Green Infrastructure In New Jersey – The Current State of Implementation

Prepared for Sustainable Jersey by the Natural Resources Defense Council

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The State of New Jersey was in many respects an early adopter of green infrastructure practices as a means of reducing stormwater pollution. In 2004, the state revised its Stormwater Management Rules[1] to require green infrastructure practices as part of its overall approach towards stormwater management and to reduce stormwater runoff volume, and its associated impacts, statewide. The rules required use of "nonstructural" controls for development, including efforts to reduce impervious surface area, and set requirements for on-site groundwater recharge to reduce the volume of stormwater runoff.[2] The State also developed a best management practices ("BMP") manual[3] to assist with efforts to use green infrastructure practices in development, and published a Model Stormwater Ordinance[4] that incorporated these and other green infrastructure requirements that counties or municipalities could then tailor to meet their specific needs or adopt outright.

Since 2004, however, further advances in use or promotion of green infrastructure at the state level, and with only some exceptions at the local level, have generally slowed, in part due to (and serving to highlight) limitations on the degree to which controls can be required under a complex set of state laws regulating development and stormwater management.[5] A lack of initiatives at the local level to maximally implement green infrastructure to the extent state law allows, as well as uneven efforts to enforce the green infrastructure-based mandates in place, have further hindered green infrastructure advances. Efforts to increase use of green infrastructure are further hampered by a lack of authorization for stormwater fee measures statewide.[6]

As a result, New Jersey has not kept pace with the most progressive green infrastructure policies in other jurisdictions. However, significant opportunity exists for the state, as well as individual municipalities or counties, to increase use of green infrastructure, with resulting public health, environmental, and economic benefits for their communities. Adopting more robust green infrastructure requirements that reflect the current state of implementation in other cities or states across the country, providing greater resources and planning tools, as well as incentives to use green infrastructure for developers or existing property owners, and providing long term goals for green infrastructure use in city master plans all can provide pathways toward improving New Jersey's water quality and the health of its aquatic ecosystems.

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[1] New Jersey Administrative Code (N.J.A.C.) 7:8.
[2] N.J.A.C. 7:8-5.4.
[3] New Jersey Department of Environmental Protection (2004, Revised 2009) New Jersey Stormwater Best Management Practices Manual, available at http://www.njstormwater.org/bmp_manual2.htm.
[4] *Id*., at appendix D, available at http://www.njstormwater.org/bmp_manual/NJ_SWBMP_D.pdf.
[5] See, New Jersey Future (2012) Green Infrastructure in the State of New Jersey: Statutory and Regulatory Barriers to Green Infrastructure Implementation, available at http://www.njfuture.org/wp-content/uploads/2013/01/New-Jersey-Future-Statutory-Regulatory-Barriers-to-Green-Infrastructure-in-NJ.pdf.
[6] *Id*.

Background

New Jersey's waters are impaired by pollution. According to the most recent assessment by the U.S. Environmental Protection Agency ("EPA") and New Jersey Department of Environmental Protection ("NJDEP"), 17,089 miles or 90 percent of assessed river and stream miles, 45,307.5 acres or 95 percent of assessed lake, reservoir, and pond coverage, 664.9 square miles or 89 percent of bays and estuaries, and 514.6 square miles or an astonishing 100 percent of New Jersey's ocean and near coastal waters are not meeting at least one of their designated uses, such as swimming or fishing.[7] In 2012, 29 beaches in New Jersey had 10 percent or more of water samples taken violate state bacteria limits.[8]

Urban runoff, or stormwater, and overflows from combined sewer systems are an overwhelming contributor to pollution in New Jersey's waters. As previously undeveloped land is paved over and built upon, the amount of stormwater running off roofs, streets, and other impervious surfaces into nearby waterways increases. The increased volume of stormwater runoff and the pollutants carried within it degrade the quality of local and regional waterbodies. In New Jersey, despite the presence of large portions of the state dominated by agricultural or open/forested land cover, by 2007 nearly 800 square miles of land was covered by impervious surfaces, a number increasing at a rate of almost nine football fields a day.[9] The impact on the state's waters is evident; urban runoff is listed as a source of impairment for more New Jersey waters than any other source, including 13,690.6 miles of rivers, 28,435.6 acres of lakes, reservoirs, and ponds, 195.1 square miles of bays and estuaries, and 445.6 square miles of ocean and near coastal waters.[10] Though covering substantially less area in the state, combined sewer overflows are identified as sources of impairment for 408.8 miles of rivers, 770.6 acres of lakes, reservoirs, and ponds, and 109.5 square miles of ocean and near coastal waters.[11] Increasing numbers and intensity of heavy rainfall events over the last few years have also contributed to flooding throughout the state, particularly in developed areas.[12] The Federal Emergency Management Agency has estimated that, nationwide, up to 25 percent of economic losses from flooding are the result of urban drainage, not from being located in a floodplain.[13]

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[7] U.S. EPA (2010) New Jersey Water Quality Assessment Report, available at http://ofmpub.epa.gov/waters10/attains_state.control?p_state=NJ.

