

New York City Urban Field Station

A partnership of the USDA Forest Service and
The New York City Department of Parks & Recreation



New York City Urban Field Station 2013 Annual Progress Report January 2014

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The mission of the New York City Urban Field Station

Station is to improve quality of life in urban areas by conducting and supporting research about social-ecological systems and natural resource management. In service of that mission, the Urban Field Station provides both a physical place to conduct research and a conceptual space that nurtures a network of relationships among scientists, practitioners, and university cooperators all focused on the urban environment. The Urban Field Station is sustained through a core partnership between the **USDA Forest Service Northern Research Station** and the **NYC Department of Parks & Recreation (NYC Parks)**. Since its founding in 2006, the NYC Urban Field Station has engaged over 50 non-profit, academic, and government partners, creating innovative “research in action” programs to support urban ecosystem management and sustainability and resilience initiatives in New York City. A dedicated, multi-purpose main facility opened in September 2010 at Fort Totten in Bayside, Queens. Since then, the Urban Field Station has hosted more than 100 visiting scientists and students and delivered dozens of presentations at conferences around the country.



Two members of the Jamaica Bay Restoration Corps gather data in Marine Park

2013: A year of recovery and resilience

In an era of increasing urbanization and global climate change, social-ecological research in cities becomes ever more complex and urgent. **Hurricane Sandy** brought widespread devastation to New York City in late October of 2012, providing an urgent reminder of the need to understand and support resilience in the City’s social-ecological systems. In the immediate aftermath of the storm, New York City’s communities were assisted by a diverse set of dedicated First Responders—fire fighters, sanitation workers, police officers, park employees, interagency emergency response teams, neighborhood groups, trusted neighbors, national and international nonprofits, and more. In the year since the storm, Urban Field Station researchers and practitioners have turned their attention to assessing health and resilience across many types of communities—examining individual trees, wetland and forest systems, restoration sites, beachfronts, stewardship groups and practices, and diverse communities of park and open space users. Understanding the impacts of disturbance and change have been enduring themes in the Urban Field Station’s social-ecological research, and as in other contexts and investigations, our efforts are focused on sustaining healthy ecosystems, cultivating resilient communities and tapping into the unique potential of stewardship and greening to aid in the recovery process.

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2013 was also a year for strengthening our new partnership with the **Natural Areas Conservancy**, a nonprofit that works to restore and conserve the green and blue spaces of New York City in order to enhance the lives of all New Yorkers. With the Conservancy (NAC), NYC Parks and Forest Service scientists are teaming up for a thorough social and ecological assessment of the City's natural areas, and working to understand how these areas function ecologically and benefit our diverse human populations. In our work, in our communities, around the five boroughs and beyond, we continue to witness incredible strength and innovation from the street corner garden to the historic forests of Manhattan, from informal groups of neighbors to long-standing institutional partners all working to create a thriving, resilient city.

For more information, visit our website at
<http://nrs.fs.fed.us/nyc/>

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Research Projects

Research Focus: Resilience, Health and Well-Being

Reading the landscape: A social assessment of community use of green space in New York City

What are the uses, meanings, and values of public greenspace in New York City?



Jet Richardson interviews an angler on the shores of Jamaica Bay

Forest Service social science researchers have initiated a social assessment of parks and natural areas in communities around Jamaica Bay. This research seeks to inform the adaptive management of NYC's public open spaces and to provide a new rapid assessment methodology for understanding the social and cultural values and services embodied in and performed by parkland. With financial support from the Mayor's Fund to Advance New York City, research collaboration with the Natural Areas Conservancy, and a field crew supplemented by seasonal NYC Parks employees, Forest Service staff conducted four months of field observations and data collection, exploring the uses, meanings, and values of

public green space, attending both to enduring themes in the connections between people and place, as well as to the specific issues arising in the post-Sandy context.

Field research was conducted in collaboration with a team from the **Jamaica Bay Restoration Corps**, a workforce development program funded by the Department of Labor to support individuals displaced from their work by Hurricane Sandy (October 2012). The program employed 200 adults from diverse and historically underserved communities that were most impacted by the storm. The research team trained 12 members of this Corps in mixed social science research methods, including public interviews, qualitative and quantitative site observations, and photo-documentation. The Corps worked alongside the research team for a month of intensive field research, bringing their unique and diverse perspectives on public lands to our shared work. Altogether, the field crew surveyed over 4,000 acres of city and federal parkland and interviewed over 600 park users. The research team has now transitioned into data analysis, product development, and sharing findings. Gillian Baine presented impressions and implications at the conference *Urban Resilience in an Era of Climate Change: Global Input for Local Solutions*, held in October 2013 in Brooklyn, NY. After completing the pilot study around Jamaica Bay, researchers are now exploring strategies for expanding the social assessment to parks citywide, including through training individuals and community organizations in the implementation of the rapid social assessment method.

Landscapes of Resilience

How do the processes of collaborative planning, shared creation, and stewardship of natural resources and sacred spaces support recovery from disasters?

In an effort to answer this question as it relates to a wide range of disasters and disturbances, Forest Service researchers are conducting cross-disciplinary research, funded by the TKF Foundation's program "**Open Spaces Sacred Places: The Healing Power of Nature**," which explores how urban green spaces promote individual and community resilience in Joplin, MO and New York City. The two cities are in different stages in their recovery timeline from natural disasters (an EF5 tornado in Joplin in May 2011 and Hurricane Sandy in NYC in October 2012). This work is being conducted in collaboration with Keith Tidball of Cornell University; Traci Sooter and Nancy Chikaraishi of Drury University; Chris Cotten of the City of Joplin; Donna Coble of Forest ReLeaf of Missouri; and Victoria Marshall

