority or seek state legislative action that will clarify such authority.

5. Develop multiple funding streams for green infrastructure, guided by the Mayor's Office of Climate and Environmental Justice.

Despite its tremendous need and the underfunding of sewer maintenance and improvement for decades, DEP has not aggressively pursued funding opportunities through federal, state or other grants and low-cost financing, opting instead to rely on water rates that it brags are among the lowest of cities nationwide. For example, of \$4 billion in state funding for water appropriated under the 2017 Clean Water Infrastructure Act, only \$200 million or 5% has gone to New York City, despite the fact that it houses 45% of state residents, many of whom are at or below the poverty line. The New York City DEP's failure to procure these funds is an affront to its water rate payers, many of whom live below the poverty line.

Some readily available funding streams may include grant and low-interest loan opportunities, such as the federal Infrastructure and Jobs Investment Act, Land and Water Conservation Fund/Outdoor Recreation Legacy Partnership Program, Infrastructure for Rebuilding America grants, the \$4.2 billion New York State Environmental Bond Act, Environmental Protection Fund, Clean Water Infrastructure Act, Regional Economic Development Grants, Land and Water Conservation Fund or Environmental Facilities Corporation Grants, etc. Provided with a significant portion of these funds, New York City would be better situated to meet its green infrastructure goals, among others. The burden of reporting requirements and scheduling milestone oversight is no excuse to forego these opportunities.

Other funding could come from fees placed on new development, where, in return for stormwater management plan approvals, developers fund new green spaces, stormwater management practices and maintenance. Note that these funding streams should be made equitable, so all neighborhoods benefit, and low-income housing and other developments receiving government subsidies can take advantage of them, too. This could potentially be completed through a "Stormwater Mitigation Bank."

6. Include operations and maintenance costs in all green infrastructure asset projects, especially projects that have cross-agency benefits.

DEP, Parks and DOT regularly cite operations and maintenance (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 gray infrastructure, all of which require O&M. An agreed-upon administrative solution to O&M with adequate funding would make it easier for all agencies to propose green infrastructure citywide and would contribute substantially to the success of the program. The city must make a clear commitment to funding green infrastructure O&M, just as it does for other types of O&M. And as noted in the NYC Urban Forest Agenda's Action 2.3, the city must invest equitably for planning, implementation, *and* O&M costs by prioritizing funding green infrastructure projects in environmental justice neighborhoods.

While the job maintenance and inspection pipeline acts as one exceptional example of an innovative mechanism to improve functionality of green infrastructure and nature based solutions, it is not the only way to improve O&M in order to create a more sustainable urban ecological system. The city must build O&M into its capital project budgets at every opportunity. A cohesive city-wide green infrastructure and nature based solutions strategic plan must also include a clear strategy for O&M.

7. Initiate and implement a job placement pipeline for long-term, sustainable green infrastructure inspection, operations and maintenance jobs.

Maintenance is paramount for existing green infrastructure assets, and the management of more than 11,000 assets could create hundreds of good paying jobs in the city. There are different options for such a program:

- Ongoing contracting and funding for community-based organizations to do green infrastructure maintenance, following the RAIN Coalition model;
- Increased funding for DEP and other agencies to hire year-round green infrastructure maintenance staff, with pathways for local job seekers to secure jobs and progress in careers within agencies beyond maintenance jobs; or
- Contracting with a third-party, for-profit contractor with commitment to local hiring.

Given the success that the RAIN Coalition has had in implementing the green infrastructure maintenance pilot program, a public-private partnership by which the city funds non-profits to adopt and maintain the city's green infrastructure assets, it is clear that such a model could successfully be expanded to cover the fleet of assets city-wide. These stakeholders have an interest in improving their local neighborhoods and in keeping their waters clean. Moreover, they provide job training and continuity, which is important in horticulture where first-hand knowledge of the plants will allow for their preservation.

The Philly Power Corps could serve as a model for how job training and placement would work. Training related to different types of assets would build the base skills and knowledge for green infrastructure maintenance work throughout the city. The program could in turn coordinate with multiple groups that are already on the ground in neighborhoods to place workers. Ability to progress in a career and move beyond maintenance to management or other roles would be key to continuity. The benefits of such a program include community connectivity, local jobs, local eyes on infrastructure, and educational benefits about the holistic impacts of green infrastructure. Creation of local jobs can also help mitigate green gentrification.

It is also clear that any inspection and maintenance program will require a significant, steady funding stream and that DEP has not yet allocated sufficient funds for maintenance. These costs should be figured into the overall budget for the Green Infrastructure Program. It is likely that the Comptroller would have to design a new type of contract for green infrastructure jobs, potentially with a third-party organization taking over the maintenance program.