[8] NRDC (2013) Testing the Waters 2013: A Guide to Water Quality at Vacation Beaches, available at http://www.nrdc.org/water/oceans/ttw/nj.asp.

[9] Hasse, John E. and Richard G. Lathrop (2010) Changing Landscapes in the Garden State, available at http://gis.rowan.edu/projects/luc/changinglandscapes2010.pdf.

[10] U.S. EPA (2010) New Jersey Water Quality Assessment Report. (http://ofmpub.epa.gov/waters10/attains_state.control?p_state=NJ#prob_source)

[11] *Id*.

[12] See, e.g., Bates, Todd B. "Rains bring flooding throughout Monmouth, Ocean counties as wet June gets wetter," Asbury Park Press (June 11, 2013), available at http://www.app.com/article/20130610/NJNEWS/306100063/Rains-bring-flooding-throughout-Monmouth-Ocean-counties-wet-June-gets-wetter.

[13] FEMA (2005) "Reducing Damage from Localized Flooding: A Guide for Communities." (http://www.fema.gov/pdf/fima/FEMA511-complete.pdf)

Regulations – 2004 and Now

In 2004, the state adopted progressive Stormwater Management Rules that incorporated requirements for development projects to use Green Infrastructure practices and to achieve pre-development levels of groundwater recharge on-site. However, in the nearly 10 years since, green infrastructure-based requirements have not greatly advanced at the state level.[14] For example, in 2009, NJDEP adopted a permit for Tier A municipalities[15] under the Clean Water Act's National Pollutant Discharge Elimination System ("NPDES") program, which, despite significant advances in understanding and practical implementation in other areas of the country over the period of 2004 to 2009, only "require[s] compliance with the applicable design and performance standards established under N.J.A.C. 7:8 for major development" that were developed in 2004.[16] The current permit will be up for renewal in 2014, presenting an opportunity to improve upon the 2009 permit's programs.

Moreover, several entities have called into question how effectively existing requirements are enforced at the local level; a 2010 report by the Delaware Riverkeeper Network focused on the project review process for Hamilton Township noted that it appeared that review practices under the Municipal Stormwater Regulations Program in counties and towns statewide were uneven at best.[17] Nor is the situation better for CSO communities—the state's Combined Sewer System (CSS) general permit under the Clean Water Act[18] provided only relatively weak requirements that have not led to the development, much less implementation, of Long Term Control Plans ("LTCPs") for reducing CSO pollution. The state is now developing individual permits for many cities, which will require these communities to develop LTCPs and expressly require consideration of green infrastructure as a principal means of reducing CSOs.[19]

***Rooftops to Rivers II* – Advancing Green Infrastructure Efforts Around the Country**

While New Jersey's stormwater standards, particularly those related to green infrastructure, have not appreciably changed since 2004, there have been significant advances in green infrastructure advances in other states and municipalities throughout the country. Green infrastructure programs, practices, or requirements in place elsewhere have the potential to contribute to cost-

[14] For a further discussion of the overall regulatory structure and barriers to incorporation of green infrastructure in New Jersey, including prohibitions against stormwater fee programs, see New Jersey Future (2012) Green Infrastructure in the State of New Jersey: Statutory and Regulatory Barriers to Green Infrastructure Implementation.

[15] Tier A municipalities are generally located within the more densely populated regions of the state or along or near the coast. NJDEP (2009) Tier A Municipal Stormwater Permit, available at http://www.nj.gov/dep/dwq/tier_a.htm.

[16] *Id*., at 9.

[17] Delaware Riverkeeper Network (May 2010) New Jersey Stormwater Management Implementation: A case study of Hamilton Township, Mercer County, available at http://delawareriverkeeper.org/resources/Reports/Hamilton_Twp_NJ_SWM_Implementation_Report.pdf; see also, New Jersey Future (2012).

