Rain Gardens with Native Plantings at Southwest Park in Hoboken, 2017. Source: Starr Whitehouse/City of Hoboken

Open Space, Flood Protection, and Pollutant Trapping: Unlocking the Potential of the Green Acres and Blue Acres Programs to Support Green Infrastructure

Jersey Water Works
Green Infrastructure Committee
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Introduction

The Jersey Water Works Green Infrastructure (GI) Committee encourages the New Jersey Department of Environmental Protection (NJDEP) Green Acres and Blue Acres programs, which convert flood-prone properties into open space, to incorporate green infrastructure into their final design plans. The GI Committee's Green Acres Subcommittee developed this document to showcase four successful Green Acres and Blue Acres projects that incorporate green infrastructure for flood mitigation, water quality improvements, and improved public health.

Incorporating green infrastructure into Green Acre projects treats stormwater pollutants at the source, meaning that the water is cleaner by the time it reaches the river. Source: Andrew Tabas

New Jersey's Green and Blue Acres Programs

In the face of increased coastal and inland flooding from climate change, it is necessary for New Jersey to use innovative land use programs to reduce the damage of increased rainfall and sea level rise. The Green Acres and Blue Acres programs do just that: they preserve open land to reduce flooding while providing recreation opportunities. These lands are a natural place for the implementation of green infrastructure to provide further flood reduction and water quality benefits.

It is recommended that before starting a green infrastructure project on a Green Acres or Blue Acres project site, that you contact the Green Acres Bureau of Legal Services and Stewardship to ensure compliance with program rules. For more information and staff contacts visit the Green Acres site or call 609-984-0631.

As the New Jersey Department of Environmental Protection (NJDEP) explains, "the Green Acres Program was created in 1961 to meet New Jersey's growing recreation and conservation needs." The Program acquires lands for state parks and wildlife management areas and provides grant and loan funding to local governments and nonprofit organizations for open space acquisition and park and recreation projects. Since 1961, the Green Acres Program has preserved over 718,000 acres of land and funded the development of hundreds of park and recreation projects statewide. For more information on the Green Acres Program visit their website or call 609-984-0500.

NJDEP's Blue Acres Program was established in 2007 to acquire properties damaged by or at risk of flooding. Once acquired, homes and structures are demolished, and the land becomes open space for flood protection. NJDEP notes that "all Blue Acres acquisitions must be from willing sellers." Blue Acres has acquired over 700 homes and more than 600 have been demolished. For more on the Blue Acres Program visit their site or call 609-940-4140.

In July 2020, the Jersey Water Works Green Infrastructure Committee submitted recommendations to the NJDEP for the acceptance of Blue and Green Acres applications that integrate green infrastructure practices in the proposal's stormwater management design. To advance green infrastructure practices in these programs, the Green Infrastructure Committee identified four case studies that showcase the range of green infrastructure practices as part of parks and open spaces. These New Jersey case studies are: Southwest Park in Hoboken, the Floodplain Restoration project in Woodbridge, The Watershed Institute's Watershed Center located in Pennington, and the Sussex Avenue Elementary School in Newark.

Case Study 1: Southwest Park (urban)

The Southwest Park, located in Hoboken, combines passive green space and flood mitigation to meet the neighborhood's needs. It is New Jersey's first resiliency park with integrated green infrastructure to mitigate flooding. The 1.25-acre Southwest Park is designed to mitigate flooding in the southwest Hoboken neighborhood by detaining 200,000 gallons of stormwater runoff through a series of green infrastructure best management practices including: rain gardens, porous pavers, a cistern for rainwater harvesting, and an underground detention system. Constructed with low-interest financing from the New Jersey Environmental Infrastructure Financing Program (NJEIFP), the park design includes open lawn recreational space, a dog run, open activity space for events, multi-level seating for small performances, and restrooms.

Site Plan of Hoboken's Southwest Park. Photo Credit: Starr Whitehouse/City of Hoboken.

In 2021, the City entered into an agreement to acquire an additional 1-acre property to expand the park and its green infrastructure to the west. This expansion is included in the Delay, Store, Discharge strategy of the Rebuild by Design - Hudson River Project.