The maintenance program has potentially broad implications for a just transition for low-income and Black, Indigenous, and People of Color communities who have borne the impacts of environmental racism, including paucity of green infrastructure and polluted waterways. They must be the ones who reap the greatest benefit.²⁸

8. Innovate and model adapted infrastructure practices.

New York City's five boroughs cover 302 square miles. Underground, the city's hydrology is extremely variable. In some areas, it is burdened by issues that stymie installation of traditional green infrastructure practices. These obstacles include high bedrock, in areas like the South Bronx, high water tables around Newtown Creek, Gowanus Canal, and Flushing Waterways, among others, and highly contaminated soils throughout the city. We understand that some communities have also been less receptive to DEP green

infrastructure installations than others, which affects the types of installations that are acceptable. Many areas also often struggle with extreme flooding and would greatly benefit from adapted stormwater management solutions. Wetter conditions due to climate change will only compound these issues. The city must adapt to these conditions by expanding the catalog of acceptable practices. Such practices include mechanisms that convey or move water to green stormwater management assets, non-infiltrating planting systems and assets, wetland installations, and daylighting creeks.

DEP has already pursued many of these adapted green infrastructure solutions, and could realize more installations, but budgeting, lack of inter-agency and public utility cooperation, and lack of public buy-in prevent the realization of projects. Oftentimes these projects involve planning at a larger scale—a neighborhood or a watershed scale—requiring the type of planning and understanding about the landscape, rainfall, and hydrology that is currently being completed for the Cloudburst Feasibility Studies. There are a number of success stories for this type of planning, such as the Harlem Hilltop project in the Bronx, which highlights an exceptional amount of participation and cooperation from DOT, and significant community organizing and advocacy. Other success stories include the ongoing daylighting of Tibbetts Brook, which came about pursuant to a high degree of community advocacy and a commitment on the part of DEP and Parks staff.

In order for New York City to realize these types of adapted assets, DEP green infrastructure planning teams should site and plan assets with landscape architects or urban planners and community leaders, in addition to its engineers. The same standard of resources, collaboration and priority given to the Cloudburst Program should be given to managing stormwater through adapted assets throughout the city. New funding mechanisms and collaboration strategies for assets that cross jurisdictional boundaries for these adapted assets should be developed.

New York State policies require specific guidelines intended to prevent green infrastructure infiltrating practices from contaminating groundwater. Within the context of climate change-related increased precipitation and flooding, including blue sky flooding, some neighborhoods will face conditions in which the water table is near the surface. New guidelines and permitting schemes must be developed with New York City and stakeholder guidance to meet the need for climate adapted green infrastructure solutions.

9. Evaluate every opportunity for daylighting waterways in the city.

The single most effective green infrastructure project for improving water quality, capturing stormwater and enhancing quality of life in New York City is the daylighting of Tibbetts Brook in the Bronx. Not only will it prevent hundreds of millions of gallons of combined sewer overflows from entering the Harlem River, but it will create a greenway in one of the most heavily traffic congested and heavily polluted areas of the city. It will also reduce local flooding by channeling waters away from overwhelmed infrastructure.

In general, daylighting small streams and creeks, especially near their headwaters, has vast ecological and community benefits. Daylighting increases hydraulic capacity, which helps to mitigate flooding, redirects water that would flow into combined sewer systems, generates new recreational and educational opportunities and removes nutrient pollution. Daylighting small streams closer to headwaters, is particularly important to improving overall water quality since “headwater communities of fungi, bacteria, algae, and aquatic insects consume nutrients (inorganic nitrogen and phosphorus) converting them into less harmful, more biologically useful materials.”²⁹

Tibbetts Brook is not the only waterway that was historically paved over in the desire to develop the city. Other waters include Kissena Creek, Flushing Creek and Alley Creek watersheds in Queens. And there are likely many more candidates for such projects. All of these waterways would benefit from community-centered (i.e. plans and implementation that include robust community engagement and participatory design) daylighting initiatives.

10. The Private Property Green Infrastructure Program needs new incentives and a public education campaign.

Construction and maintenance of green roofs and other stormwater practices could create thousands of jobs in the city. While absorbing millions of gallons of excess stormwater, green roofs could save homeowners on heating and cooling costs, too. It has become clear that the slow uptake of private green infrastructure in the city is due in part to a lack of knowledge among property owners about financial incentives. Moreover, the “carrot and stick incentives” are lacking. Local Laws 92 and 94, which direct some new buildings to incorporate renewable energy or green roofs into new construction, have loopholes that reduce the square footage available for green roofs, rendering these laws

largely ineffective. Moreover, it is the case that green roofs are compatible with solar panels, and technology has evolved to allow for thinner, more lightweight systems. Therefore the laws should require not one or the other, but instead both, where feasible. As noted above, this incentive should be coupled with a restructured water rate that charges more for large properties and impervious surfaces, with a rebate offered for green infrastructure.

On top of these punitive incentives, the existing green infrastructure funding incentives should be strengthened to achieve widespread participation. For instance, the city should support an amendment of the state Green Roof Tax Abatement program by:

- reducing soil depth requirement to 1.5 inches;
- raising the base abatement in non-priority districts to \$10 per square foot;
- eliminating the soil depth requirement of four inches from the priority districts;
- extending the law to 2027; and
- raising the aggregate cap from \$1 million to \$10 million.