[18] See, NJDEP, Surface Water Master General Permit Revoke & Reissue, available at http://www.nj.gov/dep/dwq/pdf/cso_final_gp.pdf.

[19] See, e.g., NJDEP, Combined Sewer Overflow (CSO) Permit Program, Camden Area CSO Permits FAQ, available at http://www.nj.gov/dep/dwq/cso.htm

effective efforts to reduce stormwater pollution and flooding in New Jersey as well, and should be considered as part of any discussion to expand use of green infrastructure throughout the state.

NRDC's November 2011 report, *Rooftops to Rivers II: Green strategies for controlling stormwater and combined sewer overflows*, documents scores of examples from other jurisdictions.[20] Some leading examples are summarized below.

Dedicated stormwater/green infrastructure funding sources

Enacting stormwater utility fees can generate a dedicated revenue source for stormwater infrastructure improvements (including green infrastructure) and maintenance, while providing an incentive for landowners to reduce runoff through use of green infrastructure and helping to shift the burden of stormwater-related problems from water consumers to stormwater generators. As discussed in New Jersey Future's report on barriers to green infrastructure in New Jersey, however, "Stormwater infrastructure faces a special barrier in New Jersey because municipal and regional entities are not authorized by state law to charge landowners a fee based on the amount of stormwater they produce."[21] New Jersey should revise its regulatory structure to allow for these types of fees. More than 1,000 communities nationwide have stormwater utilities, with the majority basing their fees, in whole or in part, on the amount of impervious area on a ratepayer's property.[22] Examples of stormwater fee programs include:

- In 2010, Philadelphia adopted a new stormwater utility fee structure for nonresidential properties, based in part on the area of impervious surface on a property, which directly correlates with the amount of stormwater the property generates. In Philadelphia, the Philadelphia Water Department ("PWD") "will coordinate other city agencies to incorporate green infrastructure designs as standard practice in city projects, using PWD's budget (funded by stormwater fee revenues), along with any available state or federal grants, to supplement other agencies' capital budgets."[23]
- The city of Seattle charges property owners a fee for stormwater management services based on each property's estimated impact on the city's drainage system. Since 2008, residential properties have been charged on the basis of parcel size, and nonresidential properties based on amount of impervious surface present.[24]

Retention Requirements and Applicability to Redevelopment

The New Jersey Stormwater Rules currently require new "major development" in the state to achieve groundwater recharge equivalent to average annual pre-construction groundwater

[20] NRDC (2011) Rooftops to Rivers II: Green Strategies for Controlling Stormwater and Combined Sewer Overflows, available at http://www.nrdc.org/water/pollution/rooftopsii/, at Philadelphia, 3.
[21] New Jersey Future (2012) Green Infrastructure in the State of New Jersey: Statutory and Regulatory Barriers to Green Infrastructure Implementation, at 17.
[22] Western Kentucky University Stormwater Utility Survey 2012, available at http://www.wku.edu/engineering/documents/swusurveys/swusurvey-2012.pdf.
[23] NRDC (2011) Rooftops to Rivers II: Green Strategies for Controlling Stormwater and Combined Sewer Overflows, at Philadelphia, 3.
[24] *Id*., at Seattle 4.

recharge for the site.[25] Groundwater recharge provides benefits for water quality by reducing runoff volume and associated pollutant loads, for flooding by reducing or delaying peak runoff rates and volumes, and for river and stream flow volumes by helping maintain base flow. However, recognizing that additional benefits can be achieved by retaining runoff over and above the volume of groundwater recharge that would have occurred before site development, a number of jurisdictions require new development and redevelopment projects to capture the full volume of a specific storm size, generally in the range of the 85th to 95th percentile events. Capturing these relatively smaller storms on-site results in a large percentile of the total annual runoff volume being retained overall, reducing the amount of stormwater and pollution discharged from separate stormwater sewer systems or decreasing the overall volume of water entering combined sewer systems, thus reducing the number and size of overflows. By applying these standards to redevelopment (a mandate that is unclear, at best, in New Jersey currently) the impacts of existing stormwater runoff sources can over time be reduced.