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and Colin MacFadyen of TILL Design. For more information, see <http://www.naturesacred.org/>. In addition to conducting research, developing the site design in Joplin, and identifying a potential restoration site in New York City, team members have presented on the project to researchers, managers, policy-makers and designers. In New York City, Forest Service social scientist Erika Svendsen presented at the University of Massachusetts-Amherst Northeast Climate Science Center as part of a fall webinar series on November 6, 2013, and at the PopTech / Rockefeller Foundation “City Resilient” conference on June 24, 2013 at Brooklyn Academy of Music: http://poptech.org/popcasts/erika_svendsen_studying_stewardship. In addition, Svendsen and Forest Service colleague Lindsay Campbell have contributed to the recently published edited volume, *Greening in the Red Zone*, (Springer, 2013). The volume, edited by Keith Tidball and Marianne Krasny of Cornell University, describes the processes by which community greening and civic ecology promote social-ecological resilience after political or natural disasters, with theoretical and empirical contributions from international researchers and practitioners. Svendsen and Campbell’s chapter describes research from the **Living Memorials Project**, documenting community greening in the wake of September 11, 2001. A review of the book was written by Nancy Falxa-Raymond (USFS) and published in *Urban Forestry & Urban Greening*.

Integrating Grey and Green Infrastructure to Improve Health and Well-being for Urban Populations

What are the relationships between grey infrastructure, green infrastructure, and human wellbeing?

The primary objective of this project is to integrate knowledge from the fields of public health and social ecology in an effort to inform urban planning and advance human health and well-being. This interdisciplinary research effort seeks to establish a systems framework for understanding complex systems made up of the built (grey) and natural (green) elements of cities, and human health and well-being. Erika Svendsen and Gillian Baine have now entered the second year of this collaboration with Mary Northridge (NYU College of Dentistry, Epidemiology & Health Promotion) and Sara Metcalf (SUNY-Buffalo, Geography). The collaboration has helped inspire and frame several presentations, including at The City Resilient in Brooklyn, NY (Svendsen: “Cultivating resilient spaces in the city”); the Association of American Geographers annual meeting (Metcalf: “Modeling urban health and behavior at the intersection of social, natural, and built environments”); SUNY-Buffalo’s Applied Mathematics Seminar Series (Metcalf: “Agent-based system dynamics: hybrid models of urban health”); the Spreading the Canopy Symposium in Des Moines, IA (Northridge: “The Grey, the green, and the human”); and at Improving Oral Hygiene Behavior: A Workshop to Spark New Ideas for Research at the University of Pennsylvania, Philadelphia, PA (Northridge: “An Oral public health approach: promoting health equity”). Additionally, the work catalyzed an editor’s choice in the American Journal of Public Health entitled “Protecting Public Spaces” (Northridge and Mark, 2013) and a forthcoming editorial in the same journal entitled “Recognizing resilience” (Svendsen, Baine, Campbell, Northridge, and Metcalf, 2014).

Evaluating youth engagement at East New York Farms!

What are the impacts and successes of a youth employment program engaging teenagers in sustainable food production, farmers market operations, and a curriculum based on food justice and food systems?

Nancy Falxa-Raymond and Lindsay Campbell completed an evaluation of East New York Farms! (ENYF) Youth Internship Program alumni this year, collaborating with the nonprofit’s executive director, Sarita Daftary, in a project supported by **NRS Civil Rights Special Project funding**. ENYF is a program of United Community Centers, and runs an intensive 9-month internship program for local youth ages 13-18 in Brooklyn, NY. Interns grow food in community gardens using sustainable methods, collaborate with adult gardeners to run two farmers’ markets, and participate in workshops to better understand the context of their work. Youth who participate in the program must live or go to school in East New York, a



Washing greens at East New York Farms!
Photo credit: East New York Farms!

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historically marginalized community of color in Brooklyn. The evaluation addressed alumni outcomes, attitudes, and behaviors after taking part in the ENYF internship for at least one year, and found that the amount of time spent in the internship positively impacted alumni attitudes and behaviors around aspects of food, health, environment, and community. Program successes were evident in the findings that half of the program alumni were found to be currently working part time or full time, and 64% were engaged in some type of education or training program.

Freshkills: Landfill to Park Conversion

The conversion of Freshkills from municipal solid waste landfill to community park involves a complex set of social and ecological processes. How can plant species selection expedite ecological restoration goals? And, in the midst of restoration efforts, how do neighboring community members perceive the site and its ongoing transformation; and what are their intentions to visit the future park?

The site of a former municipal solid waste landfill, Freshkills is being converted into a 2,200 acre municipal park (for more information on the site, visit: www.nycgovparks.org/park-features/freshkills-park.) Continuing the partnership between the Urban Field Station and Freshkills Park, Forest Service scientists have worked with NYC Parks staff and several University faculty members to investigate both biophysical and social questions that have arisen throughout the restoration process:

- **“Attitudes towards and Intentions to Visit Freshkills Park”** is a large scale, quantitative assessment of Staten Island residents’ attitudes towards the transformed site. The project is led by David Klenosky of Purdue University with cooperators Christine Vogt (Michigan State University), Stephanie Snyder (USFS), Lindsay Campbell (USFS), and Freshkills Park staff. Klenosky et al. presented at the 2013 Northeastern Recreation Research Symposium in Cooperstown, NY, April 7-9, 2013. The authors have a paper in development entitled “Predicting visitation to Freshkills Park: A transformed landfill-to-park site in New York City.”
- **“Improving Ecosystem Health and Functioning at Freshkills Park through Phytotechnologies”** is led by plant geneticist Ron Zalesny at the U.S. Forest Service Northern Research Station’s Institute for Applied Ecosystem Studies in Rhinelander, WI, along with Adam Wiese (USFS-Rhinelander), Bruce Birr (USFS-Rhinelander), Rich Hallett (USFS NRS), Nancy Falxa-Raymond, and Freshkills park staff. The first step in this process is to identify and propagate “workhorse” species belonging to the *Populus* (poplar) and *Salix* (willow) genera. Team members collected initial plant material from native Staten Island populations in order to conduct greenhouse studies in Rhinelander, WI using a process called phyto-recurrent selection. The long-term goal is to select and establish the most successful genotypes that can help improve soil quality and other aspects of ecosystem health in Freshkills and other New York City parks and to then conduct field trials via another round of phyto-recurrent selection. The authors have a paper in submission entitled “Propagating Native Salicaceae for Afforestation and Restoration in New York City’s Five Boroughs.”