In addition, the Department of Buildings should take on a larger role in implementing green infrastructure-related programs (such as the Green Roof Tax Abatement) by having a designated full-time staff member, who can work with DEP, facilitate permitting for green roofs, and ensure effective dissemination of information (e.g., updating the website).

11. Extend the Green Infrastructure Program to include separately sewered areas.

The city must construct green infrastructure in the separately sewered areas not only to protect water quality, but also to improve quality of life in those neighborhoods—often environmental justice neighborhoods—through green infrastructure’s many co-benefits. Building green infrastructure in separately sewered areas would foster continuity and equity across neighborhoods, create community connectivity and “greenways,” and change the perception of New York from a “concrete jungle” to a green city. Doing so in conjunction with tools outlined in the “Sharing in the Benefits of a Green City” toolkit would help to reduce the impact of potential green gentrification. And taking advantage of varied funding streams—especially those earmarked for resilience—would allow the program to expand beyond the water quality goals in the Clean Water Act Consent Order and beyond the existing requirements for new construction in the separately sewered areas. A single set of metrics by which to compare green infrastructure projects in both the combined and

separately sewered areas—one that assesses their water quality impact alongside their co-benefits—could be used to implement such a program. The potential to broaden the program beyond its Clean Water Act requirements warrants careful consideration from the state DEC and other stakeholders.

One avenue in which the Green Infrastructure Program is already being expanded into the separately sewered area is through the neighborhood-wide Cloudburst Feasibility Studies. Those studies rely on a collection of relevant factors, including:

- the array of physical features, both natural and constructed;
- the number and size of area storm drain and sewer pipes;
- available space for new projects;
- below ground conditions, such as soil quality and existing utility infrastructure;
- the possibility of connecting green and gray infrastructure; and
- the social and economic conditions of the people and businesses in a community.³⁰

In addition to a broad framing of the metrics by which to rate projects, the feasibility studies will include public involvement, which will help build community buy-in to green infrastructure siting. Whether under the “cloudburst” moniker or traditional green infrastructure, such metrics and community inclusion are laudable and should be incorporated as part of all green infrastructure planning. The resources and planning devoted to the Cloudburst Program should be the model for implementing all green infrastructure assets citywide, which will allow for a more uniform siting of assets throughout the combined and separately sewered areas.

12. Expand incentives and education where localized flooding is endangering people and property.

It is important in particularly sensitive areas that the city take advantage of every opportunity to reduce local flooding impacts. This includes a green infrastructure investment in the immediate drainage areas of areas that commonly flood. There is a general lack of knowledge around stormwater requirements on private property, where landowners often pave over pervious surfaces on their lots without notifying the city. A door-to-door program could help prevent additional harm in select areas. A broader program to help these homeowners develop green infrastructure practices on their properties would reverse the damage already done.

Summary of Recommendations

- 1** Expand DEP's Green Infrastructure Program to comply with existing water quality laws.
- 2** Integrate green infrastructure development throughout all relevant agencies and for all development and construction projects.
- 3** Protect and restore the city's existing forests and wetlands.
- 4** Restructure water rates to separate stormwater management and treatment fees from drinking water fees.
- 5** Develop multiple funding streams for green infrastructure, guided by the Mayor's Office of Climate and Environmental Justice.
- 6** Include operations and maintenance costs in all green infrastructure assets, especially projects with cross-agency benefits.
- 7** Initiate and implement a job placement pipeline for long-term, sustainable inspection, operations and maintenance jobs.
- 8** Innovate and model adapted infrastructure practices.
- 9** Evaluate every opportunity for daylighting waterways in the city.
- 10** Create new incentives and a public education campaign for the Private Property Green Infrastructure Program.
- 11** Extend the Green Infrastructure Program to include separately sewered areas.
- 12** Expand incentives and education in areas of localized flooding.

Conclusion + Thank You

Thank you for your consideration of these recommendations. We appreciate DEP staff's efforts to date to construct more than 11,000 green infrastructure assets and their ingenuity in working with partners to find creative ways to manage stormwater. And we acknowledge the successful joint efforts of other agencies, including Parks, DOT, NYCHA, DOE, and SCA, to incorporate green infrastructure into their programmatic goals.

With its myriad co-benefits, green infrastructure is the swiss army knife of equitable climate adaptation and it must be a part of any overarching climate adaptation plan. It is our hope that these recommendations will spark greater inter-agency cooperation; more creative and aggressive funding procurement; and better planning for maintenance in the city's maturing Green Infrastructure Program, among other things.

Our organizations are committed to working with the Adams Administration, Mayor's Office of Climate and Environmental Justice, Department of Environmental Protection, New York City Council, Department of Environmental Conservation, and other important partners to foster and improve the Green Infrastructure Program.

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Recommendation Supporters

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