Examples of strong retention standards from other jurisdictions include:

- In Washington, D.C., the city's Clean Water Act stormwater permit requires on-site retention of 1.2" of stormwater from a 24-hour storm through evapotranspiration, infiltration and/or stormwater harvesting and use for all development greater than or equal to 5,000 square feet.[26]
- The City of Philadelphia imposes a one-inch infiltration requirement for new development and redevelopment projects.[27]
- The New York State Stormwater Management Design Manual provides for on-site retention of the 90th percentile storm, using infiltration, evapotranspiration, and/or rainwater harvesting.[28] New York's statewide Clean Water Act general permit for municipal separate storm sewer systems incorporates the standards from the Manual.[29]
- Throughout California, Clean Water Act stormwater permits require retention of the 85th percentile storm event through use of infiltration, evapotranspiration, or capture and re-use of rainwater.[30]

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[25] N.J.A.C. 7:8-5.4

[26] U.S. EPA (2012) Permit for the District of Columbia Municipal Separate Storm Sewer System, available at http://www.epa.gov/reg3wapd/npdes/dcpermits.htm.

[27] PWD Stormwater Management Regulation, Section 600.5.

[28] New York State Stormwater Management Design Manual (August 2010), at Chapter 4: Uniform Sizing Criteria, available at http://www.dec.ny.gov/chemical/29072.html.

[29] New York State Department of Environmental Conservation (May 1, 2010) SPDES General Permit for Stormwater Discharges from Municipal Separate Storm Sewer Systems (MS4s), available at http://www.dec.ny.gov/docs/water_pdf/ms4gp2011.pdf.

[30] See, e.g., Los Angeles Regional Water Quality Control Board (Nov. 8, 2012) Waste Discharge Requirements for Municipal Separate Storm Sewer System (MS4) Discharges Within the Coastal Watersheds of Los Angeles County, Except Those Discharges Originating From the City of Long Beach, Order No. R4-2012-0175; Los Angeles Regional Water Quality Control Board (July 8, 2010) Ventura County Municipal Separate Stormwater National Pollutant Discharge Elimination System (NPDES) Permit; Order No. R4-2009-0057; San Diego Regional Water Quality Control Board (December 16, 2009) South Orange County MS4 Permit, Order No. R9-2009-0002.

- Portland, Oregon's Clean Water Act stormwater permit requires projects to capture and treat 80 percent of the average annual runoff volume for the site.[31]

Retrofit requirements

Many jurisdictions have enacted requirements to retrofit the existing built environment in order to address existing stormwater pollution sources. For example:

- The Washington, D.C. Clean Water Act permit requires the city to develop and implement a retrofit program, largely based in green infrastructure retention practices, for a minimum of 18,000,000 square feet of impervious surfaces during the permit term.[32]
- In order to address CSO issues, Philadelphia's *Green City, Clean Waters* plan—which is incorporated in a state administrative consent order and will be incorporated into the city's Clean Water Act permits—requires the retrofit of nearly 10,000 acres (at least one-third of the impervious area served by the city's combined sewer system) to manage the first inch of runoff on-site.[33] The program relies on green infrastructure for a majority of the required CSO reductions.
- New York City's *Green Infrastructure Plan* includes a commitment to capture the first inch of runoff from at least 10 percent of the impervious surfaces in the city's combined sewer areas; this requirement, with a 2020 compliance deadline, has been incorporated into a state administrative consent order and the city's Clean Water Act permits.[34]

Green street programs

Many jurisdictions have increasingly looked to the public right-of-way as a resource area in which local or neighborhood scale green infrastructure projects can be implemented:

- Chicago has undertaken a "Greening Chicago's Alleys," program, which uses permeable pavements, as well as proper grading and pitch, in the city's more than 13,000 alleys to improve infiltration and reduce runoff.[35]

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[31] Oregon Department of Environmental Quality (2011) National Pollutant Discharge Elimination System Municipal Separate Storm Sewer System (MS4) Discharge Permit for the City of Portland, available at http://www.deq.state.or.us/wq/wqpermit/docs/individual/npdes/ph1ms4/portland/PortlandMS4Permit201101131.pdf.

[32] U.S. EPA (2012) Permit for the District of Columbia Municipal Separate Storm Sewer System, available at http://www.epa.gov/reg3wapd/npdes/dcpermits.htm

[33] City of Philadelphia Water Department (June 2011) "Green City, Clean Waters—Philadelphia Combined Sewer Overflow Control Long Term Control Plan Update," available at http://www.phillywatersheds.org/what_were_doing/documents_and_data/cso_long_term_control_plan.

[34] See http://www.dec.ny.gov/press/80919.html (March 13, 2012 press release summarizing administrative order); Notice of permit modification to SPDES General Permit for Stormwater Discharges from Municipal Separate Storm Sewer Systems, available at http://www.dec.ny.gov/enb/20120516_reg2.html.