Research Focus: Stewardship and Governance

City of Farms, City of Forests

How are urban sustainability planning and implementation negotiated in the current era of green infrastructure investments in global cities; what claims are made in that process; and what are the effects on the transformation of urban land and natural resource management practices?

In her doctoral dissertation, ***City of Forests, City of Farms: Constructing Nature in New York City***, Forest Service social scientist Lindsay Campbell explores how urban nature is constructed in New York City from 2007 to 2011, in policy making, planning, and implementation. Focusing on New York City’s municipal long-term sustainability plan, PlaNYC, the research examines the network of actors, discourses, and socio-natural environments that constitute

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urban forestry and agriculture. Campbell successfully defended this dissertation in September 2013 for the completion of her PhD in geography at Rutgers University, which was funded by the Forest Service's "Scientist Recruitment Initiative" and the USDA Pathways program. Campbell presented on research from her dissertation at the Urban Affairs Association conference in San Francisco and the Urban Forests and Political Ecologies conference in Toronto, Canada, both in April 2013. She has also been invited to submit a chapter to an edited volume by Routledge that is currently in press. Campbell is now working to turn the dissertation into a book and other research products.

MillionTreesNYC Research and Evaluation

What are the citywide impacts of the MillionTreesNYC campaign, in its efforts to increase forest cover in NYC; to promote basic social-ecological research; to engage a broad constituency of volunteers, stewards, and advocates; and to educate and train diverse populations in urban forestry and tree stewardship?

MillionTreesNYC is an ambitious campaign to plant and care for one million new trees in New York City, launched as part of PlaNYC by NYC Parks and the nonprofit New York Restoration Project. Forest Service research findings quantifying the environmental benefits of New York city's street trees and urban tree canopy helped make the case for this massive public and private investment in tree planting, education, and awareness. Research is integrated



Volunteers fan out across Rockaway Community Park at the MillionTreesNYC planting in November, 2013

throughout all aspects of the MillionTreesNYC initiative, but especially in the Research and Evaluation subcommittee of the MillionTreesNYC Advisory Committee, co-chaired by Erika Svendsen and Jacqueline Lu (NYC Parks). The work of the Research and Evaluation subcommittee has helped to build connections between researchers and practitioners through a research workshop, a symposium, and a special issue of the journal *Cities and the Environment* (vol. 3, issue 1, 2010). At the same time, the MillionTreesNYC campaign has inspired new lines of basic and applied research related to green jobs, air quality, stormwater retention, forest restoration practices, species selection, and environmental stewardship. Dana Fisher (University of Maryland), Erika Svendsen, and James Connelly (Northeastern) are working on a book detailing the work of volunteer tree stewards to be published by Routledge Press, entitled ***Urban Environmental Stewardship and Civic Engagement: How Planting Trees Strengthens the Roots of Democracy***. The

campaign will also produce long-term scientific datasets that will be available for use by future researchers. A new report, "**MillionTreesNYC: The Integration of Research and Practice**" will be published in 2014 by NYC Parks and made available on the Urban Field Station website and distributed nationally.

- **MillionTreesNYC Surveys and Participant Evaluations:** Ruth Rae (NYC Parks) collaborated on the design, administration, and analysis of on-line surveys designed to evaluate different aspects of the MillionTreesNYC program. These included the Volunteer Post-Planting Day and the New Street Tree Request surveys. The results of these and other surveys were presented at the **MillionTreesNYC Task Force** meeting in June, 2013. The Volunteer Post-Planting Day survey evaluated volunteer participants' experience of the large-scale reforestation planting day events in the spring and fall of 2013. The New Street Tree Request survey, which was sent to individuals who had requested and received a new street tree in front of their home, investigated motivations for the request and resident interest in receiving stewardship training for these new trees. Rae presented "**Narrowing the Evaluation Focus on a Myriad of MillionTreesNYC Programs**" at the Eastern Evaluation Research Society Conference on April 16, 2013. Her presentation described a program evaluation of MillionTreesNYC and the campaign's enhanced focus on stewardship.

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- **Green Jobs:** In 2009, the USFS's Northern Research Station and Northeastern Area State & Private Forestry partnered in supporting the **MillionTreesNYC Training Program (MTTP)**, with \$2 million in funding to secure the employment of graduates from the 9-month training program. MTTP, run by NYC Parks and the New York Restoration Project, targeted 18-24 year olds who were previously disconnected from the workforce. Graduates of the program worked directly in arboriculture, ecological restoration, landscape design and horticulture. This year, Nancy Falxa-Raymond, Erika Svendsen, and Lindsay Campbell published the results of research analyzing the experiences of first year MTTP graduates in *Urban Forestry & Urban Greening*. Based on face-to-face interviews conducted with sixteen graduates of MTTP and their employers, the findings reveal the significant challenges facing the graduates, but also the benefits of urban conservation job training and employment that are potentially transformational for these economically disadvantaged young adults. Green jobs training and employment present real opportunities for intellectual stimulation and an increased sense of accomplishment, due in part to the uniqueness of the environmental work.
- **MillionTreesNYC Monitoring Study:** This year marks the fifth and final year of the MillionTreesNYC monitoring study, which follows a small subset of the two- to three-gallon reforestation trees planted citywide to evaluate survival rates and health outcomes during the root-establishment period. Led by Brady Simmons (NYC Parks), the study has gathered data from 718 plots in 53 parks citywide to date. Survival and health metrics of all species will be used in conjunction with existing soils data and site preparation and maintenance regimes to assess the effectiveness of various restoration practices in both reforestation and afforestation efforts. Newly planted trees in both site types exhibited an average survival rate of 88% in the first year, and a 90% chance of survival through the second year. Trees planted in afforestation plantings, where there is little or no mature canopy cover, had a lower survival rate in the first year of establishment (86%) than those planted as part of reforestation efforts (90%). The rates in dieback were similar between the first and second year of growth (73% and 69%, respectively).