Project information:

- Site: Park
- Project status: Completed
- Year built: 2017
- Partner(s): City of Hoboken, North Hudson Sewerage Authority, New Jersey Infrastructure Bank/New Jersey Department of Environmental Protection (NJDEP), Natural Fish & Wildlife Service, and Hudson County

- Green or Blue Acres? Green Acres, to be included in the next Recreation and Open Space Inventory (ROSI) update
- Green Infrastructure Practice(s): Rain gardens, porous pavers, cistern, underground detention
- Cost: $5.6 million
- Funding Source: $250,000 grant from the National Fish & Wildlife Foundation, $100,000 grant from Hudson County Open Space Trust Fund, and Hoboken Open Space Trust Fund. New Jersey Environmental Infrastructure Financing Program (NJEIFP) low-interest financing plus $1 million in principal forgiveness for green infrastructure saved the City $2 million over the 20-year term of the loan, or 40% of the project cost.
- Contact: Jennifer Gonzalez, jgonzalez@hobokennj.gov

Rain Gardens with Native Plantings at Southwest Park, 2017. Source: Starr Whitehouse/City of Hoboken.

Project Takeaways:

Benefits to the Greater Community

This was the first park in Southwest Hoboken, a flood-prone neighborhood that lacked open space. The park design includes open lawn recreational space, a dog run, open activity space for events, multi-level seating for small performances, and restrooms.

Challenges

The biggest challenge was balancing the many active and passive uses that the community wanted to incorporate into a 1.25-acre park. The City also overcame some construction challenges including unforeseen soil conditions and certain bid items that were higher than the engineer's estimate.

Lessons Learned

Partnerships are critical to designing, operating, and maintaining a successful green infrastructure project. The City built the resiliency park and maintains the vegetated green infrastructure, while the North Hudson Sewerage Authority maintains the underground detention system. The City was able to leverage financing from several sources because this is a multi-benefit project that mitigates rainfall flooding while adding open space and recreation value.

For more information about the project, visit Southwest Resiliency Park's website.

Case Study 2: Woodbridge River Floodplain Restoration and Open Space (suburban)

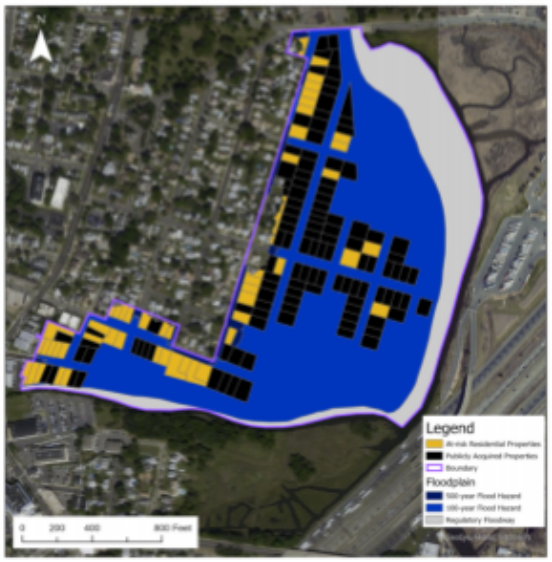
In 2007 and again in 2014, Woodbridge Township proactively sought to increase its resilience, securing funds (originally from a 1991 natural resource damages settlement with Exxon Corporation and, most recently, through the NJDEP Blue Acres Program) to purchase approximately 200 flood-prone properties located within the Woodbridge River Floodplain. The initiative's primary objectives were to protect the safety and health of residents by encouraging homeowners in the FEMA designated flood zones in the Avenel, Watson-Crampton, and Sewaren project areas to relocate permanently to higher elevation areas, and to restore the floodplain's natural function to promote storage and infiltration of stormwater, particularly during significant storm events. The Township sought to increase the public amenities within the area by establishing a trail system and network of interpretive signage.

Once properties were acquired, Woodbridge Township partnered with the Rutgers Cooperative Extension Wildlife Conservation and Management Program to design and implement ecological restoration strategies form transforming previously diked flood-prone degraded tidal marsh and urban residential areas into community open space and natural habitats, resulting in improved habitat, flood storage potential, and passive recreational opportunities. This landscape adaptation strategy will strengthen community resiliency against storms, improve conservation value of these areas, and create low-maintenance strategies to ensure long-term persistence of public open space. Since 2016, Rutgers has assisted the Township in removing approximately 1 acre of impervious cover, planting approximately 1,500 native trees and shrubs, and seeding approximately 3 acres of warm-season grass/wildflower meadow. The work has earned a 2017 Merit Award in Landscape Planning and Analysis from the NJ Chapter of the American Society of Landscape Architects and the 2017 Outstanding Floodplain Management Award from the New Jersey Association of Floodplain Management.

Land use changes and restoration efforts within the most vulnerable sections of the project area have led to the establishment of the Open Space Conservation/Resiliency Zone (OSC/R). The OSC/R Zone was created to help minimize the risk to residences within floodplains, reduce the amount of flood damage sustained during future flood events, and promote natural floodplain functions. As a result, ecological integrity is enhanced, and future flood risk parameters will be defined through the lens of a more resilient landscape. Ongoing efforts to meet local needs through multiple floodplain management disciplines protects the health, safety, ecology, and financial equity of the community. In addition, these comprehensive methods serve as a model for confronting future flooding scenarios, as well as the need to include ecosystem services within mitigation and financial decision-making processes.