[35] Buranen, Margaret (2008) "Chicago's Green Alleys," Stormwater 9(7), available at http://www.erosioncontrol.biz/SW/Articles/Chicagos_Green_Alleys_2191.aspx.

- Philadelphia, under its *Green City, Clean Waters* plan, will focus on streets and sidewalks, since they account for 38 percent of the impervious cover in combined sewer areas. The program will make use of streets already slated for capital improvements or routine repaving by the city Streets Department or state Department of Transportation; streets slated for repair or replacement of PWD's existing water and sewer infrastructure or flood control-related construction; and streets where cable, gas, or phone infrastructure are being repaired, as locations to install tree trenches and expanded tree pits, sidewalk planters and bump-outs, porous pavement, and other green infrastructure features.[36]
- As of June 2013, New York City has completed construction of three Neighborhood Demonstration Areas, in which dozens of "right-of-way bioswales" were installed to allow the city to measure CSO volume reductions from green infrastructure projects on a multi-block scale. Taken together, the three installations are projected to collect more than 7 million gallons of stormwater a year and keep it out of the combined sewer system. Citywide, the city has installed 119 right-of-way bioswales to date, and expects to rapidly accelerate construction in the coming years, with near-term goals of 2,000 bioswales by the end of 2014 and 6,000 by the end of 2015.[37]

Efforts at the Local and Regional Level

Although green infrastructure efforts have advanced only slowly in the past 10 years in most of New Jersey, recent planning efforts, at least in several municipalities and sewerage districts, have begun to reverse this trend. Overall, greater and more consistent efforts will be needed to address the pollution issues facing New Jersey, but these examples of green infrastructure efforts indicate the beginnings of a move in the right direction.

Camden Smart Initiative

Camden, NJ, has longstanding water quality issues stemming from the discharge of sewage from 28 CSO outfalls throughout the city. In, 2010 the Camden County Municipal Utilities Authority ("CCMUA") partnered with the Rutgers Cooperative Extension's Water Resources Program to pilot a community based initiative focused on implementing green infrastructure projects throughout the City of Camden, resulting in formation of the Camden SMART (Stormwater Management and Resources Training) Initiative.[38]

The objective of the Camden SMART Initiative is to "develop a comprehensive network of green infrastructure programs and projects for the City of Camden. The initiative includes neighborhood green and grey infrastructure projects, stormwater management policy

[36] Philadelphia Water Department (June 2011). "Amended Green City, Clean Waters—The City of Philadelphia's Program for Combined Sewer Overflow Control, Program Summary."
[37] See http://www.nyc.gov/html/dep/html/press_releases/13-065pr.shtml (June 3, 2012 press release); NYC Environmental Protection, 2012 Green Infrastructure Annual Report, available at http://www.nyc.gov/html/dep/pdf/green_infrastructure/gi_annual_report_2013.pdf.
[38] The initiative is a collaboration between the City of Camden, CCMUA, the RCE Water Resources Program, New Jersey Tree Foundation (NJTF), Cooper's Ferry Partnership (CFP), the Center for Environmental Transformation (CfET), New Jersey Department of Environmental Protection (NJDEP), public-private partners, community organizations, and Camden residents.

development, and green infrastructure training programs."[39] In 2011, the Rutgers Cooperative Extension, working with Camden SMART partners, completed a comprehensive feasibility study for implementation of green infrastructure throughout Camden.[40] Green infrastructure projects that have since been installed or are planned for installation, including numerous rain gardens, are projected to capture 1.5 million gallons of stormwater each year.[41]

Hamilton Township

In 2010, the Delaware Riverkeeper produced a report on Hamilton Township to highlight the inadequacy of implementation of New Jersey's current stormwater program. The report demonstrated that a variety of projects approved in Hamilton Township underwent inadequate review and ultimately failed to fully, or in some instances even moderately, comply with stormwater regulations; based on a 100 point scale, the report found that the average project compliance grade with use of nonstructural stormwater management strategies (such as green infrastructure strategies) was a "dismal" 13 percent.[42]

Two years later, Hamilton Township has released a "Watershed and Stormwater Management Implementation Plan," developed by the Rutgers Cooperative Extension Water Resources Program, that promotes use of green infrastructure practices as a part of a comprehensive strategy for the township to improve water quality and increase compliance with current state and federal stormwater regulations.[43] Among other strategies, the plan calls for use of rain gardens and downspout disconnections, as well as completion of an impervious cover analysis and community based program to evaluate opportunities for disconnecting additional impervious cover from the city's MS4 system. So far, this effort has not advanced beyond the planning stage, but the analysis suggests opportunities for a robust increase in use of green infrastructure.