STEW-MAP: Understanding and mapping stewardship in New York City and Philadelphia

What are the social and spatial (geographic) interactions among people and groups that conserve, manage, monitor, advocate for, and educate the public about their local environments (including water, land air, waste, toxics, and energy issues)?

STEW-MAP is a comprehensive study of the presence, capacity, geographic turf, and social network of stewardship groups. STEW-MAP defines a “stewardship group” as an organization or group that works to conserve, manage, monitor, advocate for, and/or educate the public about their local environments. This work includes efforts that involve water, forests, land, air, waste, toxics, and energy use. 2013 marks the launch of **STEW-MAP Philadelphia**, with surveys distributed citywide this year and data collection ending in January of 2014. STEW-MAP Philadelphia will be that city’s first ever comprehensive map of the more than 1,000 local civic environmental groups. Citywide greening groups and other local organizations are working together with researchers from the U.S. Forest Service and the University of Maryland to develop this project. Together they will count, map, and connect all the different forms of environmental work happening in Philadelphia. Other partners in the effort include the Philadelphia Field Station, the Pennsylvania Horticultural Society, Philadelphia Parks & Recreation, the Mayor’s Office of Sustainability, and PhillyStake. Forest Service scientists, including members of the NYC Urban Field Station, have supported Philadelphia’s effort to launch STEW-MAP. Simultaneously, researchers from Los Angeles, CA, and San Juan, Puerto Rico, are expressing keen interest in replicating the STEW-MAP study and application for their own cities.

Using STEW-MAP data, Forest Service research social scientists have continued to publish peer-reviewed articles, book chapters, and white papers on the subjects of urban environmental stewardship and governance. This year, Erika Svendsen and Lindsay Campbell contributed to a paper published in *Landscape and Urban Planning* with James Connelly and Dana Fisher: “Organizing urban ecosystem services through environmental stewardship and governance

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in New York City” (vol. 109: 76-84). Svendsen and Fisher also contributed to the 2014 Routledge International Handbook of Social and Environmental Change: “Hybrid Arrangements within the Environmental State” (Lockie, Sonnefeld and Fisher, eds.). Svendsen authored a chapter entitled “Storyline and design: How civic stewardship shapes urban design in New York City” in a new book, *Resilience in Ecology and Urban Design* (Pickett, S.T.A.; Cadenasso, M.L.; McGrath, B., eds., 2013). Forest Service social scientists Svendsen and Campbell are sharing their work on stewardship and environmental governance among a group of researchers from cities throughout the world through a Research Collaborative Network (RCN) on Urban Sustainability facilitated by Dan Childers (Arizona State University) and Steward T. A. Pickett (Cary Institute for Ecosystem Studies).

Finally, Erika Svendsen and Forest Service colleague J. Morgan Grove were invited by order of the Secretary of the Interior to participate in the **federal Strategic Sciences Group (SSG)** in March 2013. Svendsen and Grove joined experts from around the country to develop future scenarios and provide rapid, interdisciplinary scientific assessments in the aftermath of Hurricane Sandy, a regional disaster affecting human life, and America’s natural resources, economy, and infrastructure. Svendsen worked with this group to identify areas for future study on the subject of urban disasters, specifically providing both local knowledge and expertise on community development and civic organizational networks. Recommendations were given directly to the Hurricane Sandy Rebuilding Task Force.

Research Focus: Urban Forest Health and Assessment

i-Tree Eco

What is the structure and composition of New York City’s urban forest, and what ecosystem services does it provide?

This summer, Rich Hallett, Nancy Falxa-Raymond, and Novem Auyeung (NYC Parks) partnered with David Nowak and Robert Hoehn III (USFS) as well as Mark Bradford and Emily Stevenson of Yale University to assess New York City’s forest using **i-Tree Eco**, a peer reviewed method developed by the Forest Service for quantifying the structure of urban trees, as well as the environmental services that they provide. Two crews of interns collected data from 300 plots located randomly throughout New York City across both public and private lands, including industrial, residential, open space, and streetscape plots. The results of the i-Tree Eco assessment will provide estimates of the number of trees citywide, species distribution, size distribution, structural value, pollution removal, carbon sequestration, and building energy reductions due to the urban forest. The study updates the UFORE assessment conducted in 1997, and will be repeated every five years to track changes in New York City’s urban forest. Rich Hallett has published an article in German magazine AFZ-DerWald describing the study.



An i-Tree crew gathers data in the field

Greenhouse soil project

How do native tree species perform in a variety of urban soils from sites around the city?

Clara Pregitzer (NYC Parks), Tim Wenskus (NYC Parks), Rich Hallett, and Nancy Falxa-Raymond have collaborated to **quantify the performance of four commonly planted native tree species growing in typical urban soils** collected from reforestation sites in New York City. Using a multi-factorial design, researchers planted red oak, silver maple, serviceberry, and black birch seedlings in thirteen soil types, including one custom-made greenhouse soil and twelve urban soils collected from four typical New York City soil categories (coal ash, urban construction fill, sandy clean fill, and native till). After two growing seasons in a common greenhouse environment, tree health was assessed using

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height and diameter growth, leaf discoloration, and chlorophyll fluorescence (an indication of photosynthetic performance). These parameters were combined into a single standardized tree health variable, which was found to be significantly affected by soil type ($p < 0.001$). After data collection, the trees and soil were harvested and dried for subsequent biomass and chemistry analyses.

Exploring Hurricane Sandy Flooding Impacts

What are the impacts of salt water inundation on NYC's urban forest?