Project Information:

- Site: Open Space
- Project status: Under Construction, anticipated completion in 2022.
- Year built: 2021 - 2022
- Partner(s): NJDEP Blue Acres Program, National Oceanic and Atmospheric Administration (NOAA), the U.S. Department of the Interior (DOI), Woodbridge Township, the U.S. Army Corps of Engineers, NY/NJ Baykeeper, Rutgers Cooperative Extension Wildlife Conservation and Management Program, United States Fish and Wildlife Service Partners for Fish and Wildlife Program, and local community groups.
- Green or Blue Acres? Blue Acres
- Green Infrastructure Practice(s): Replacing pavement with gardens and grasses
- Cost: Cost of post-buyout restoration work, approximately $350,000.00
- Funding Source: Multiple
- Project contact: Dr. Brooke Maslo, brooke4.maslo@rutgers.edu, Caroline Ehrlich, caroline.ehrlich@twp.woodbridge.nj.us, Fawn McGee, fawn.mcgee@dep.nj.gov



Left: Federal Emergency Management Agency (FEMA) flood zone designations for the Avenel, Watson-Crampton, and Sewaren project areas in Woodbridge Township, NJ. Right: At-risk residential properties and Blue Acres buy-outs in Watson-Crampton. Source: Rutgers Cooperative Extension.

Woodbridge River and adjacent salt marsh along the fringe of the Watson-Crampton neighborhood of Woodbridge Township. This location is the site of a future kayak launch and recreational greenway through the municipality. Source: Brooke Maslo.

Project Takeaways:

Benefits to the Greater Community

This habitat restoration relocated at-risk residents, removed mosquito breeding sites, and improved flood hazard mitigation while providing passive recreation and a river-based conservation corridor connecting rexisting parkland.

Challenges

Coordination of the many agencies and protocols required to meet regulations and effectively recreate productive natural areas.

Lessons Learned

Persistence and cooperation among diverse agency interests can achieve long-term improvements to once degraded environs.

For more information about the project, visit:

- Rutgers Wildlife Conservation and Management Program
- Woodbridge Township Open Space and Floodplain Restoration Plan
- NJDEP Page on Woodbridge River Restoration
- Woodbridge River Floodplain Socioeconomic Monitoring Report
- Floodplain Management: Effective Tools to Help Increase Flood Resilience

Case Study 3: The Watershed Institute's Watershed Center for Environmental Advocacy, Science, and Education (rural)

In 2014, green infrastructure demonstration and education projects were installed as part of the expansion of The Watershed Institute's Center for Environmental Science, Advocacy, and Education located in Pennington. The renovations resulted in the building being certified as LEED Platinum from the U.S. Green Building Council. The centerpiece features include a 4,300 square feet (sq. ft.) entrance rain garden, a 1,500 sq. ft. driveway/side rain garden, a 1,400 sq. ft. green roof, and a 1,200-gallon underground cistern that was designed to provide grey water to the building for flushing the toilets. These projects were funded as part of the $8 million capital campaign fundraiser for the Watershed Center construction project, which also includes an artificial wetland wastewater treatment system, vegetated stormwater basin, passive and active solar energy, and a geothermal energy heating and cooling system.

Project Information:

- Site: Private
- Project status: Completed
- Year built: 2014
- Partner(s): The Watershed Institute, Farewell Architects, LLC., Princeton Hydro, Viridian Landscape Studio, ThinkGreen, LLC., Roofmeadow, and Carter Mechanical.
- Green or Blue Acres? Green Acres, property is certified as publicly-accessible open space
- Green Infrastructure Practice(s): Rain gardens, green roof, rainwater harvesting (1,200-gallon cistern)
- Cost: Incorporated as part of the capital improvement project. The green roof cost $144,000 and the cistern cost $52,500.
- Funding Source: Self-funded, capital campaign fundraiser.
- Project contact: Steve Tuorto, stuorto@thewatershed.org

1,200 sq ft rain garden in front of The Watershed Institute Center for Environmental Education, Science and Advocacy. This rain garden receives runoff from the 2,500 sq ft roof of the Center's main entrance hall. Source: The Watershed Institute.

1,600 sq ft Green Roof on The Watershed Institute Center for Environmental Education, Science and Advocacy. Source: The Watershed Institute.