Newark Master Plan and Greater Newark Conservancy – Vacant lots for CSO control

One-half of Newark, NJ is served by a separate storm sewer, while the remaining half is served by combined sewer systems that discharge huge volumes of CSOs. Both systems supply pollution to the region's waters. In order to address these dual sources of pollution, Newark has called for increased use of green infrastructure practices in its recently released Master Plan.[44]

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[39] Community-Based Green Infrastructure for the City of Camden – Feasibility Study (2011), available at http://www.ccmua.org/wp-content/uploads/2012/01/Green-Infrastructure-for-Camden-Feasibility-Study_Jan-20121.pdf

[40] *Id.*

[41] NJDEP (2013) Draft Combined Sewer Overflow (CSO) Permit for Camden, Fact Sheet, at 8, available at http://www.nj.gov/dep/dwq/pdf/draft_cso_0108812.pdf.

[42] Delaware Riverkeeper Network (May 2010) New Jersey Stormwater Management Implementation: A case study of Hamilton Township, Mercer County, at 3.

[43] Rutgers Cooperative Extension Water Resources Program (2012) Hamilton Township (Mercer County) Watershed and Stormwater Management Implementation Plan, available at http://water.rutgers.edu/Projects/Hamilton/FINAL_Implementation_Plan_Complete_02142012.pdf

[44] Newark's Master Plan: Our City Our Future, Volume 1 at 172, available at http://www.ci.newark.nj.us/userimages/downloads/Newark_Master_Plan_FINAL_Vol_I(1).pdf.

According to the Master Plan, Newark's stormwater ordinance calls for new developments or substantial redevelopments to capture stormwater runoff on-site, though the ordinance does not contain minimum design or performance standards, and projects are only encouraged, as opposed to required, to incorporate green infrastructure strategies into design plans. The Master Plan also states that Newark recently drafted a revised ordinance that will require non-structural strategies to be used to the maximum extent practicable, with specific design and performance standards for the practices chosen.[45] The City will also advocate for establishing in in lieu fee or fund to support stormwater management projects when sites are unable to meet the retention requirements, and, acknowledging the hurdles to funding stormwater management in New Jersey overall, plans to investigate transferring sewer rate charges from a water use-based system to a stormwater/sewer contribution-based system.[46]

Passaic Valley Sewerage Commission and Passaic County.

The Passaic Valley Sewerage Commission ("PVSC") has been working to use green infrastructure practices to alleviate CSO events and stormwater pollution in the region. The initial phase of PVSC's plans, to be rolled out in cooperation with Rutgers University, will involve public education and outreach, provision of technical assistance for communities or municipalities, and finally installation of several green infrastructure pilot projects, with a focus on cost-effective, replicable projects.[47] Additionally, Passaic County has recently finalized Green Streets guidelines, with a goal of expanding use of green streets to reduce stormwater impacts, maintain drinking water supplies, improve air quality, and reduce heat island impacts.[48] The County's guidelines note that green infrastructure can be used to decrease capital costs for public stormwater infrastructure.[49]

Conclusion

While New Jersey has a strong initial framework in place for green infrastructure, and several localities in the state are undertaking planning efforts that contain promising green infrastructure elements, the state has fallen behind other states and cities across the country, as more and more progressive green infrastructure programs are implemented to address problems caused by increased stormwater runoff in urban and suburban environments. Moreover, the state is hindered by regulations that, at current, limit opportunities for further expansion of green infrastructure programs or requirements. The state should review its codes and regulatory structure to remove barriers to green infrastructure implementation and establish robust stormwater retention standards for new development and redevelopment throughout the state. Additionally, New Jersey should develop new initiatives to implement green infrastructure-based programs that have proven successful elsewhere in the country.

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[45] *Id.*
[46] *Id.*
[47] See, Green Infrastructure Municipal Outreach and Technical Assistance Program, available at http://www.water.rutgers.edu/PVSC.html.
[48] Passaic County Planning Department, Complete Streets Guidelines, Green Streets, at 55, available at http://www.passaiccountynj.org/DocumentCenter/View/1664.
[49] *Id*. At 56.