Powerful winds and high water from Hurricane Sandy in October 2012 have inspired a close look at the **response of NYC's trees to saltwater flooding**. Over 20,000 trees citywide, including 11,000 street trees, were toppled by the storm. The full impact of the storm on the city's street trees, however, has yet to be determined. NYC Parks' officials estimate that 47,900 trees stood in the flood zones. NYC Parks foresters noted that in spring 2013 many trees in these zones were late to leaf out. To better understand possible impacts on tree health, NYC Parks employees assessed over 40,000 trees in parks and streets throughout inundation zones, estimating whether the tree had 0%, 25%, 50%, or 75% of its leaves. The most impacted tree species were London planetree, maple, cherry species, and oak. Questions remain regarding whether these trees will continue to decline or recover over time. Taking these observations a step further, in August 2013 Rich Hallett, Nancy Falxa-Raymond and Novem Auyeung took their research to Queens and measured fifty red maple street trees that were flooded by the storm surge and fifty red maples that were not impacted by salt water. They collected data on iPhones as part of a beta testing of the new data collection app DataSavvy created by Urban Field Station partner Sound Science. Preliminary analysis shows that flooded trees are significantly more stressed than non-flooded trees, with more results to come on foliar chemistry measurements. These data will provide the basis for future work as we strive to understand and prepare for the longer-term impacts of hurricanes and other disturbances on urban forests in coastal areas.



low stress

high stress

← The tree health assessment team generated a stress index for red maples in Sandy inundation zones →

Green Infrastructure

How do constructed green infrastructure installations function to aid in the city's management of stormwater, in terms of their capacity to moderate the flow and influence the quality of runoff?

Green infrastructure creates a system of ecologically engineered landscapes that provide multiple environmental benefits, including stormwater management. New York City has over 2,500 Greenstreet sites, some of which have been specifically designed to maximize stormwater capture. As part of a continuing collaboration with NYC Parks, Franco Montalto (Drexel University) is studying five greenstreet sites around the city, collecting and analyzing data from instrumentation installed in the sites. Research primarily investigates stormwater retention through the quantification of rates at which stormwater runoff moves through a greenstreet; it also measures evapotranspiration rates on



Installing instrumentation at a green infrastructure site.

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these sites. At three of these sites, efforts also include the monitoring of stormwater pollutant removal and greenstreet soil chemistry. The research team is now collecting baseline measurements in advance of the construction of several new green infrastructure features in the Bronx River Combined Sewer Overflow sewershed (CSO)—including greenstreets, green roofs, green walls, and downspout disconnections. These field research efforts, along with controlled lab experiments testing canopy interception under a rainfall simulator, are now the basis of monthly meetings to further advance green infrastructure research projects and their design implications. Bram Gunther (NYC Parks, NAC) has presented “Green Infrastructure in the 21st Century,” on the research and practice happening in New York City, to many audiences worldwide, including at the U.S. Department of State (November 4, 2013), the New York University (September 10, 2013), the Rooted in the Future Training Conference in Vancouver (September 20, 2013), Smart Designs for Sustainable Water Conference (Brisbane, Australia, November 25, 2013), and the American Society of Landscape Architects of New York City (NYC, February 13, 2013).

Investigating urban soils

How can we characterize the unique structures and compositions of NYC’s urban soils?

Individual efforts to test and describe NYC’s soils take place across site type and explore a range of variables, such as heavy metals content, organic matter content, soluble salt content, plant nutrient content, and others. In an effort to consolidate soil test results from the many projects around the city, Brady Simmons and Novem Auyeung convened members of NYC Parks Natural Resources Group (NRG) for a training in interpreting results from such tests. Together with Craig Mandel and Rachel Charow, they are working to establish a soil database and to streamline soil testing and reporting processes in an attempt to advance a holistic understanding of soils around the city. This year, NYC Parks is transitioning to a new soil-testing contract with Rich Hallett and Jeff Merriam of the Forest Service’s Northern Research Station.

Research Focus: Natural Areas Restoration

NYC Afforestation Project (NYCAP)

How successfully do constructed, native, urban forests sustain themselves; and how resilient are they to the invasion of non-native invasive plant species?

Rich Hallett, Nancy Falxa-Raymond, and Novem Auyeung continued collaboration with Yale University researchers Alexander Felson, Mark Ashton, Mark Bradford, Emily Stevenson, and Robert Warren II to investigate the sustainability of constructed, native, urban forests planted as part of the MillionTreesNYC program and their resilience to invasive species. Researchers collected data at their site in Kissena Park for a third year, tracking recruitment from the planted, native vegetation as well as the proliferation of invasive plant species and are investigating the impact of planted species diversity and organic amendments on these processes. Soil quality, water and carbon storage capacity are improving as a result of the afforestation efforts. This year, buried wood stakes installed at the research site in 2012 as part of a national study of soil organic matter decomposition and soil productivity were dug up and analyzed by researchers Mary Beth Adams (USFS) and Marty Jurgensen (Michigan Technological University).

Long-term forest restoration study in Pelham Bay Park, Bronx

Can forest restoration efforts encourage the development of closed canopy forests and discourage the establishment of non-native invasive species?

Ecologists from NYC Parks and the Forest Service (Simmons, Auyeung, Hallett, and Falxa-Raymond) have collaborated to conduct a study on the success of forest restoration in Pelham Bay Park, NYC’s largest public park. Located in the northeast section of the Bronx, Pelham Bay Park hosts a diverse array of habitats and reflects a varied land use history. Portions of the park experienced intense deforestation pressure in the early 20th century. Rodman’s Neck, a

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section of Pelham Bay, was identified as a restoration site in 1992 after the area was surveyed and deemed severely degraded with invasive vines and an altered forest structure. The objective of this study is to determine if the restoration resulted in a more native and diverse forest than control sites and to understand the effects of a differential maintenance regime across different sites in the restoration area. Three distinct treatment areas were delineated using historic restoration plans: (1) cleared of non-native vegetation; (2) cleared and planted with native trees; and (3) cleared, planted, and maintained after initial restoration. Control plots were established in neighboring areas that remained degraded. Using a nested plot design, forty-eight plots were established to assess the abundance of non-native species, planted tree survival, native shrub and herbaceous species diversity and abundance. Team members measured crown transparency and foliage height diversity with digital camera techniques that allow an examination of the vertical profile of native and non-native species composition.