Project Takeaways:

Benefits to the Greater Community

In terms of water quantity and quality to the Stony Brook watershed, the combined green infrastructure installations with other installed features capture, clean, and infiltrate the majority of stormwater from the Watershed Center helping to reduce flooding, improve the water quality, and recharge the aquifers within the Stony Brook watershed. The native flora associated with installing these natural systems helps support healthy ecosystems by promoting healthier soils and higher native biodiversity, especially for certain pollinator populations of concern. Along with the other features at the Center, these green infrastructure practices act as educational tools for sustainability and watershed health, and are used in a range of activities such as engaging the general public, educational tours for professional and educational groups, educational programming for high school students and teachers, green infrastructure construction and maintenance training and certification courses (e.g. for contractors, facilities managers, public works & other municipal employees, other state/local officials, etc.), as well as many other activities.

Challenges

Obtaining either experienced contractors or ones that are able and willing to follow design specifications is essential. The features described here were installed by several different contractors, and the differences in the initial installation process had a great impact on localized plant survival and susceptibility to external weed pressure. These variables are likewise affected by the development and implementation of a maintenance plan. Areas that were improperly installed (soil installation, planting/seeding density, etc.) and did not receive proper maintenance for the first two years following installation have required a large amount of labor for weed removal, amendments, and new plantings, and continue to be a challenge in this way.

Lessons Learned

Proper initial installation impacts future survival and maintenance requirements. An initial one to two-year maintenance plan that is strictly adhered to greatly increases the survival of the feature and long-term maintenance requirements. In addition, less complex planting plans (using three to five species per area) simplifies plant identifications and maintenance efforts.

For more information about the project, visit the Green Infrastructure Atlas and The Watershed Institute.

Case Study 4: Sussex Avenue Elementary School (urban, schoolyard)

Newark's central and west wards have few parks or green spaces. To help change that, The Trust for Public Land partnered with Congregation Ahavas Sholom, Newark's oldest operating synagogue, and The Healthcare Foundation of New Jersey to transform Sussex Avenue School's asphalt schoolyard into a safe and vibrant play space. The partnership reflects the synagogue's focus on tikkun olam (repairing the world) and tzedakah (social justice). The playground now features play equipment for students of all ages, a basketball court, a running track, and an outdoor classroom. The new design also incorporates green infrastructure elements-including gardens, porous play areas, and a turf field-to help manage stormwater and prevent flooding.

Project Information:

- Site: Schoolyard
- Project status: Completed
- Year built: 2014
- Partner(s): Newark Board of Education, Congregation Ahavas Sholom, The Trust for Public Land, Neglia Engineering Associates, and Tec-Con Contractors.
- Green or Blue Acres? Green Acres, property owned by the City of Newark's Board of Education.
- Green Infrastructure Practice(s): Stormwater store and release system under the turf playfield, rain garden, and porous safely play surface under play equipment.
- Cost: $1,000,000
- Funding Source: Private philanthropy, Community Development Block Grants, NJDEP Green Acres
- Project contact: Scott Dvorak, scott.dvorak@tpl.org

Site Plan of Sussex Avenue Schoolyard in Newark NJ, design by Neglia Engineering Associates. Source: The Trust for Public Land.

Children enjoying Sussex Avenue Schoolyard in Newark NJ. Source: Christian Valdez, The Trust for Public Land.

Project Takeaways:

Benefits to the Greater Community

In addition to the benefit of reducing stormwater during significant rain events, the project provided an improved play and outdoor educational experience for the students of the school, as well as turning an asphalt lot into a well-designed space with trees and plantings. The process of participatory design was an opportunity to educate faculty, students, and their families about the benefits of green infrastructure and the benefits of a green, sustainable playground. The greening of the site helped to reduce the heat impact of the paved areas.

Challenges

Challenges included raising funding, keeping the students meaningfully engaged over the period of time from concept design until construction, and connecting with the school on an ongoing basis to continue using the schoolyard's green infrastructure components as a meaningful educational tool.

Lessons Learned

Having a champion Principal helped the project run smoothly - from selection of students to participate in the design process, to engaging the whole school community, to troubleshooting things as they came up during design or construction.

Another important lesson is that designers should be cautious when using artificial turf because of its potential to contribute microplastics to the environment.

For more information about the project, visit the Sussex Avenue School page, on the Trust for Public Land's website.

Acknowledgements

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About Jersey Water Works

Jersey Water Works is working to transform New Jersey's inadequate water infrastructure through sustainable, cost-effective solutions that provide communities with clean water and waterways; healthier, safer neighborhoods; local jobs; flood and climate resilience; and economic growth. The Green Infrastructure Committee's goal is to increase the number of communities that employ green infrastructure to maximize benefits including reduced flooding and improved water quality, local economies, community health, and long-term resiliency.

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