Measuring tree height with a hypsometer in Pelham Bay Park

Preliminary results indicate that total tree basal area is greater in all the treatment plots than in control plots, with the highest basal area found in the cleared and planted plots. Native basal area was also greater in several treatment plots than in control plots, including those areas treated with invasive removal alone, and those that were cleared, planted, and maintained for invasive control. Foliage height diversity and canopy closure were both higher in the restored areas compared to control plots. It has been 20 years since the initial restoration work; and the results of this study show retention of planted trees as well as a closed mature canopy in the restored areas. Further analysis will help elucidate understory reponse to diverse restoration practices and help generate comprehensive guidelines for managing future restoration efforts.

Natural Areas Ecological Assessment

What is the current ecological health of the New York City's natural areas?

Staff and scientists from the Natural Areas Conservancy and NYC Parks are collaborating in the first-ever citywide Ecological Assessment of natural areas—parkland that is set aside for objectives such as habitat and biodiversity rather than maintained for active recreation. The multi-year research effort aims to guide future natural resource conservation efforts in order to expand, restore, and manage a network of green and blue spaces across New York City, creating a city that is more resilient, sustainable, and livable. In 2013, the ecological assessment team developed and tested methodologies for assessing freshwater wetlands, salt marshes, and upland and forest sites, which will be continued in 2014. The field team completed upland assessments in Van Cortlandt Park in the Bronx and in all Brooklyn parks. Freshwater wetlands were surveyed in Van Cortlandt Park and Alley Pond Park in Queens. Seventy percent of salt marsh complexes were assessed citywide, with plans in place to assess the remaining wetlands in 2014. The 2013 efforts successfully covered 3,090 acres, or 35% of NYC Parks' natural areas. Throughout this pilot year, the ecological assessment research team has been integrating a variety of other data into their efforts, including from breeding bird surveys and the social assessment led by Forest Service social scientists.

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Research Focus: Urban Biodiversity

Surveying Urban Vernal Pools:

How do NYC's vernal pool populations compare to vernal pool populations in less developed areas around the region?

Susan Stanley (NYC Parks) continued her research on vernal pools for a third year with a focus on urban parks with breeding amphibians, such as the wood frog (*Lithobates sylvatica*) and spotted salamander (*Ambystoma maculatum*). She surveyed eleven ponds in two parks in Queens, with amphibian reproduction recorded in both typical woodland pools as well as large, vegetated kettle ponds found throughout the glacial terminal moraine of New York City. Preliminary results indicate that vernal pond obligate amphibian metapopulations are present in two parks within the city.

Monitoring Breeding Birds

How can breeding bird populations be used as an indicator of forest and salt marsh restoration efforts?

NYC Parks ecologists Susan Stanley, Brady Simmons, and Ellen Pehek have been conducting bird surveys since 1992 in an ongoing effort that follows citywide salt marsh and forest restoration projects. Spot mapping has been consistently used over the last 17 years to describe changes in distribution and abundance over time and within these community types. Recent efforts have focused on converting all hard copy maps to a spatial database using ArcGIS. This digitized dataset will allow researchers to spatially correlate bird population dynamics with changes in habitat, land use, and other site conditions. The work of digitizing the data inspired collaboration with Brian Olechnowski (Fairleigh-Dickinson University). His lab will examine and analyze breeding bird survey data from riparian forest restorations in the Bronx.

Susan Stanley also assisted New York City Audubon in their **annual survey of colonial water birds** on South Brother Island in New York Harbor. Due to the relative isolation of this and other abandoned quarantine islands, several species of birds can be found nesting here. Eggs, nests and chicks of yellow and black-crowned night herons, great egrets and double-crested cormorants were recorded.

Biodiversity Assessment Handbook for New York City

NYC Parks ecologists authored sections of the recently released *Biodiversity Assessment Handbook of New York City*, published by the American Museum of Natural History and authored by Erik Kiviat of Hudsonia, Elizabeth A. Johnson of the American Museum of Natural History, and several other contributors. Susan Stanley and Ellen Pehek wrote sections on the streams and woodland pools of New York City. The Handbook is free and available for download in the Publications section of the museum's website: www.amnh.org.

In another investigation of New York City's biodiversity, Susan Stanley participated in the **2013 Central Park Bioblitz**. This year's event was spearheaded by the Central Park Conservancy and the Macaulay Honors College of the City University of New York. Stanley led a bat walk for Bioblitz participants; and despite some evening rain, one silver-haired bat—the first ever captured in Central Park—and two red bats were caught in the mist nests in an operation supervised by bat biologist Dr. Rodrigo Medellin of the National Autonomous University of Mexico.

For a complete and current list of products and publications, please visit: <http://www.nrs.fs.fed.us/nyc/pubs/>



Susan Stanley surveys a vernal pool

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Science Education

University Partnerships

- **CCNY Spitzer School of Architecture** - Lindsay Campbell and Erika Svendsen consulted with Denise Hoffman-Brandt, chair of the Landscape Architecture program, in reformulating the program's first year graduate urban ecology seminar. Working with lecturer Amy Lerner, Campbell and Svendsen developed a heavily field oriented curriculum that used the landscapes of New York City as content and context for the course. The researchers lectured in class about community gardens, urban agriculture, and stewardship; and led a walking tour along with Lenny Librizzi of GrowNYC of Central Brooklyn gardens. Rich Hallett and Nancy Falxa-Raymond led a seminar on urban forest restoration, and Kat Bounds of NYC Parks led a related field tour of a forest restoration site.
- **Macaulay Honors College, City University of New York:** The Forest Service Social Science research team was invited to help coordinate a semester-long research project for freshmen in CUNY's Macaulay Honors College. Lindsay Campbell and Gillian Baine led a seminar and field training exercise for forty freshmen as part of their seminar "Science and Nature in New York City." Students used the mixed social science research methods as the foundation for their semester-long research project examining community use and value of NYC parks in northern Manhattan.
- **Yale University:** The New York City Urban Field Station has secured seed funding for a fellowship program to engage Yale University graduate students in place-based social and ecological research efforts for the summer of 2014. This fellowship comes out of a formalized **partnership with the New Haven Urban Resources Initiative**, a University-affiliated nonprofit dedicated to fostering community-based land stewardship; promoting environmental education; and advancing the practice of urban forestry.

Teaching, mentoring, and advising

Urban Waters Federal Partnership: With help from a U.S. Forest Service **More Kids in the Woods grant**, hundreds of students at Bronx Community Charter School and the Learning Tree will bring the Bronx River Forest into the schools' curriculum and culture. The **Bronx River Alliance** will actively participate in the development of a Bronx River Curriculum, which will be vetted and tested by both schools and shared through the NYC Urban Field Station website. Rich Hallett, Erika Svendsen, and Gillian Baine will assist with building the curriculum and evaluating its success in the schools. By centering learning and activities around an area in close proximity to the schools—the Bronx River Forest and surrounding parkland—the program will not only serve the participants but also nurture future stewards of this urban forest.

In August 2013, NYC Urban Field Station scientists participated in hosting a group of students from the National Environmental Hispanic Council as part of the 8th annual **New York City Minority Youth Environmental Training Institute**, an intensive, science-based, residential environmental education and environmental career development program for Hispanic youth. Eloise Hirsch, Freshkills Park Administrator, and Shastine Van Vugt, a staff landscape architect, facilitated a tour of Freshkills Park; where Erika Svendsen and Lindsay Campbell offered a presentation about cities as complex social-ecological systems, urban environmental stewardship, and Forest Service social science in New York City. About twenty-five high school students from across the United States, ages 16-19, attended as part of their immersive, 7-day program.



Forest Service scientists host the National Environmental Hispanic Council at Freshkills

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Green Girls Summer Environmental Education camp: As part of the City Parks Foundation's summer program introducing middle school girls to women scientists, NYC Parks ecologist Susan Stanley led a day-long lesson and field exercise on dragonflies. Stanley brought the group of approximately twenty students to Strack Pond in Forest Park, Queens, where they learned about dragonfly and damselfly ecology, behavior, and function in a wetland system. They ventured out into the field (and water) to try to capture these fast-flying insects. They were able to capture three different dragonfly species and one species of damselfly. The event was covered by the Wall Street Journal, Queens Gazette, and the Times Newsweekly.

Wave Hill Woodland Ecology Research Mentorship (WERM) program: Nancy Falxa-Raymond and Clara Pregitzer are science mentors to a group of academically high-achieving high school students from a number of underserved areas of the Bronx and Brooklyn, exposing them to both urban forest ecology and social-ecological research methods. Rich Hallett, Tim Wenskus, Ellen Pehek, and Helen Forgione (NAC) are serving as Science Advisors to the program. In the coming year, students will choose one scientist to work with and will complete a final research project under the guidance of their mentor. Falxa-Raymond and Pregitzer, along with the NYC Urban Field Station staff serving as science advisors, have facilitated field exercises and workshops exploring both biophysical and social science approaches to understanding NYC's natural resources.

Seminars and public events:

- In partnership with the CUNY Center for Urban Environmental Reform (CUER), the NYC Urban Field Station hosted a **public seminar on Landscape Architecture: Re-envisioning curriculum and practice for 21st century ecosystems**. The seminar featured perspectives from Dr. Laura Lawson (Rutgers University) and Denise Hoffman Brandt (the City College of New York).
- As part of the **Municipal Arts Society's annual Jane's Walk** series, honoring Jane Jacobs and her contributions as an advocate for livable cities and vibrant neighborhoods, NYC Urban Field Station staff hosted a **public walking tour** celebrating civic engagement, environmental activism, and natural resource stewardship in the Gowanus and Park Slope neighborhoods of Brooklyn for approximately 20 New Yorkers.
- The NYC Urban Field Station hosted a **special wildlife briefing on coyotes** in New York City, in which Mark Weckel (American Museum of Natural History), Chris Nagy (Mianus River Gorge), and Suzanne Clemente (Pace University) shared data collected from cameras on public lands and directed a conversation among ecologists, city land managers, and urban park rangers about coyote populations in the city.
- The Urban Field Station hosted two **international visitors** this fall. Lyndal Plant, Program Delivery Manager at Parks and Environmental Planning, Brisbane City Council, and M. Phil Candidate at the University of Queensland, offered a presentation on **Street Tree Management and Research in Brisbane, Australia** at the Urban Field Station in September 2013, discussing some of her Council's successful urban forestry programs and policies and sharing the results of her graduate research on the composition, structure, and associated property value benefits of Brisbane's street trees. Later that month, Johan Östberg of the Swedish University of Agriculture Sciences presented his work: **"Grading of Parameters for Urban Tree Inventories by City Officials, Arborists, and Academics Using the Delphi Method."**

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Urban Field Station Residents, Lab, and Research Permitting

Residents: The NYC Urban Field Station continues to host visiting scientists and scholars for short- and long-term stays while they pursue research related to urban social-ecological systems and urban natural resource management. While the summer months are the busiest, the field station has accommodations for visitors year-round. In 2013, fifty-nine researchers stayed at the field station for periods ranging from one night to three months; seven of these visitors were long-term residents visiting for between two weeks and three months. These researchers herald from eleven different institutions, including academic institutions, federal agencies, and nonprofit land management groups. For more information on staying at the NYC Urban Field Station, please visit our website: <http://nrs.fs.fed.us/nyc>.



Novem Auyeung, Brady Simmons, and Susan Stanley in the Urban Field Station lab

The Field Station also hosts retreats, trainings and seminars for multiple audiences. Resident and visiting Forest Service staff hosted a two-day **i-Tree training** for twelve people. Field Station staff also received a visiting leadership team of **USFS Forest Supervisors** and **Deputy Forest Supervisors** from around the country, leading the visitors in a discussion and tour to explore land management issues in New York City. NYC Parks staff held a retreat at the Field Station for the MillionTreesNYC campaign. The Field Station also hosted the kickoff event for the **Alley Pond Watershed Advisory Committee**, a group of governmental and nongovernmental members who will advise on the development of an Alley Pond Watershed Plan.

Lab update: The NYC Urban Field Station laboratory is now equipped with an **invertebrate reference specimen cabinet** that is available to researchers and students. Visiting researchers and in-house staff used the lab to process samples collected from the field, which included soils, plants, and insects.

Research in NYC Parks: NYC Parks issued 44 research permits during the 2013 calendar year for research on parkland. Research proposals explored issues throughout the five boroughs and spanned multiple parks, habitat types and taxa. Most of the research permits were issued for citywide or multi-borough projects; and the four most studied parks were Central Park, Inwood Hill, Pelham Bay, and Van Cortlandt Park. Researchers represented a range of organizations, including local community groups, public schools, universities, environmental organizations, and federal/state/city agencies. Many out-of-town researchers stay at the Urban Field Station while conducting their work. For a report summarizing permitted research in NYC Parks during 2013, visit the NYC Urban Field Station website: <http://www.nrs.fs.fed.us/nyc/about/>

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Staff and Support

Permanent Staff

David Maddox of Sound Science joined the staff of the Urban Field Station in early 2013, serving as the Director of Science for the Natural Areas Conservancy and the co-director of the Urban Field Station. Maddox had previously worked as a consultant for the field station, conducting a strategic outreach assessment and report to help identify key strengths and areas for potential growth. During his tenure at the field station, he helped initiate, shepherd and implement many of the strategic initiatives he had previously identified as critical for the next phase of the Urban Field Station's growth and evolution. He oversaw the development of the citywide Ecological Assessment; helped implement a decision tree for forest restoration efforts within NYC Parks; and worked on a number of other science and research goals for NYC Parks and the Natural Areas Conservancy. He left the Field Station this fall but continues to advise and partner with the Field Station on an ad hoc basis.

Fiona Watt has recently returned to the Urban Field Station in her new role as Co-Director and Manager of Strategic Initiatives. In this role she will cultivate fellowships, visiting professorships and scholars; steward existing and nascent partnerships with academic and civic organizations; convene workshops, symposia, and conferences to advance the work of the Urban Field Station to link research to the work of the Forestry, Horticulture, and Natural Resources Division within NYC Parks; and supervise a variety of special natural resource management projects.

Gillian Baine joined the Urban Field Station in March of 2013 as the Strategic Programs Director. Her efforts focus on developing field station fellowship programs, building and strengthening partnerships, and convening events at the field station and around the City. She also collaborates on research with the Forest Service social science team.

Novem Auyeung joined the Urban Field Station in January 2013 as the Laboratory Safety Coordinator and later also began work as the Ecological Assessment Analyst for the Natural Areas Conservancy. Her work involves managing the lab at the field station; issuing NYC Parks research permits; and collaborating on ecological research with scientists from the Forest Service, NYC Parks, the Natural Areas Conservancy, and other partnering institutions.

Summer staff, research assistants, and interns

The Urban Field Station welcomed four Research Assistant Summer Interns for the summer, all supervised by NYC Parks staff. **Antonietta Castro Cosio**, a PhD candidate at the New School's Urban and Public Policy program, conducted two literature reviews, one on Green Infrastructure, and one on Environmental Stewardship and Social Capital. **Alice Rhee**, an undergraduate student in the department of Environmental Psychology at the University of Florida, conducted two literature reviews, one on cultural and evolutionary dimensions of Visual Preference and one on environmental and landscape aesthetics. Both Castro and Rhee were supervised by Ruth Rae. **William Sklar**, a recent graduate of Binghamton University with a B.A. in Environmental Studies, assisted with efforts to geo-reference historic bird maps and create new GIS layers from spot maps made in the field as part of the breeding bird monitoring project. **Kevin Zhang**, a biology major also from Binghamton University, learned about urban vernal pools while helping with invertebrate sorting and identification in the field station lab. Forest Service social scientists welcomed two field research supervisors for their summer and fall work in the Jamaica Bay Social & Site Assessment of parks and natural areas: **Joana Chan and Jet Richardson**. Chan, a natural resources doctoral student at the University of Nebraska-Lincoln, focuses her research on urban agroecosystems and social-ecological resilience. Richardson is pursuing his MS in Urban Planning and MA in International Affairs at Columbia University, with a particular focus in emergency management and conflict resolution.

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Funders and supporters

Much of the work of the Urban Field Station is made possible through generous support of private and public grant funding. We thank all of our supporters who support our work and the mission of the Urban Field Station to improve quality of life in cities by conducting and supporting research about social-ecological systems and natural resource management:

- Doris Duke Charitable Foundation
- Environmental Facilities Corporation
- Leon Levy Foundation
- The Mayor's Fund to Advance New York City
- National Fish and Wildlife Foundation
- National Science Foundation's RCN Urban Sustainability Project
- New York Botanical Garden
- NYS Department of State
- Prince of Monaco Foundation
- TKF foundation
- Tiffany & Co. Foundation
- USDA Forest Service Northern Research Station
- USDA Forest Service MKIW / Children's Forests Special Project Funds
- USDA Forest Service Northern Research Station Civil Rights Special Project Funds

For additional information please visit <http://nrs.fs.fed.us/nyc> or contact:

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